Xam idea

SAMPLE PAPERS

Simplified

Science

Strictly according to CBSE Sample Paper

- CBSE Sample Paper-2023 (Solved)
- 5 Sample Papers (Solved)
- 10 Sample Papers for Practice

Class X
2023

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Contents

SYLLABUS

CENTRAL BOARD OF SECONDARY EDUCATION, NEW DELHI

SCIENCE–X (2022–23)

Unit No.	Units	Marks
I	Chemical Substances—Nature and Behaviour	25
II	World of Living	25
III	Natural Phenomena	12
IV	Effects of Current	13
V	Natural Resources	05
	Total	80
	Internal assessment	20
	Grand Total	100

Theme: Materials

Unit I: Chemical Substances—Nature and Behaviour

Chemical Reactions: Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, endothermic, exothermic reactions, oxidation and reduction.

Acids, Bases and Salts: Their definitions in terms of furnishing of H^+ and OH^- ions, General properties, examples and uses, neutralization, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and Non-metals: Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

Carbon Compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohols, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Theme: The World of the Living

Unit II: World of Living

Life Processes: 'Living Being'. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and Co-ordination in Animals and Plants: Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health-need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity & Evolution: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction: (topics excluded-evolution; evolution and classification and evolution should not be equated with progress).

Theme: Natural Phenomena

Unit III: Natural Phenomena

Reflection of light by curved surfaces; Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.

Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula (Derivation not required); Magnification. Power of a lens.

Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life (excluding colour of the sun at sunrise and sunset).

Theme: How Things Work

Unit IV: Effects of Current

Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Magnetic Effects of Current: Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Theme: Natural Resources

Unit V: Natural Resources

Our Environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

Note for the Teachers:

1. The chapter Management of Natural Resources (NCERT Chapter 16) will not be assessed in the year-end examination. However, learners may be assigned to read this chapter and encouraged to prepare a brief write up to any concept of this chapter in their Portfolio. This may be for Internal Assessment and credit may be given Periodic Assessment/Portfolio).
2. The NCERT text books present information in boxes across the book. These help students to get conceptual clarity. However, the information in these boxes would not be assessed in the year-end examination.

DESIGN OF QUESTION PAPER

SCIENCE [086]

CLASS–X [2022-23]

Theory: Maximum Marks: 80	
Competencies	
Demonstrate Knowledge and Understanding	46%
Application of Knowledge/Concepts	22%
Formulate, Analyze, Evaluate and Create	32%
	100%

Note:

- Typology of Questions: VSA including objective type questions, Assertion – Reasoning type questions; SA; LA; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

Internal Assessment (20 marks)

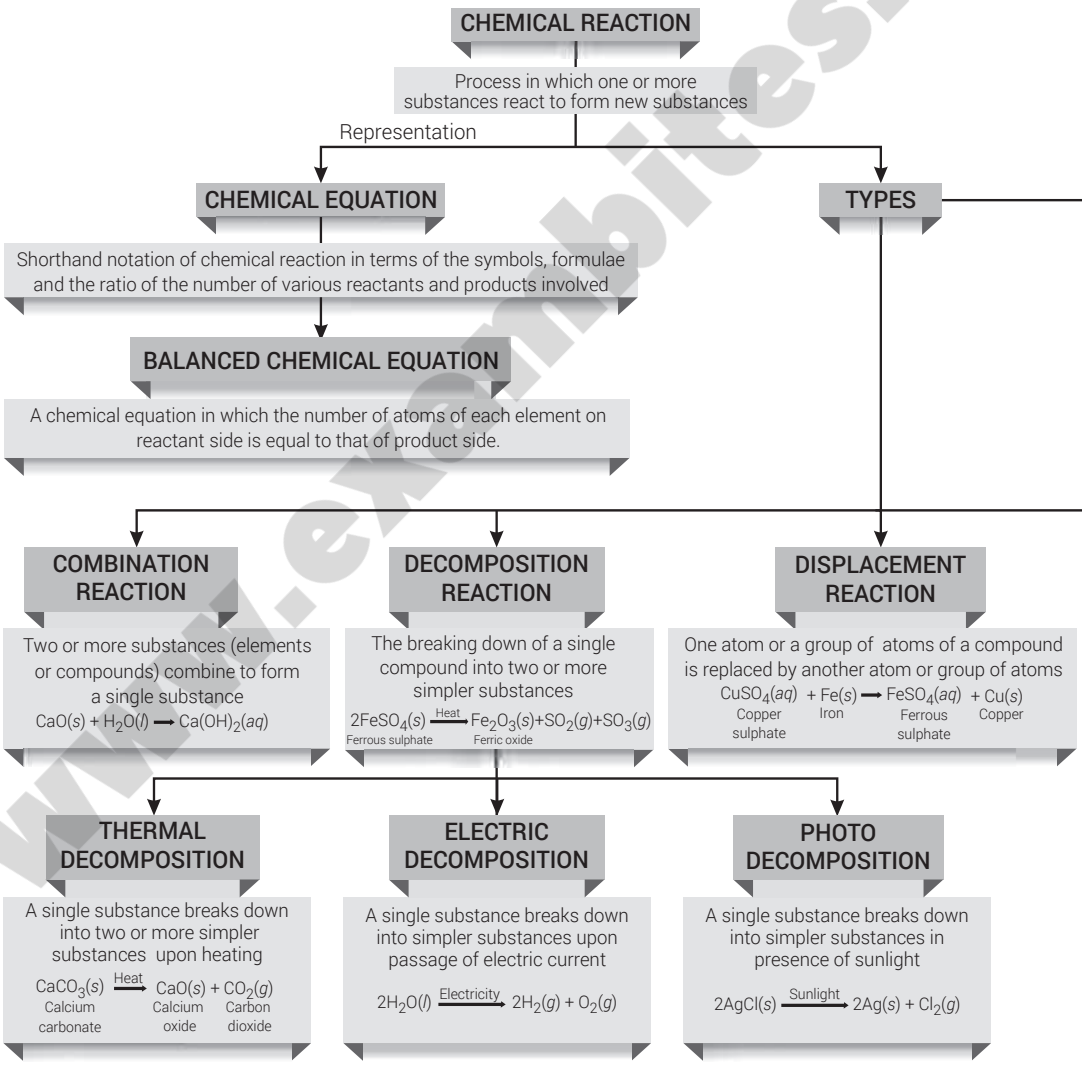
- Periodic Assessment - 05 marks + 05 marks
- Subject Enrichment (Practical Work) - 05 marks
- Portfolio — 05 marks

Suggestive verbs for various competencies

- Demonstrate Knowledge and Understanding
  State, name, list, identify, define, suggest, describe, outline, summarize, etc.
- Application of Knowledge/Concepts
  Calculate, illustrate, show, adapt, explain, distinguish, etc.
- Formulate, Analyze, Evaluate and Create
  Interpret, analyze, compare, contrast, examine, evaluate, discuss, construct, etc.

BASIC CONCEPTS —A FLOW CHART

Chapter-1: Chemical Reactions and Equations



On the basis of heat transfer

ENDOTHERMIC REACTION

- Reaction in which heat energy is absorbed
- Mostly decomposition reactions are endothermic reactions

$CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$

EXOTHERMIC REACTION

Reaction in which heat energy is released along with the formation of products

$CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(g) + \text{Heat energy}$

DOUBLE DISPLACEMENT REACTION

Two reacting compounds exchange their corresponding ions and form two new compounds

$AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$

Silver nitrate — Sodium chloride — Silver chloride (White ppt.) — Sodium nitrate

A reaction that produces precipitate (insoluble salt) is called a precipitation reaction

OXIDATION–REDUCTION (REDOX) REACTION

OXIDATION

- Gain of oxygen atoms
- Loss of hydrogen atoms

REDUCTION

- Loss of oxygen atoms
- Gain of hydrogen atoms

Reduction: Copper oxide is being reduced, CuO is an oxidising agent

$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$

Oxidation: Hydrogen is being oxidised, H_2 is the reducing agent

EFFECTS IN EVERYDAY LIFE

CORROSION

Slow conversion of metals into their undesirable compounds (sulphides, carbonates, oxides, etc.) by interaction with atmospheric gases and moisture

$2Fe(s) + \frac{3}{2}O_2(g) + xH_2O(l) \longrightarrow Fe_2O_3.xH_2O(s)$

Iron — (from air) — Moisture — Hydrated ferric oxide (Rust)

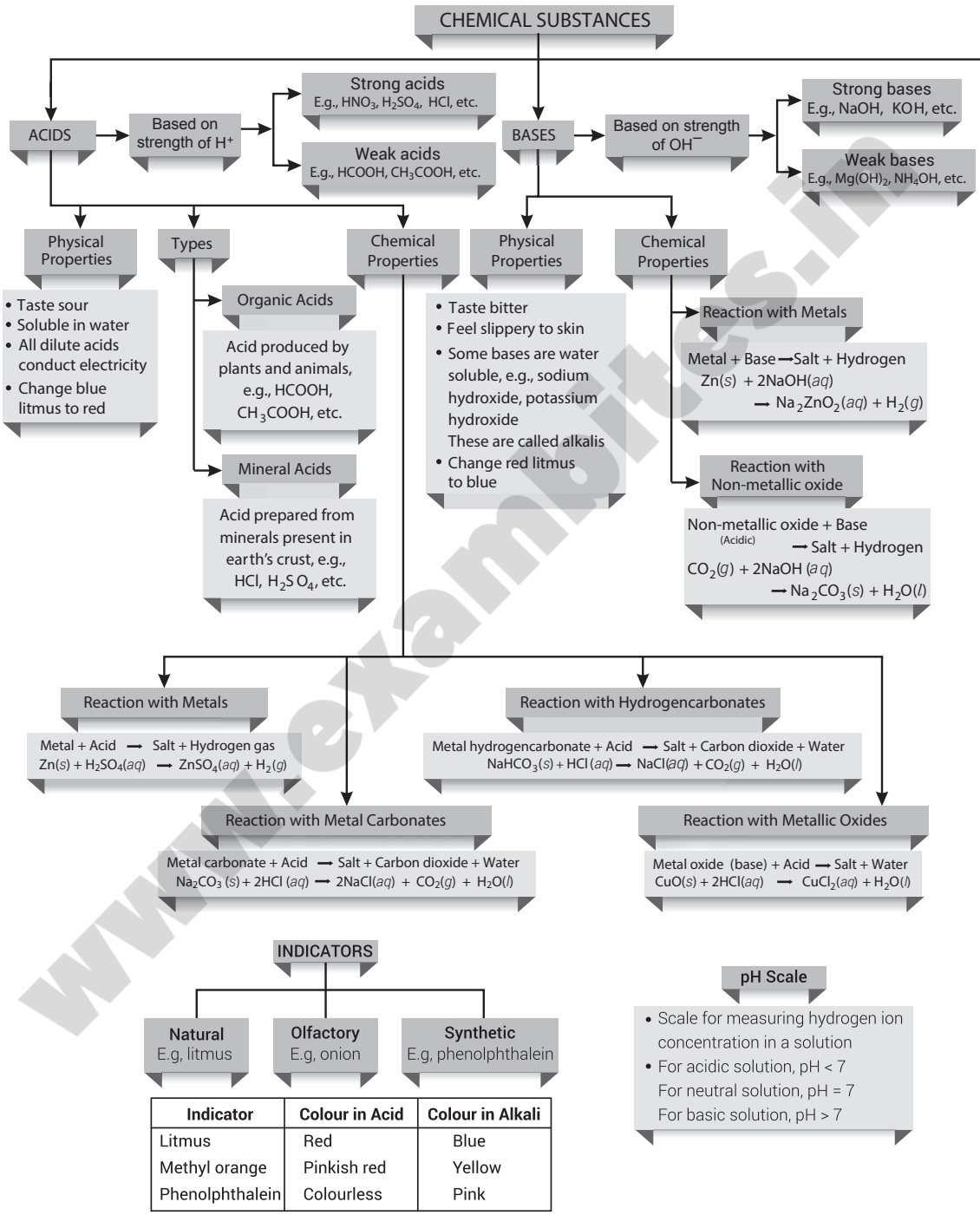
RANCIDITY

Oxidation of oils or fats in food resulting in bad taste and smell

Methods of Prevention

- By Adding Antioxidants
- Vacuum Packing
- Replacing Air by Nitrogen
- Refrigeration of the Foodstuff

Chapter-2: Acids, Bases and Salts



Indicator	Colour in Acid	Colour in Alkali
Litmus	Red	Blue
Methyl orange	Pinkish red	Yellow
Phenolphthalein	Colourless	Pink

Salts

Formed by neutralisation reaction

Acid + Base ⟶ Salt + Water

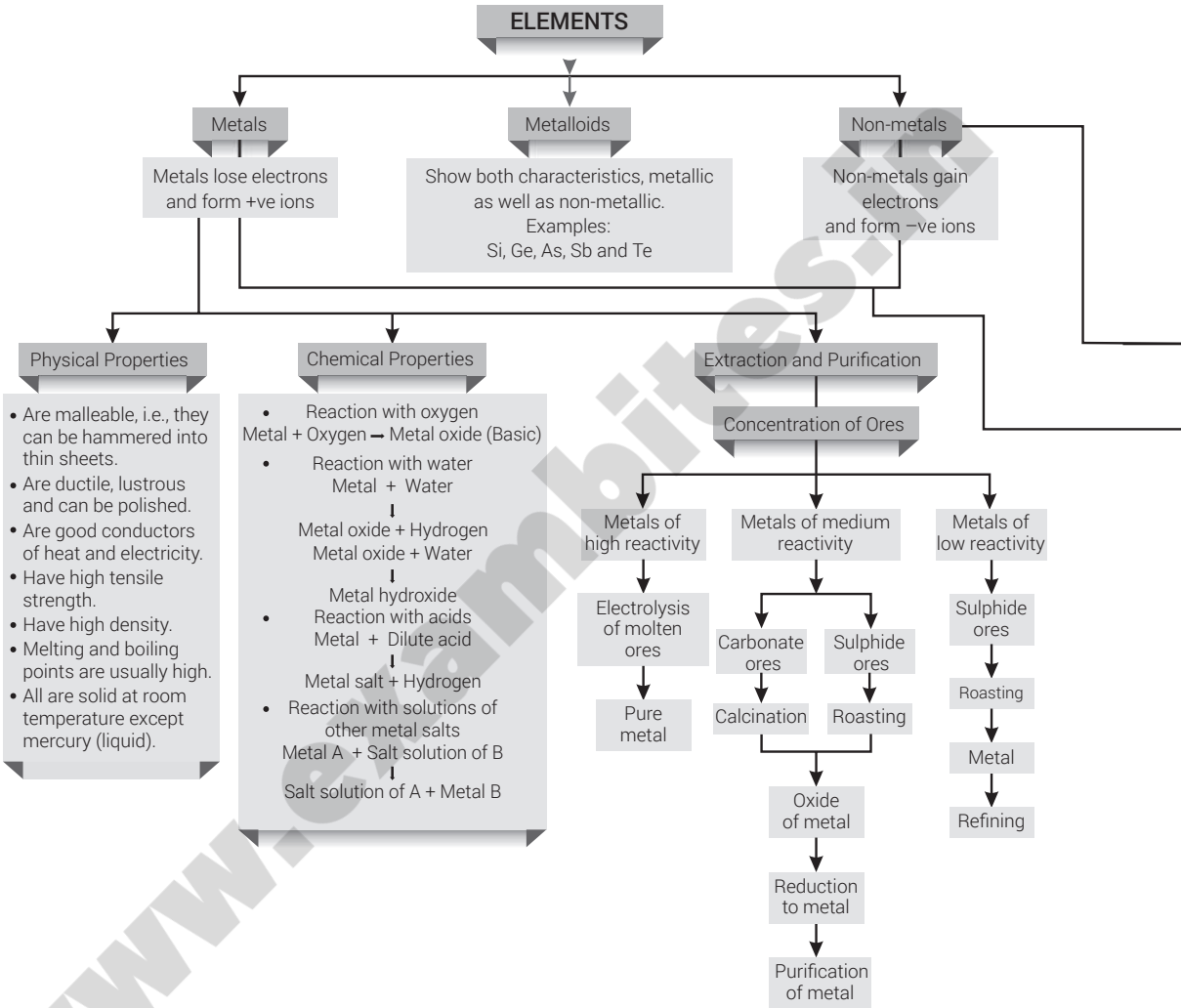
HA + MOH ⟶ MA + HOH

$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$

$HNO_3(aq) + KOH(aq) \longrightarrow KNO_3(aq) + H_2O(l)$

Important Compounds	Chemical name	Chemical formula	Preparation	Uses
Common Salt	Sodium chloride	NaCl	By combination reaction of sodium hydroxide and hydrochloric acid $NaOH(aq) + HCl(aq) \downarrow NaCl(aq) + H_2O(l)$	(i) As raw material for making many chemicals (ii) In cooking food
Caustic Soda	Sodium hydroxide	NaOH	By passing electricity through concentrated sodium chloride (brine) solution $2NaCl(aq) + 2H_2O(l) \downarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$	(i) In detergents and soaps (ii) In paper making (iii) In bleach manufacture (iv) In bauxite purification to extract aluminium
Washing Soda	Sodium carbonate decahydrate	$Na_2CO_3.10H_2O$	By recrystallisation of sodium carbonate in water $Na_2CO_3 + 10H_2O \downarrow Na_2CO_3.10H_2O$	(i) Softening hard water (ii) In washing clothes (iii) In paper, paint and textile industry (iv) Manufacturing glass, borax and caustic soda extract
Baking Soda	Sodium hydrogen carbonate	$NaHCO_3$	On reacting cold concentrated sodium chloride (brine) solution with ammonia and carbon dioxide $NaCl + NH_3 + CO_2 + H_2O \downarrow NaHCO_3 + NH_4Cl$	(i) Preparing baking powder (ii) Manufacture of soda water (iii) In fire extinguishers (iv) As an antacid in medicine
Bleaching Powder	Calcium oxychloride	$CaOCl_2$	By passing chlorine gas over dry slaked lime $Ca(OH)_2 + Cl_2 \downarrow CaOCl_2 + H_2O$	(i) For bleaching cotton textile (ii) For disinfecting drinking water (iii) As an oxidising agent in chemical industry (iv) Manufacturing chloroform
Plaster of Paris	Calcium sulphate hemihydrate	$CaSO_4 . \frac{1}{2}H_2O$	By heating gypsum at 373K $CaSO_4.2H_2O$ (Gypsum) $\xrightarrow{373K} CaSO_4 . \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$	(i) For making statues, models, toys, etc (ii) For making fireproof materials (iii) For setting fractured bones

Chapter-3: Metals and Non-metals



Corrosion

Gradual destruction of metal by air, water or any other substance around it.

Methods of Prevention

- Painting
- Oiling and greasing
- Plastic coating
- Chromium plating
- Galvanising (zinc plating)
- Alloying

Ionic Compounds

Physical Properties

- Are solids or gases except bromine (liquid)
- Are brittle, i.e., they break down when hammered or stretched
- Are non-malleable
- Are non-ductile
- Except graphite, all are bad conductors of heat and electricity
- Have very low tensile strength
- Have low melting and boiling points

Chemical Properties

- Reaction with oxygen
  Non-metal + oxygen → Non-metallic oxide (Acidic)
  $C(s) + O_2(g) \rightarrow CO_2(g)$
  $CO_2(g) + H_2O(l) \rightarrow H_2CO_3(aq)$ (Carbonic acid)
- Reaction with acids
  Non-metals do not displace H_2

Properties

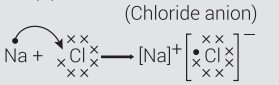
- Solid and crystalline in nature.
- Made up of positive and negative ions.
- Soluble in water and insoluble in solvents such as kerosene, petrol.
- Good conductors of electricity in aqueous solutions and molten state but do not conduct in the solid state.
- Melting and boiling points are high.

Formation

Compounds are formed by a give-and-take relation between the elements as shown below:

$Na \rightarrow Na^+ + e^-$
2,8,1 2,8
(Sodium cation)

$Cl + e^- \rightarrow Cl^-$
2,8,7 2,8,8
(Chloride anion)



Sodium chloride

Activity Series: Relative reactivities of metals

K	Potassium	Most reactive
Na	Sodium	
Ca	Calcium	
Mg	Magnesium	
Al	Aluminium	
Zn	Zinc	Reactivity decreases
Fe	Iron	
Pb	Lead	
H	Hydrogen	
Cu	Copper	
Hg	Mercury	
Ag	Silver	
Au	Gold	Least reactive

Chapter-4: Carbon and its Compounds

CARBON AND ITS COMPOUNDS

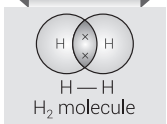
Type of bonding in carbon

Covalent Bond

- Carbon shares its valence electrons with other elements or other carbon atoms.
- Covalent compounds have low melting and boiling points, and are poor conductors of electricity.

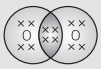
Types of covalent bonds

Single Covalent Bond



H — H
H_2 molecule

Double Covalent Bond



O = O
O_2 molecule

Triple Covalent Bond

N ≡ N
N_2 molecule

Versatile Nature of Carbon

- *Catenation:* Self-linking property of carbon atoms through covalent bonds to form long chains and rings.
- *Tetravalency:* Since carbon has a valency of four, it is capable of making bonds with four other atoms of carbon or any other element

Types of carbon compounds based on saturation

Saturated Compounds

- Carbon compounds having only single bond (called alkane) between the carbon atoms are called saturated carbon compounds.
- *Examples:* Methane, Ethane, Propane, etc.

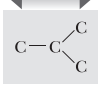
Unsaturated Compounds

- Carbon compounds having double bond (called alkene) or triple bond (called alkyne) between the carbon atoms.
- *Examples:* Ethene, Ethyne, Propene, Propyne, etc.

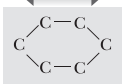
Types of carbon compounds based on skeleton

Straight Chain

Branched Chain



Closed Chain (Ring)



Hetero atom	Functional group	Formula of functional group
Cl/Br	Halo– (Chloro/bromo)	–Cl, –Br (substitutes for hydrogen atom)
Oxygen	1. Alcohol	–OH
	2. Aldehyde	
	3. Ketone	
	4. Carboxylic	

Chemical Properties of Carbon

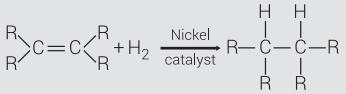
Combustion

Burn in oxygen to give carbon dioxide along with heat and light.

$CH_3CH_2OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$ + Heat and light

Addition Reaction

Unsaturated hydrocarbons add hydrogen in the presence of catalyst to give saturated hydrocarbons,



Oxidation

Oxygen is added to the starting material by oxidising agents.

$CH_3CH_2OH \xrightarrow[\text{or, acidified } K_2Cr_2O_7 + \text{heat}]{\text{Alk. } KMnO_4 + \text{heat}} CH_3COOH$

Substitution Reaction

One or more hydrogen atoms of a hydrocarbon are replaced by some other atoms.

$CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl$

Methane — Chlorine — Chloromethane — Hydrogen chloride

Properties of some carbon compounds

Ethanol

- Reaction with sodium

$2Na + 2CH_3CH_2OH \longrightarrow 2CH_3CH_2O^-Na^+ + H_2$

Sodium — Ethanol — Sodium ethoxide — Hydrogen

- Dehydration reaction

$CH_3-CH_2OH \xrightarrow{\text{Hot conc. } H_2SO_4} CH_2=CH_2 + H_2O$

Ethanoic Acid

- Esterification reaction

$CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$

Ethanoic acid — Ethanol — Ethyl ethanoate (ester)

Saponification reaction

$CH_3COOC_2H_5 \xrightarrow{NaOH} CH_3COONa + C_2H_5OH$

Ester — Sodium acetate — Alcohol

- Reaction with carbonates and hydrogencarbonates

$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$

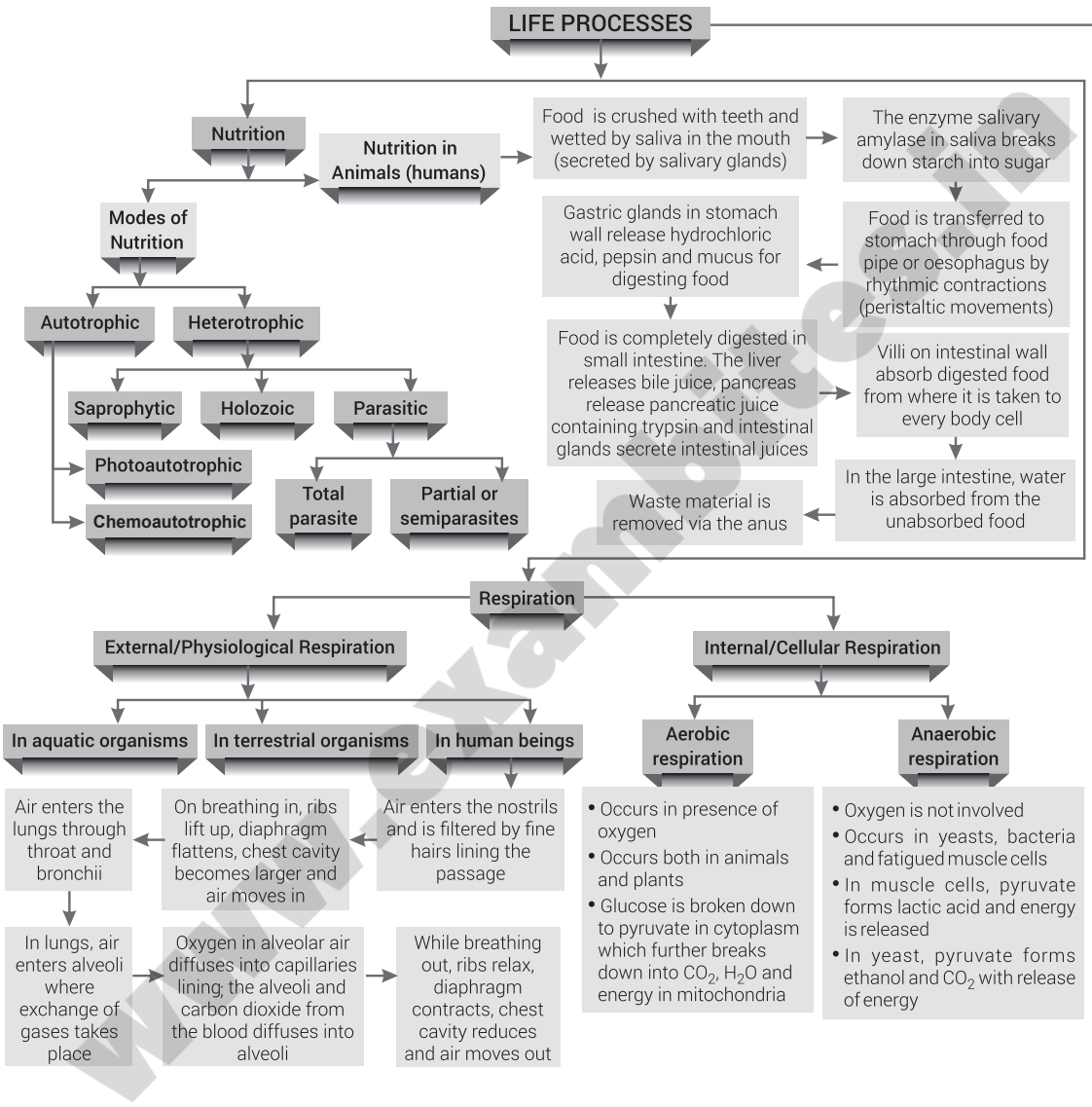
Ethanoic acid — Sodium acetate

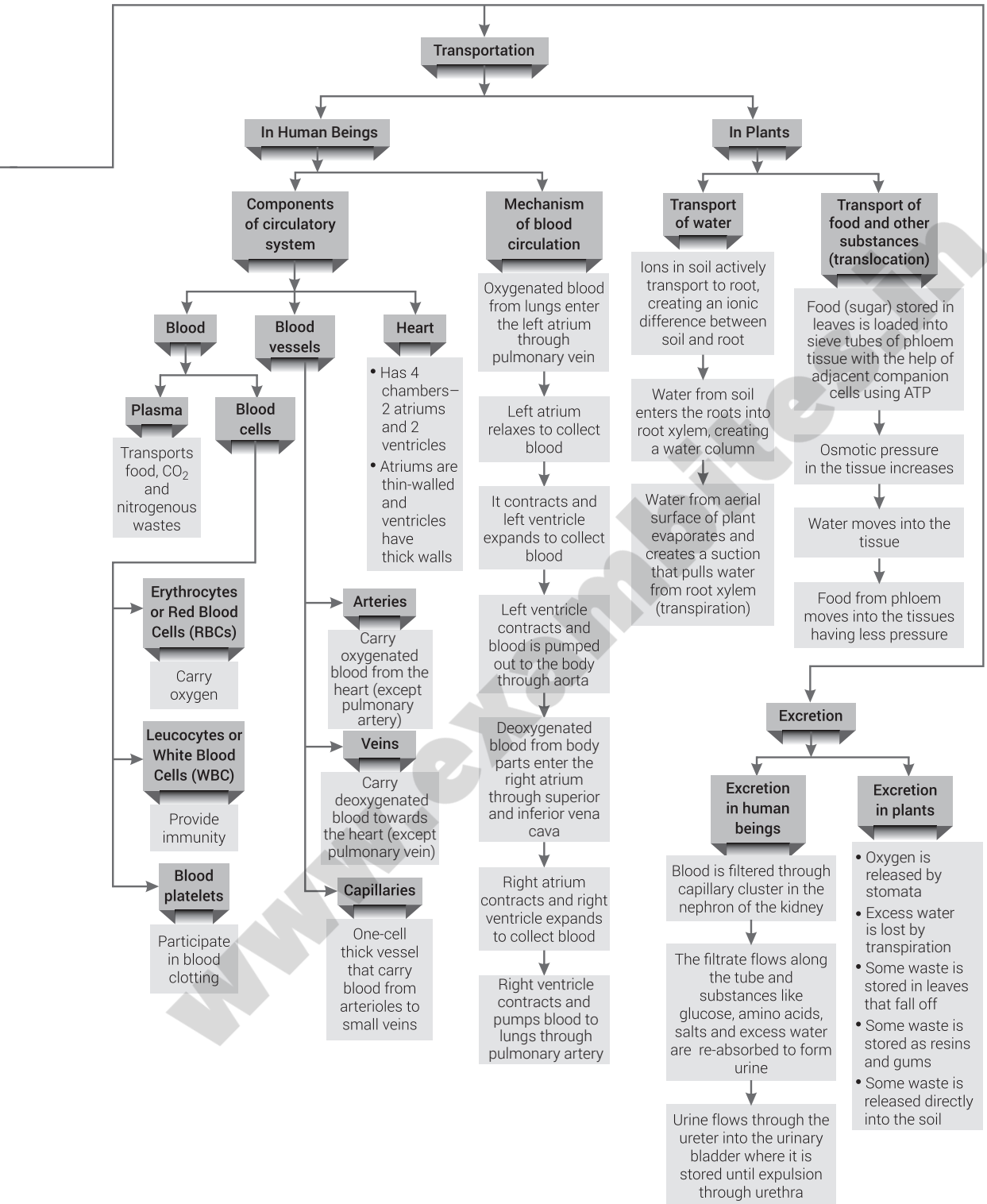
- Reaction with a base

$NaOH + CH_3COOH \longrightarrow CH_3COONa + H_2O$

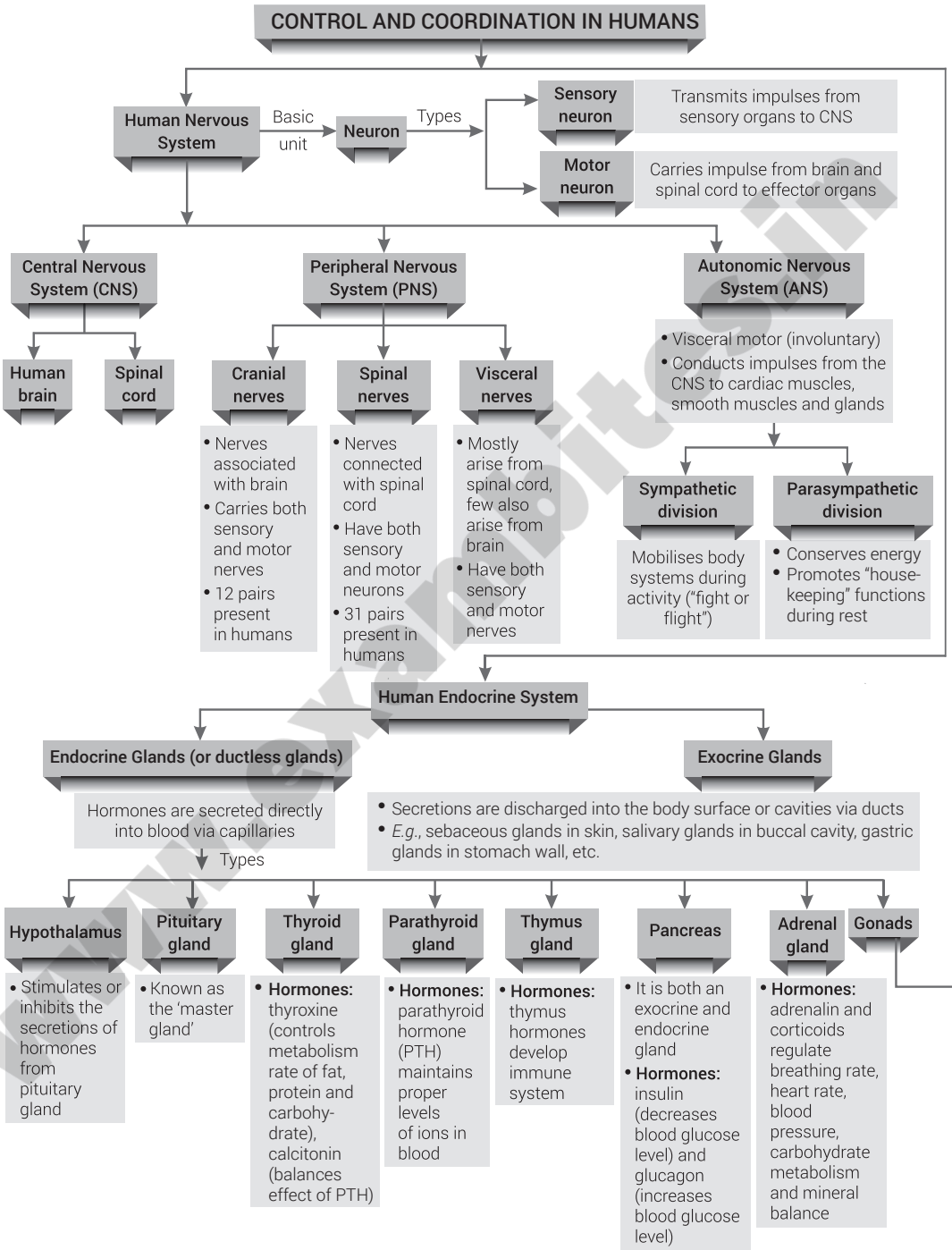
Base — Acid — Salt

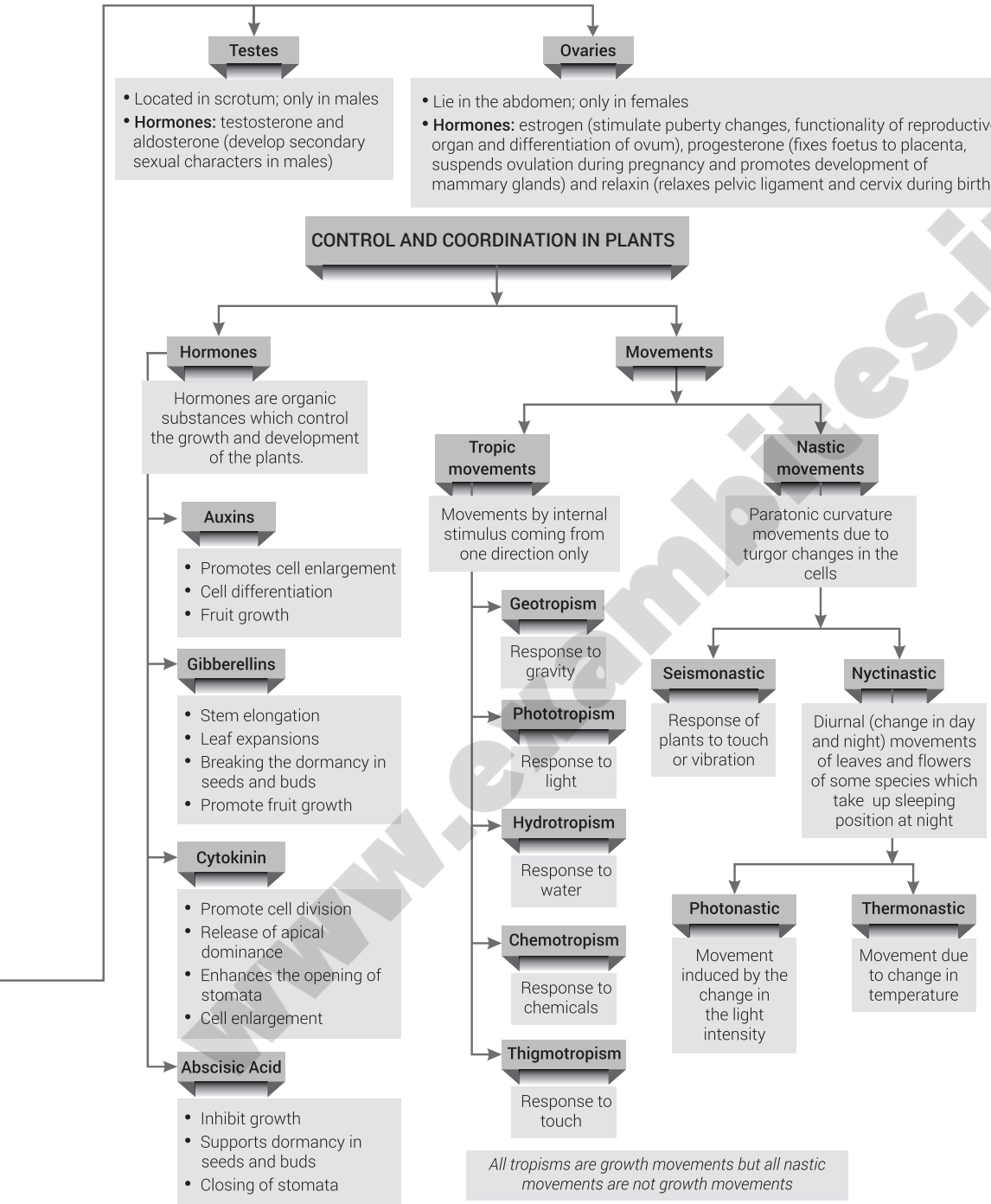
Chapter-5: Life Processes



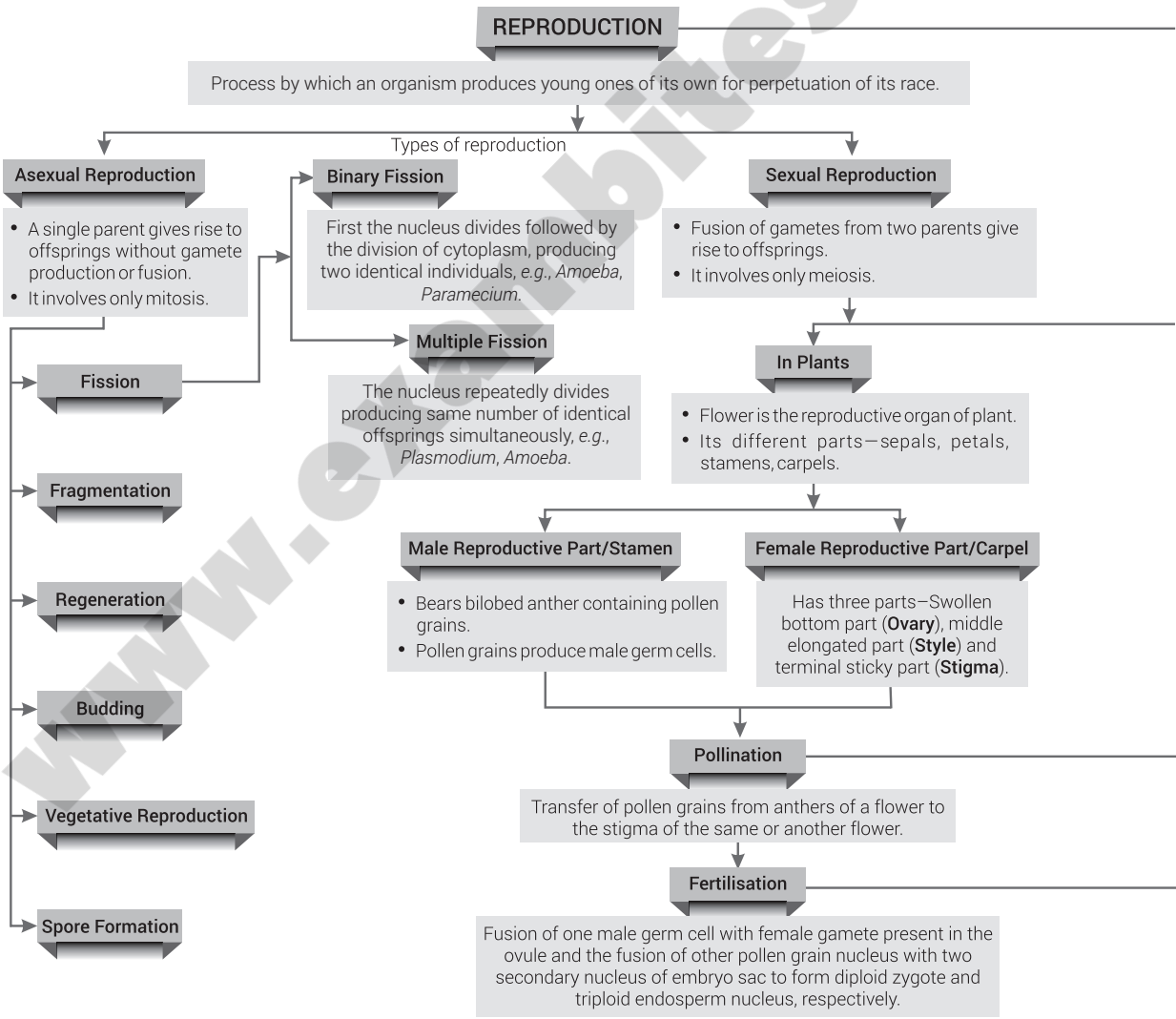


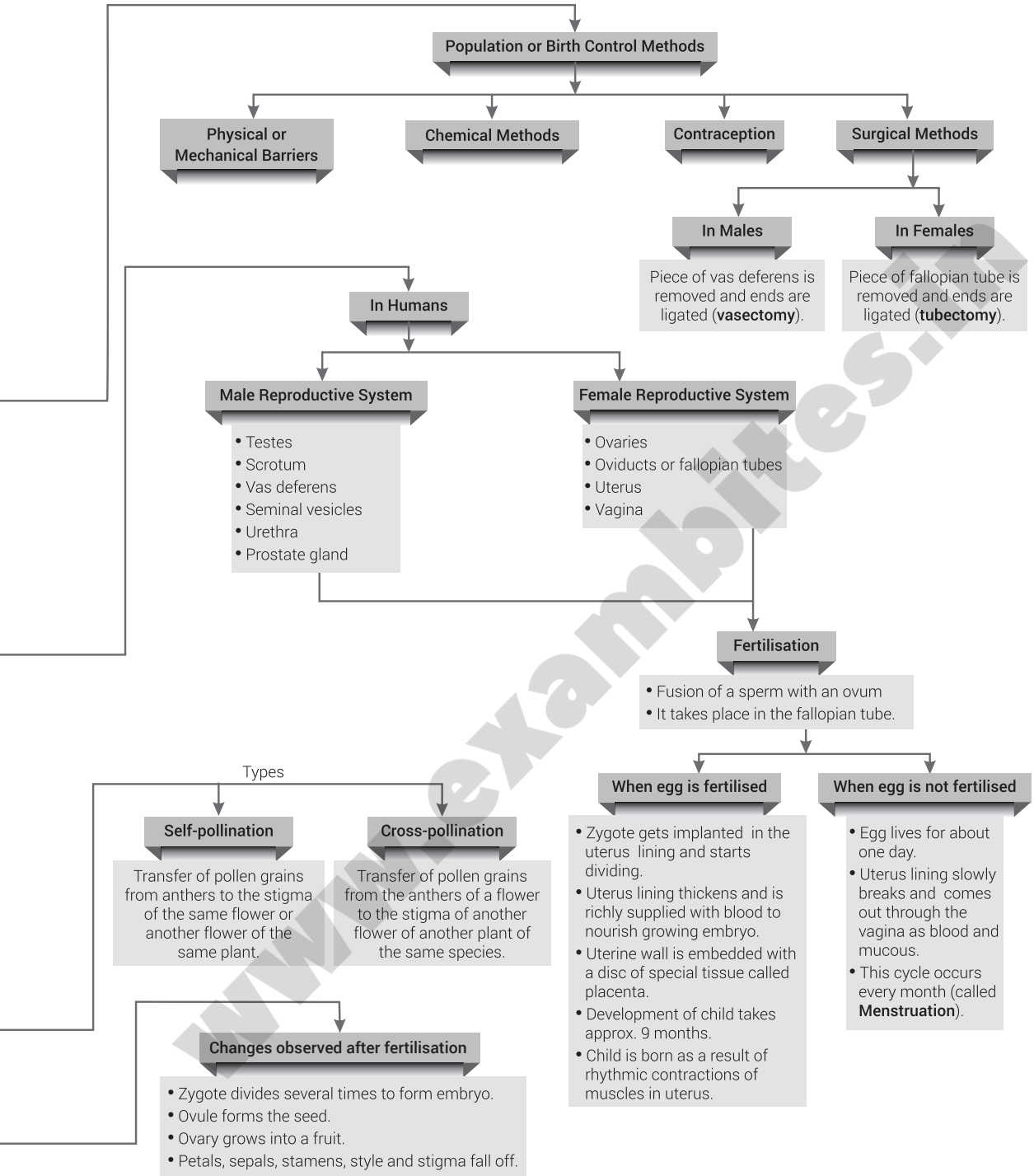
Chapter-6: Control and Coordination



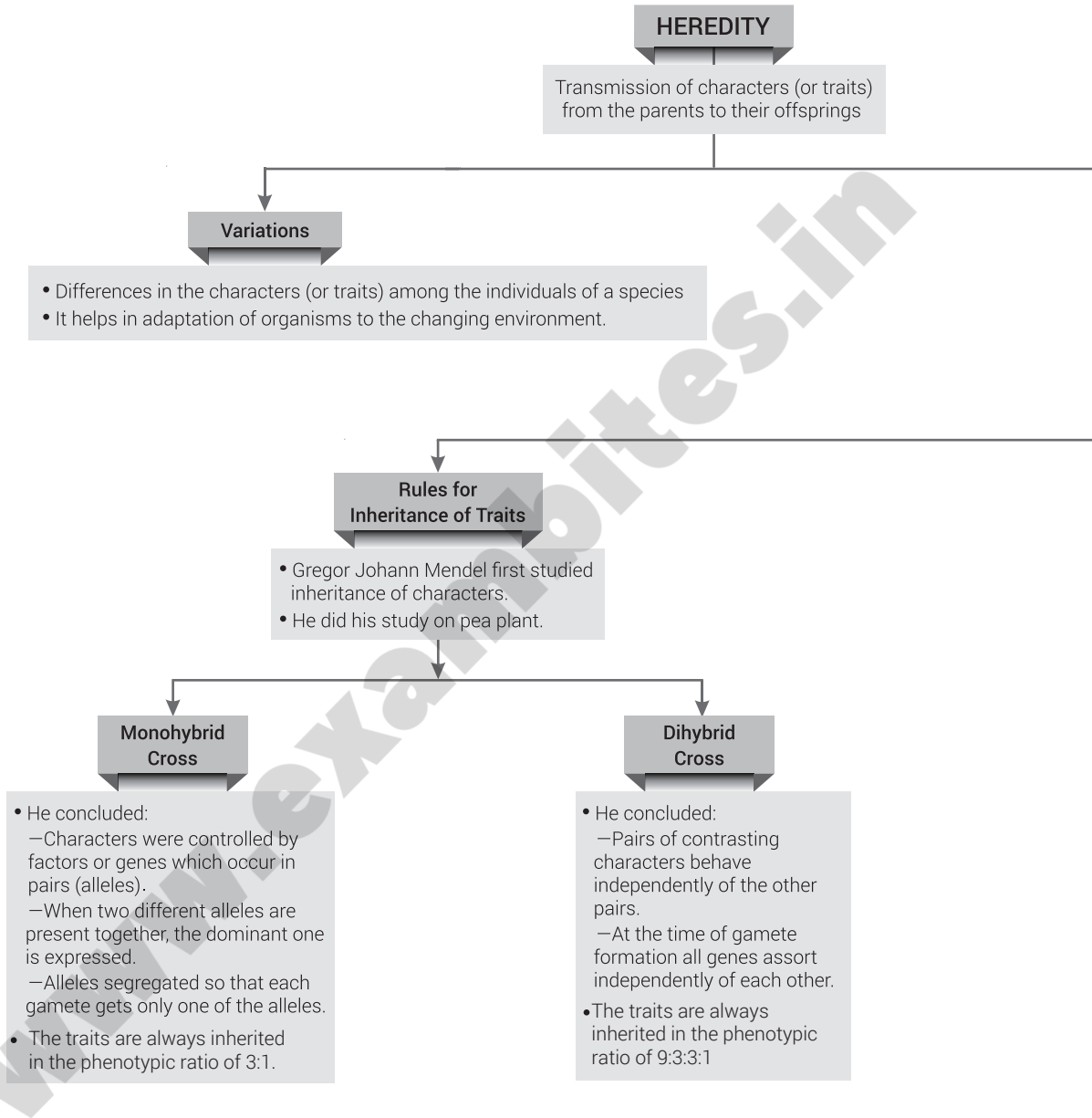


Chapter-7: How do Organisms Reproduce?





Chapter-8: Heredity



Inherited Traits

Traits and characteristics are reliably inherited to next generation to provide a common basic body design.

How are Traits Expressed

- Cellular DNA is the information source for making proteins in the cell.
- A section of DNA that provides information for one protein is called the gene for that protein.
- Each gene set is present as separate independent pieces called chromosomes.
- Each cell has two copies of each chromosome, one each from male and female parents.
- Every germ cell takes one chromosome from each pair.
- When two germ cells combine, the normal number of chromosomes is restored.

Sex Determination

- Process by which the sex of a person is determined.
- The female has two X-chromosomes (XX) in the germ cell or egg and the male has one X-chromosome and one Y-chromosome (XY) in the germ cell or sperm.
- When a sperm bearing X-chromosome unites with egg or ovum, female (XX) child is born.
- When a sperm bearing Y-chromosome unites with ovum, male (XY) child is born.

Chapter-9: Light–Reflection and Refraction

LIGHT — Phenomena of Light

Reflection

- Coming back of light rays to the same medium, when they fall on a surface.
- Laws of reflection:
  Ist law: The incident ray, the reflected ray and the normal at the point of incidence all lie in the same plane.
  IInd law: The angle of incidence is always equal to the angle of reflection.

Reflecting surfaces → **Spherical Mirrors**

Important terms:

- *Pole:* Midpoint or centre of the reflecting surface of a spherical mirror.
- *Centre of curvature:* Centre of the hollow sphere of which the mirror is a part.
- *Radius of curvature:* Radius of that sphere of which the mirror is a part.
- *Principal axis:* Line joining the pole and the centre of curvature.
- *Principal section:* Vertical section of a mirror cut by a plane passing through the principal axis of the mirror.

Types

Concave Mirror

- Reflecting surface is curved inwards.
- Polishing is done on outer surface.

Uses

- Used by dentists to focus light on the patient's teeth.
- Used as shaving mirrors.

Image formation

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F	Highly diminished, point-sized	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
At C	At C	Same size	Real and inverted
Between C and F	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect

Convex Mirror

- Reflecting surface is curved outwards.
- Polishing is done on inner surface.

Uses

- Used as rear view mirrors in vehicles
- Used as a reflector in street lamps.

Image formation

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F, behind the mirror	Highly diminished, point sized	Virtual and erect
Between infinity and the pole P of the mirror	Between P and F, behind the mirror	Diminished	Virtual and erect

Important Formulae

- Mirror formula, $\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$
- Magnification produced by mirror, $m=\frac{h'}{h}=-\frac{v}{u}$
- Snell's law $\frac{\sin i}{\sin r}=\frac{n_b}{n_a}=n_{ba}=\frac{v_a}{v_b}=\frac{\lambda_a}{\lambda_b}$
- Absolute refractive index, $n=\frac{c}{v}$
- If C is critical angle, then refractive index $n=\frac{1}{\sin C}$
- Lens formula, $\frac{1}{v}-\frac{1}{u}=\frac{1}{f}$
- Magnification produced by lens, $m=\frac{h'}{h}=\frac{v}{u}$
- For combination of lenses, $m=m_1\times m_2\times m_3\times \ldots$
- Power of a lens, $P=\frac{1}{f\,(\text{in m})}=\frac{100}{f\,(\text{in cm})}$
- Power of combination of lenses, $P=P_1+P_2+P_3+\ldots$

Refraction

- Bending of light when it passes from one medium to another.
- *Laws of refraction:*

First law: The incident ray, the refracted ray, and the normal at the point of incidence all lie in the same plane.

Second law (Snell's law): The ratio of sine of angle of incidence to the sine of angle of refraction is a constant for a given pair of media.

$$i.e., \frac{\sin i}{\sin r} = constant$$

Expression of extent of change in direction in a pair of media

Refractive Index

- Ratio of the speed of light in vacuum to the speed of light in the medium.

$$\text{Refractive index, } n = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}} = \frac{c}{v}$$

- It is a ratio and has no unit.

Refracting surfaces

Spherical Lenses

Important terms

- *Optical centre:* Centre point of a lens.
- *Principal axis:* Line passing through the optical centre of the lens and perpendicular to both the faces of the lens.
- *Principal focus of a convex lens:* A point on its principal axis to which light rays parallel to principal axis converge after passing through the lens.
- *Principal focus of a concave lens:* A point on its principal axis from which light rays originally parallel to the axis, appear to diverge after passing through the concave lens.

Types

Convex Lens

- Thick at centre, thinner at edges.
- These converge light rays.

Image formation

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F_2	Highly diminished, point-sized	Real and inverted
Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
At $2F_1$	At $2F_2$	Same size	Real and inverted
Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
At Focus F_1	At infinity	Infintely large or highly enlarged	Real and inverted
Between focus F_1 and optical centre O	On the same side of the lens as the object	Enlarged	Virtual and erect

Concave Lens

- Thin in the middle, thicker at edges.
- These diverge light rays.

Image formation

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F_1	Highly diminished, point-sized	Virtual and erect
Between infinity and optical centre O of the lens	Between F_1 and O	Diminished	Virtual and erect

Chapter-10: The Human Eye and the Colourful World

HUMAN EYE AND COLOURFUL WORLD

Human Eye

Main Parts of the Eye

Cornea
Transparent spherical membrane covering front of the eye through which light enters.

Iris
Coloured diaphragm between the cornea and the lens that controls size of pupil.

Pupil
A hole in the middle of the iris that regulates the amount of light entering the eye.

Retina
Screen on which the image is formed by the lens system of human eye.

Types of light sensitive cells

- **Rods** — Respond to the intensity of light and enable vision in dim light.
- **Cones** — Respond to colour so that we perceive objects as they are.

Eye Lens
Transparent crystalline convex lens converges the light rays and produces a real and inverted image of object on retina.

Optic Nerve
Transfers signals from retina to the brain.

Power of Accommodation

- Ability of the eye lens to adjust its focal length.
- Relaxation of ciliary muscles → lens becomes thin → increase in focal length.
- Contraction of ciliary muscles → lens becomes thick → focal length decreases.

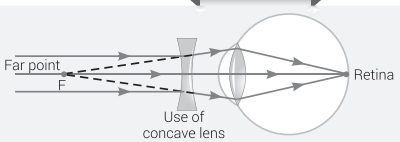
Defects of Eye

Myopia or Near-sightedness

- Eye cannot see distant objects clearly.
- Image of distant object forms in front of retina.

Reasons:
(i) Focal length of eye lens is too short
(ii) Elongation of eyeball.

Correction → **Concave Lens**



Phenomena Occurring in Nature

Dispersion of Light

- Splitting of light into its component colours.
- White light disperses into its seven-colour components in the order VIBGYOR (Violet, Indigo, Blue, Green, Yellow, Orange, Red).
- Red light bends least, violet the most.
- Rainbow appears due to dispersion of sunlight by tiny rain droplets.

Atmospheric Refraction

- Refraction of light by the earth's atmosphere.
- The twinkling of stars is due to continuously atmospheric refraction of starlight before it reaches earth.

Scattering of Light

Tyndall Effect

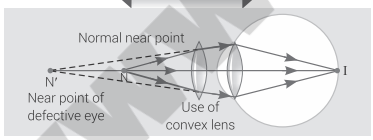
- When a beam of light strikes fine particles in air, path of the beam becomes visible.
- Very fine particles scatter mainly blue light while particles of larger size scatter light of longer wavelengths.

Hypermetropia or Far-Sightedness

- Eye cannot see nearby objects clearly.
- Image of close by object forms behind retina.
- Reasons:
  (i) Focal length of eye lens is too long.
  (ii) Eyeball becomes small.

Correction

Convex Lens



Presbyopia

- Eye suffers from myopia as well as from hypermetropia.
- Due to gradual weakening of ciliary muscles and diminishing flexibility of eye lens.

Correction

Bi-focal Lens (concave + convex lenses)

Calculation of focal length for correcting lenses:

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

(i) For Myopia: $u = \infty$
v = far point of myopic person

(ii) For Hypermetropia: u = normal near point of eye (25 cm)
v = near point of hypermetropic eye.

Chapter-11: Electricity

ELECTRIC CURRENT (I)

- Rate of flow of electric charges
  $I = \frac{\text{Net charge (Q)}}{\text{Time (t)}}$
- Measured by ammeter

Essential requirement for current flow

Potential difference (V)

- Work done to move a unit charge from one point to other.
  $V = \frac{\text{Work done (W)}}{\text{Charge (Q)}}$ J/C
- Measured by voltmeter.

Unit

volt (V)

1 V = 1 JC^{-1}
1 mV = 10^{-3} V

Opposition to passage of electric current

Resistance (R)

Ratio of potential difference across a conductor to current flowing through it.

Unit

ohm (Ω)

1 kΩ = 10^3 Ω
1 mΩ = 10^{-3} Ω

Ohm's law

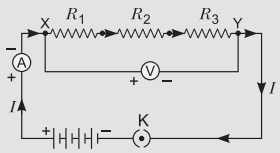
A relationship between V across a conductor and I through it.
$V \propto I$
i.e., $V = I R$

Factors affecting resistance

- Length ($R \propto l$)
- Area of cross-section ($R \propto \frac{1}{A}$)
- Nature of material
- Temperature

Combination of resistors

Resistors in series



- Current remains constant but voltage varies.
  $V = V_1 + V_2 + V_3$
- $R_s = R_1 + R_2 + R_3$

Measure of current

Electric power (*P*) — Unit → **watt (W)**

Rate at which electric energy is dissipated or consumed in an electric circuit

$P = VI = I^2R = V^2/R$

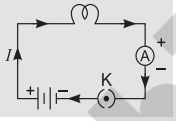
$1\ W = 1\ Js^{-1}$

$1\ kW = 10^3\ W$

Representation of current flow

Electric circuit

Continuous and closed path for an electric current



Unit

ampere (A)

$1\ A = 1\ Cs^{-1}$

$1\ mA = 10^{-3}\ A$

Heating effect

According to Joule's law of heating

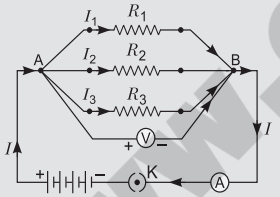
$H \propto I^2$

$H \propto R$

$H \propto t$

$\therefore$ Heat produced, $H = I^2Rt$

Resistors in parallel



- Voltage remains constant but current varies.
- $I = I_1 + I_2 + I_3$
- $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

Practical applications of heating effect

- To produce light (electric bulb)
- Electric fuse that protects circuits and appliances.
- In electrical heating appliances (electric iron, toaster, room heater, etc.).

Commercial unit of electric energy is kilowatt hour (kWh), commonly known as 'unit'.
$1\ kWh = 3.6 \times 10^6\ J$

MAGNETIC EFFECTS OF ELECTRIC CURRENT

Electric current through a metallic conductor produces a magnetic field around it.

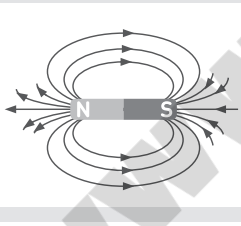
Magnetic field

- Space surrounding a magnet within which a magnetic force is experienced.
- Has both direction and magnitude.
- SI unit is tesla.

Field patterns produced in different shapes by current carrying conductor

Magnetic field lines

- Continuous curve in a magnetic field such that the tangent at any point on it gives the direction of magnetic field at that point.
- If field lines are close, field is stronger.
- If field lines are far apart, field is weak.
- Field lines around a bar magnet:

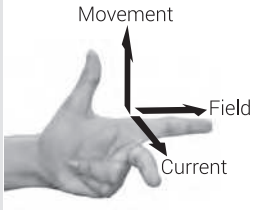


Force on a current-carrying conductor

Force acting on the conductor is perpendicular to the direction of magnetic field.

Direction of force

Fleming's left hand rule

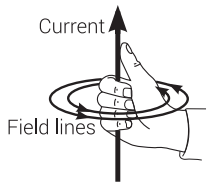


Straight conductor

Magnetic field is represented by concentric circles which become larger and larger as the distance increases.

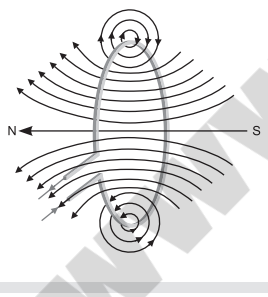
Direction of magnetic field lines

Right hand thumb rule



Circular loop

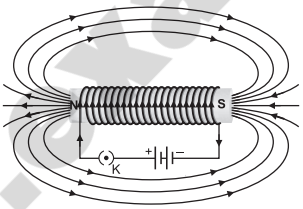
Magnetic field lines are represented by concentric circles near the wire of the loop that flattens as we move towards centre and appear as straight lines at the centre of loop.



Solenoid

Direction of magnetic field

Magnetic field produced is similar to that produced by a bar magnet.

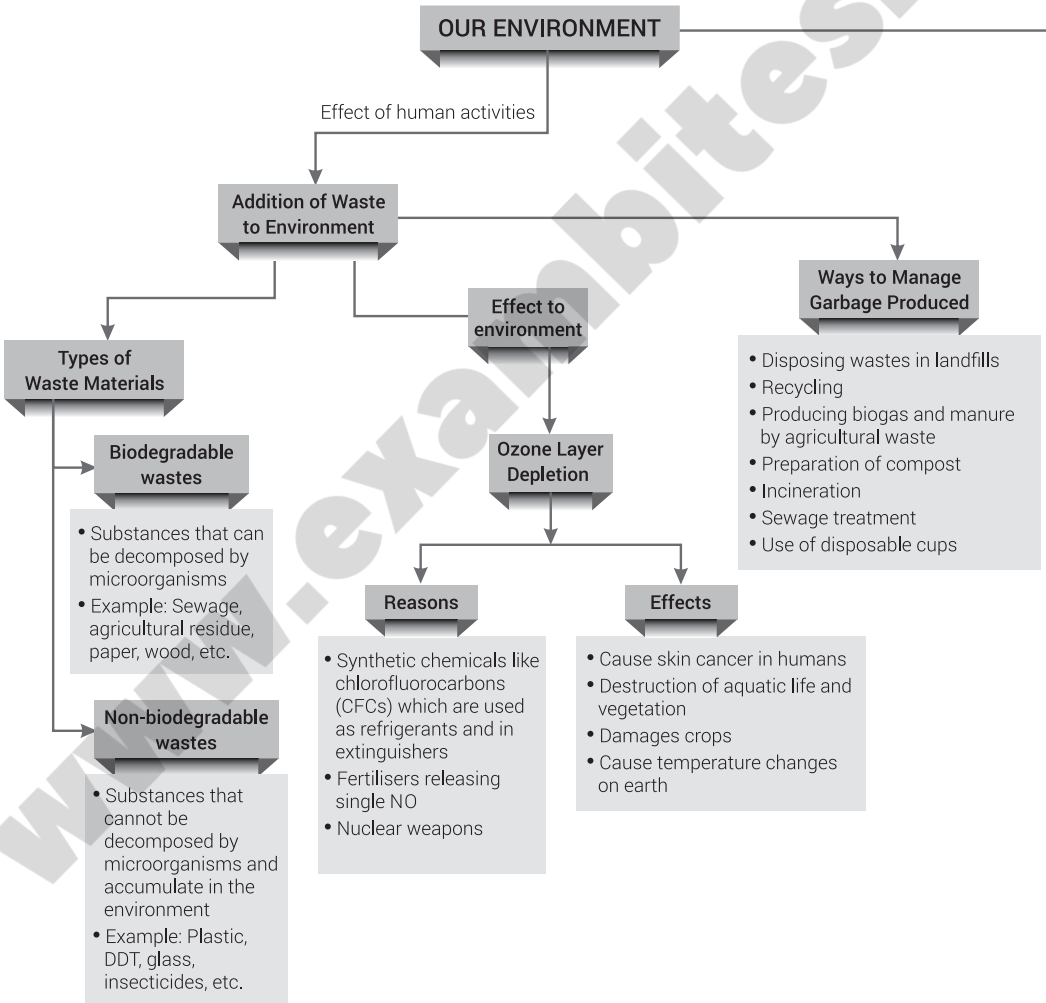


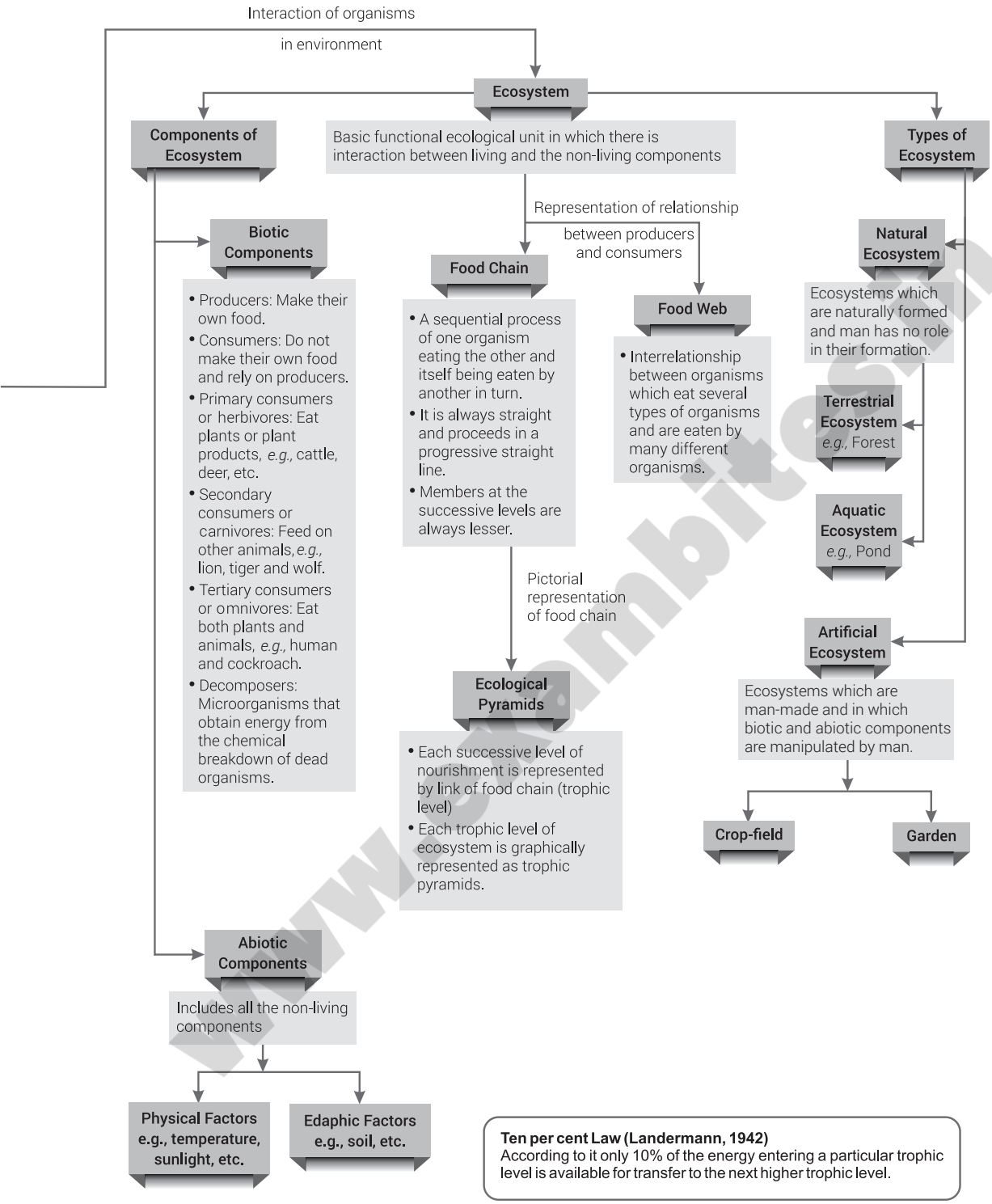
(a) Clockwise current shows south polarity
(b) Anti-clockwise current shows north polarity

Electromagnet

- A temporary magnet of soft iron core with a coil wound around it which retains magnetism only when current passes through the coil.
- Used in electric bell, telephone, electric motor, etc.

Chapter-13: Our Environment





CBSE SAMPLE QUESTION PAPER–2023 (SOLVED)

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:**

(i) The question paper consists of 39 questions in 5 sections.

(ii) All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

*(iii) **Section A** consists of **20** objective type questions carrying **1** mark each.*

*(iv) **Section B** consists of **6** Very Short Answer type questions, carrying **02** marks each. Answers to these questions should in the range of **30** to **50** words.*

*(v) **Section C** consists of **7** Short Answer type questions carrying **03** marks each. Answers to these questions should in the range of **50** to **80** words.*

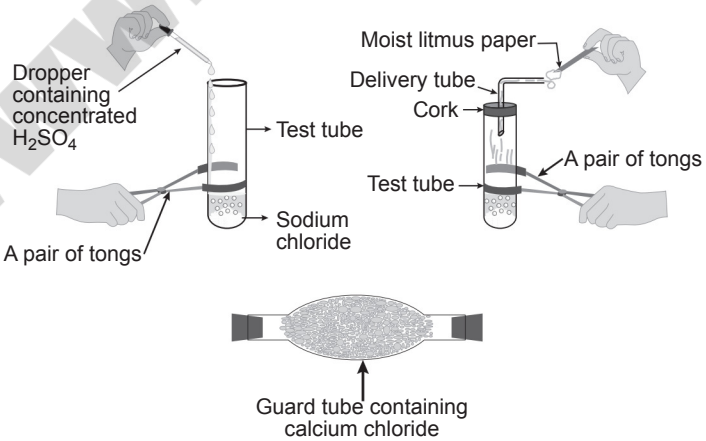
*(vi) **Section D** consists of **3** Long Answer type questions carrying **05** marks each. Answer to these questions should be in the range of **80** to **120** words.*

*(vii) **Section E** consists of **3** source-based/case-based units of assessment of **04** marks each with sub-parts.*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20**

1. The change in colour of the moist litmus paper in the given set up is due to **1**



(*i*) presence of acid

(*ii*) presence of base

(*iii*) presence of H^+(aq) in the solution

(*iv*) presence of Litmus which acts as an indicator

(*a*) *i* and *ii* (*b*) Only *ii*

(*c*) Only *iii* (*d*) Only *iv*

2. In the redox reaction **1**

$MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$

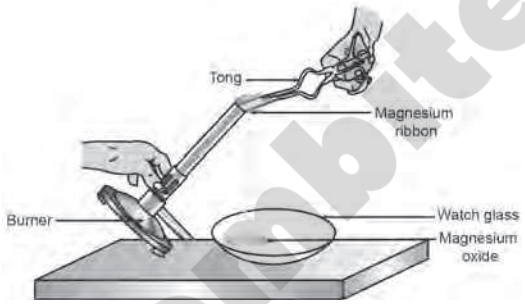
(*a*) MnO_2 is reduced to $MnCl_2$ & HCl is oxidized to H_2O

(*b*) MnO_2 is reduced to $MnCl_2$ & HCl is oxidized to Cl_2

(*c*) MnO_2 is oxidized to $MnCl_2$ & HCl is reduced to Cl_2

(*d*) MnO_2 is oxidized to $MnCl_2$ & HCl is reduced to H_2O

3.



Which of the following is the correct observation of the reaction shown in the above set up? **1**

(*a*) Brown powder of Magnesium oxide is formed.

(*b*) Colourless gas which turns lime water milky is evolved.

(*c*) Magnesium ribbon burns with brilliant white light.

(*d*) Reddish brown gas with a smell of burning Sulphur has evolved.

4. With the reference to four gases CO_2, CO, Cl_2 and O_2, which one of the options in the table is correct? **1**

Option	Acidic oxide	Used in treatment of water	Product of respiration	Product of incomplete combustion
(*a*)	CO	Cl_2	O_2	CO
(*b*)	CO_2	Cl_2	CO_2	CO
(*c*)	CO_2	O_2	O_2	CO_2
(*d*)	CO	O_2	CO_2	CO_2

5. On placing a copper coin in a test tube containing green ferrous sulphate solution, it will be observed that the ferrous sulphate solution **1**

(*a*) turns blue, and a grey substance is deposited on the copper coin.

(*b*) turns colourless and a grey substance is deposited on the copper coin.

(*c*) turns colourless and a reddish–brown substance is deposited on the copper coin.

(*d*) remains green with no change in the copper coin.

6. Anita added a drop each of diluted acetic acid and diluted hydrochloric acid on pH paper and compared the colours. Which of the following is the correct conclusion? 1

(*a*) pH of acetic acid is more than that of hydrochloric acid.

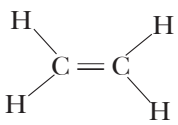
(*b*) pH of acetic acid is less than that of hydrochloric acid.

(*c*) Acetic acid dissociates completely in aqueous solution.

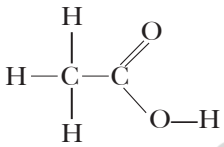
(*d*) Acetic acid is a strong acid.

7. The formulae of four organic compounds are shown below. Choose the correct option. **1**

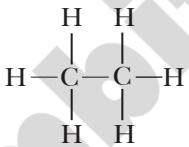
A



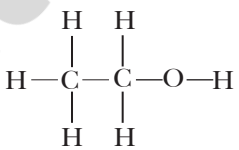
B



C



D



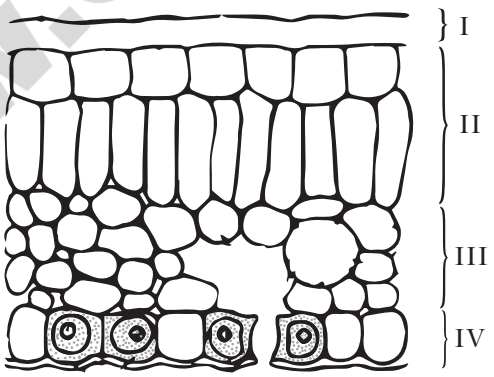
(*a*) A and B are unsaturated hydrocarbons

(*b*) C and D are saturated hydrocarbons

(*c*) Addition of hydrogen in presence of catalyst changes A to C

(*d*) Addition of potassium permanganate changes B to D

8. In the given transverse section of the leaf identify the layer of cells where maximum photosynthesis occurs. **1**



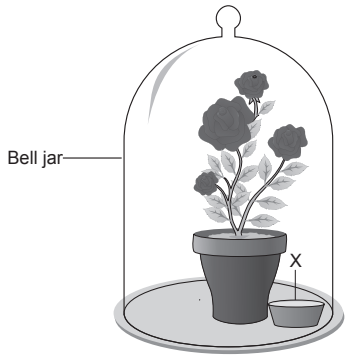
(*a*) I, II

(*b*) II, III

(*c*) III, IV

(*d*) I, IV

9. Observe the experimental setup shown below. Name the chemical indicated as 'X' that can absorb the gas which is evolved as a by product of respiration. **1**



(*a*) NaOH (*b*) KOH

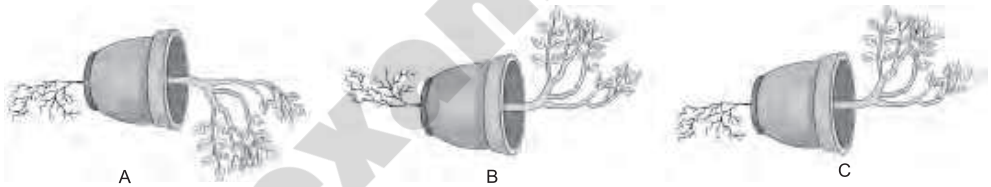
(*c*) $Ca(OH)_2$ (*d*) K_2CO_3

10. If a tall pea plant is crossed with a pure dwarf pea plant then, what percentage of F1 and F2 generation respectively will be tall? **1**

(*a*) 25%, 25% (*b*) 50%, 50%

(*c*) 75%,100% (*d*) 100%, 75%

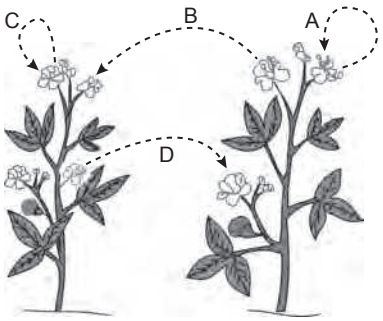
11. Observe the three figures given below. Which of the following depicts tropic movements appropriately? **1**



(*a*) B and C (*b*) A and C

(*c*) B only (*d*) C only

12. The diagram shown below depicts pollination. Choose the options that will show a maximum variation in the offspring. **1**



(*a*) A, B and C (*b*) B and D

(*c*) B, C and D (*d*) A and C

13. A complete circuit is left on for several minutes, causing the connecting copper wire to become hot. As the temperature of the wire increases, the electrical resistance of the wire **1**

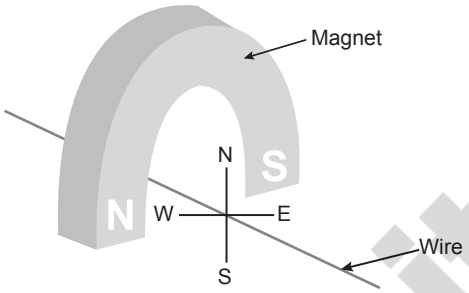
(*a*) decreases.

(*b*) remains the same.

(*c*) increases.

(*d*) increases for some time and then decreases.

14. A copper wire is held between the poles of a magnet. **1**

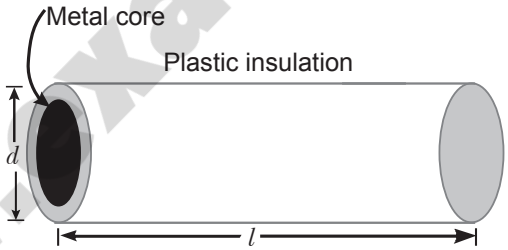


The current in the wire can be reversed. The pole of the magnet can also be changed over. In how many of the four directions shown can the force act on the wire?

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

15.



Plastic insulation surrounds a wire having diameter *d* and length *l* as shown above. A decrease in the resistance of the wire would be produced by an increase in the **1**

(*a*) length *l* of the wire (*b*) diameter *d* of the wire

(*c*) temperature of the wire (*d*) thickness of the plastic insulation

16. Which of the following pattern correctly describes the magnetic field around a long straight wire carrying current? **1**

(*a*) Straight lines perpendicular to the wire.

(*b*) Straight lines parallel to the wire.

(*c*) Radial lines originating from the wire.

(*d*) Concentric circles centred around the wire.

Q. No. 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. **Assertion *(A)* :** Silver bromide decomposition is used in black and white photography.

Reason *(R)* : Light provides energy for this exothermic reaction. **1**

18. **Assertion *(A)* :** Height in pea plants is controlled by efficiency of enzymes and is thus genetically controlled.

Reason *(R)* : Cellular DNA is the information source for making proteins in the cell. **1**

19. **Assertion *(A)* :** Amphibians can tolerate mixing of oxygenated and deoxygenated blood.

Reason *(R)* : Amphibians are animals with two chambered heart. **1**

20. **Assertion *(A)* :** On freely suspending a current carrying solenoid, it comes to rest in Geographical N-S direction.

Reason *(R)* : One end of current carrying straight solenoid behaves as a North pole and the other end as a South pole, just like a bar magnet. **1**

SECTION–B

Q. No. 21 to 26 are very short answer questions.

21. A clear solution of slaked lime is made by dissolving $Ca(OH)_2$ in an excess of water. This solution is left exposed to air. The solution slowly goes milky as a faint white precipitate forms. Explain why a faint white precipitate forms, support your response with the help of a chemical equation. **2**

OR

Keerti added dilute Hydrochloric acid to four metals and recorded her observations as shown in the table given below:

Metal	Gas Evolved
Copper	Yes
Iron	Yes
Magnesium	No
Zinc	Yes

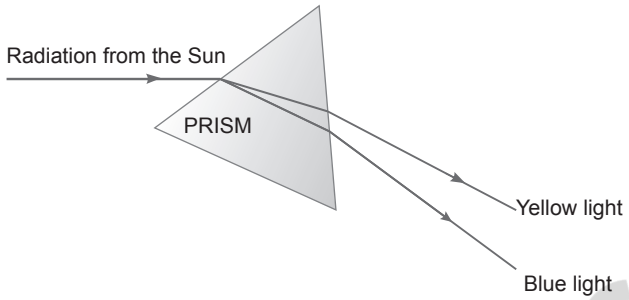
Select the correct observation(s) and give chemical equation(s) of the reaction involved.

22. How is the mode of action in beating of the heart different from reflex actions? Give four examples. **2**

23. Patients whose gallbladder are removed are recommended to eat less oily food. Why? **2**

24. Name the substances other than water, that are reabsorbed during urine formation. What are the two parameters that decide the amount of water that is reabsorbed in the kidney? **2**

25.



State the phenomena observed in the above diagram. Explain with reference to the diagram, which of the two lights mentioned above will have the higher wavelength? **2**

OR

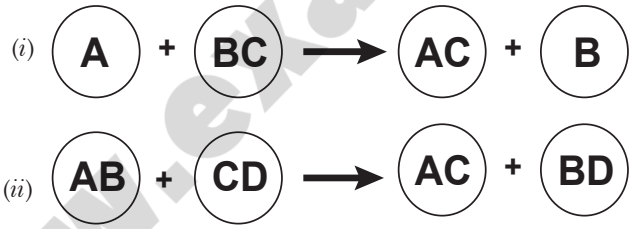
How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw the diagram.

26. A lot of waste is generated in neighbourhood. However, almost all of it is biodegradable. What impact will it have on the environment or human health? **2**

SECTION–C

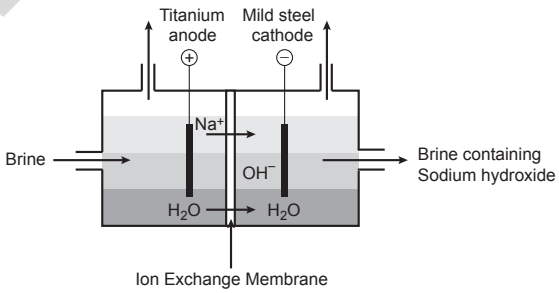
Q. No. 27 to 33 are short answer questions.

27.



Identify the types of reaction mentioned above in (*i*) and (*ii*). Give one example for each type in the form of a balanced chemical equation. **3**

28.



(*a*) Identify the gases evolved at the anode and cathode in the above experimental set up.

(*b*) Name the process that occurs. Why is it called so?

(*c*) Illustrate the reaction of the process with the help of a chemical equation. **3**

29. The leaves of a plant were covered with aluminium foil, how would it affect the physiology of the plant? **3**

OR

How is lymph an important fluid involved in transportation? If lymphatic vessels get blocked, how would it affect the human body? Elaborate.

30. Rohit wants to have an erect image of an object using a converging mirror of focal length 40 cm.

(*a*) Specify the range of distance where the object can be placed in front of the mirror. Justify.

(*b*) Draw a ray diagram to show image formation in this case.

(*c*) State one use of the mirror based on the above kind of image formation. **3**

31. (*a*) A lens of focal length 5 cm is being used by Debashree in the laboratory as a magnifying glass. Her least distance of distinct vision is 25 cm.

(*i*) What is the magnification obtained by using the glass?

(*ii*) She keeps a book at a distance 10 cm from her eyes and tries to read. She is unable to read. What is the reason for this?

(*b*) Ravi kept a book at a distance of 10 cm from the eyes of his friend Hari. Hari is not able to read anything written in the book. Give reasons for this? **3**

32. A student fixes a white sheet of paper on a drawing board. He places a bar magnet in the centre and sprinkles some iron filings uniformly around the bar magnet. Then he taps gently and observes that iron filings arrange themselves in a certain pattern.

(*a*) Why do iron filings arrange themselves in a particular pattern?

(*b*) Which physical quantity is indicated by the pattern of field lines around the bar magnet?

(*c*) State any two properties of magnetic field lines. **3**

OR

A compass needle is placed near a current carrying wire. State your observations for the following cases and give reasons for the same in each case-

(*a*) Magnitude of electric current in wire is increased.

(*b*) The compass needle is displaced away from the wire.

33. Why is damage to the ozone layer a cause for concern? What are its causes and what steps are being taken to limit this damage? **3**

SECTION - D

Q. No. 34 to 36 are Long answer questions.

34. Shristi heated Ethanol with a compound A in presence of a few drops of concentrated sulphuric acid and observed a sweet smelling compound B is formed. When B is treated

with sodium hydroxide it gives back Ethanol and a compound C.

(*a*) Identify A and C.

(*b*) Give one use each of compounds A and B.

(*c*) Write the chemical reactions involved and name the reactions. **5**

OR

(*a*) What is the role of concentrated Sulphuric acid when it is heated with Ethanol at 443 K. Give the reaction involved.

(*b*) Reshu by mistake forgot to label the two test tubes containing Ethanol and Ethanoic acid. Suggest an experiment to identify the substances correctly? Illustrate the reactions with the help of chemical equations.

35. (*a*) Why is it not possible to reconstruct the whole organism from a fragment in complex multicellular organisms?

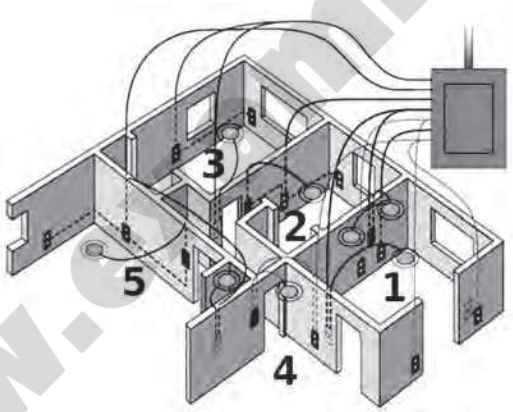
(*b*) Sexual maturation of reproductive tissues and organs are necessary link for reproduction. Elucidate. **5**

OR

(*a*) How are variations useful for species if there is drastic alteration in the niches?

(*b*) Explain how the uterus and placenta provide necessary conditions for proper growth and development of the embryo after implantation?

36.



The diagram above is a schematic diagram of a household circuit. The house shown in the above diagram has 5 usable spaces where electrical connections are made. For this house, the mains have a voltage of 220 V and the net current coming from the mains is 22A.

(*a*) What is the mode of connection to all the spaces in the house from the mains?

(*b*) The spaces 5 and 4 have the same resistance and spaces 3 and 2 have respective resistances of 20Ω and 30Ω. Space 1 has a resistance double that of space 5. What is the net resistance for space 5.

(*c*) What is the current in space 3?

(*d*) What should be placed between the main connection and the rest of the house's electrical appliances to save them from accidental high electric current? **5**

SECTION - E

Q. No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. Two students decided to investigate the effect of water and air on iron object under identical experimental conditions. They measured the mass of each object before placing it partially immersed in 10 mL of water. After a few days, the object were removed, dried and their masses were measured. The table shows their results.

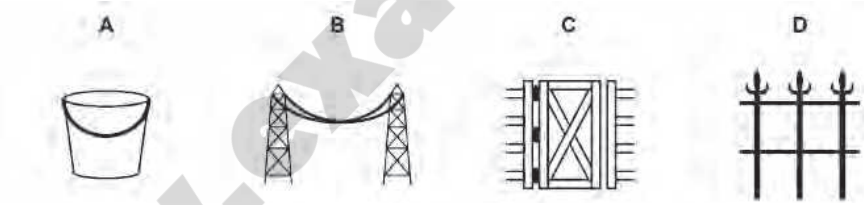
Student	Object	Mass of Object before rusting in g	Mass of the coated object in g
A	Nail	3.0	3.15
B	Thin plate	6.0	6.33

(*a*) What might be the reason for the varied observations of the two students?

(*b*) In another set up the students coated iron nails with zinc metal and noted that, iron nails coated with zinc prevents rusting. They also observed that zinc initially acts as a physical barrier, but an extra advantage of using zinc is that it continues to prevent rusting even if the layer of zinc is damaged. Name this process of rust prevention and give any two other methods to prevent rusting. **4**

OR

(*b*) In which of the following applications of Iron, rusting will occur most? Support your answer with valid reason.



A - Iron Bucket electroplated with Zinc

B - Electricity cables having iron wires covered with aluminium

C - Iron hinges on a gate

D - Painted iron fence

38. Pooja has green eyes while her parents and brother have black eyes. Pooja's husband Ravi has black eyes while his mother has green eyes and father has black eyes.

(*a*) On the basis of the above given information, is the green eye colour a dominant or recessive trait? Justify your answer.

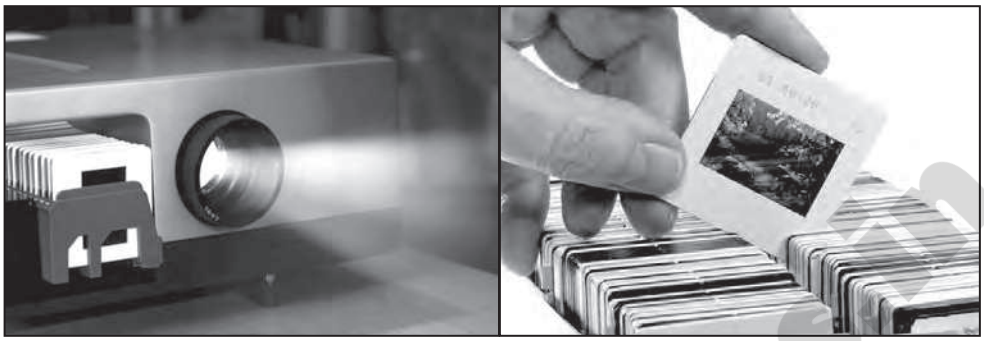
(*b*) What is the possible genetic makeup of Pooja's brother's eye colour?

(*c*) What is the probability that the offspring of Pooja and Ravi will have green eyes? Also, show the inheritance of eye colour in the offspring with the help of a suitable cross.

OR

(*c*) 50% of the offspring of Pooja's brother are green eyed. With help of cross show how this is possible. **4**

39.



The above images are that of a specialized slide projector. Slides are small transparencies mounted in sturdy frames ideally suited to magnification and projection, since they have a very high resolution and a high image quality. There is a tray where the slides are to be put into a particular orientation so that the viewers can see the enlarged erect images of the transparent slides. This means that the slides will have to be inserted upside down in the projector tray.

To show her students the images of insects that she investigated in the lab, Mrs. Iyer brought a slide projector. Her slide projector produced a 500 times enlarged and inverted image of a slide on a screen 10 m away. **4**

(*a*) Based on the text and data given in the above paragraph, what kind of lens must the slide projector have?

(*b*) If v is the symbol used for image distance and u for object distance then with one reason state what will be the sign for $\frac{v}{u}$ in the given case?

(*c*) A slide projector has a convex lens with a focal length of 20 cm. The slide is placed upside down 21 cm from the lens. How far away should the screen be placed from the slide projector's lens so that the slide is in focus?

OR

(*c*) When a slide is placed 15 cm behind the lens in the projector, an image is formed 3 m in front of the lens. If the focal length of the lens is 14 cm, draw a ray diagram to show image formation. (not to scale)

■■■

Answers

SECTION–A

1. (*c*) The change in colour of moist litmus paper from blue to red is due to the release of H^+ ions when acid dissolves in water. 1

2. (*b*) Removal of oxygen shows reduction and removal of hydrogen shows oxidation. Thus, MnO_2 is reduced to $MnCl_2$ & HCl is oxidized to Cl_2. 1

3. (*c*) Magnesium oxide is a white powder. It is formed due to the reaction between magnesium and oxygen present in the air. 1

4. (*b*) CO_2 is an acidic oxide, Cl_2 is used in treatment of water, CO_2 is produced in respiration and CO is produced in case of incomplete combustion. 1

5. (*d*) There will be no reaction between Cu and $FeSO_4$ as Cu is less reactive than Fe. So, Cu will not be able to displace Fe. Hence, ferrous sulphate solution remains green with no change in the copper coin. 1

6. (*a*) Acetic acid is weaker acid than hydrochloric acid so, pH of acetic acid is more than that of hydrochloric acid. 1

7. (*c*) Unsaturated hydrocarbons add hydrogen in the presence of catalysts such as palladium or nickel to give saturated hydrocarbons. 1

8. (*b*) Layer II and III contain maximum amount of chloroplast, so maximum photosynthesis occur at level II and III. 1

9. (*b*) CO_2 given out as a byproduct of respiration is absorbed by the KOH.

$$2KOH + CO_2 \longrightarrow K_2CO_3 + H_2O$$ 1

10. (*d*) In the F1 generation, only tall plants appear whereas in the F2 generation, 75% of the plants appear as tall. 1

11. (*d*) In case C, shoot moves in the upward direction and root moves in the downward direction. 1

12. (*b*) Only B and D will show maximum variation as cross pollination occurs here. 1

13. (*c*) If the temperature of the wire increases, the ions of the metal vibrate more vigorously. This increases the number of collisions between the free electrons and the ions. Hence, for a metal, resistance increases with increasing temperature. 1

14. (*b*) Using Fleming's left hand rule, there are only 2 possible directions (either north or south) where force acts on the wire. 1

15. (*b*) As resistance is inversely proportional to the area of cross section, so, decrease in the resistance of the wire would be produced by an increase in the diameter *d* of the wire. 1

16. (*d*) The field consists of concentric circles centred around the wire. 1

17. (*c*) A is true but R is false. 1

The correct reason is light provides energy for this endothermic reaction.

18. (*a*) Both A and R are true and R is the correct explanation of A. 1

19. (*c*) A is true but R is false.
The correct reason is Amphibians are animals with three chambered heart. 1

20. (*a*) Both A and R are true and R is the correct explanation of A 1

SECTION – B

21. Calcium hydroxide reacts with carbon dioxide present in the atmosphere to form calcium carbonate which results in milkiness/white ppt / Formation of calcium carbonate.

$$Ca(OH)_2(aq) + CO_2(g) \longrightarrow \underset{\text{(White ppt.)}}{CaCO_3(s)} + H_2O(l) \qquad 1 + 1$$

OR

$$Fe(s) + 2HCl(aq) \longrightarrow \underset{\text{[Iron(II) Chloride]}}{FeCl_2(aq)} + H_2(g)$$ (No deduction for balancing/ states)

$$Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g) \qquad 1+1$$

22.

Beating of heart	Reflex actions
Involuntary actions are the actions which are not controlled by our will.	Reflex actions are the sudden action in response to something.
They do not need any kind of stimulus to work.	They required stimulus for its action.
These actions are regulated by the brain.	These actions are regulated by the spinal cord.
They do not involve skeletal muscle.	They do involve skeletal muscle.
These actions are performed throughout one's life.	These actions are produced in response to an event of an emergency.
This action may be quick or slow.	Reflex actions are always quick.

Any four points (½ x4=2 marks) 2

23. Gallbladder stores bile which helps in emulsification of lipids.

In the absence of stored bile, emulsification of fats will be negligible/ affected/ less and thus fat digestion will be slow. Hence there are such diet restrictions. 1 + 1

24. Glucose, amino acids, salts and a major amount of water are selectively re-absorbed as the urine flows along the tube. 1

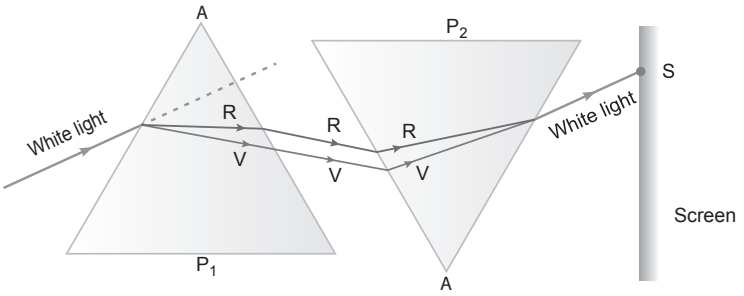
The amount of water reabsorbed depends on how much excess water there is in the body and on how much of dissolved waste there is to be excreted. ½ +½

25. Dispersion- The splitting of white light into seven colours on passing through a prism. 1

Velocity is directly proportional to wavelength at a given constant frequency. So yellow will have greater wavelength than blue as the velocity of yellow light is greater than blue. ½ +½

OR

Angle of deflections of the two prisms need to be equal and opposite. While the first prism splits the light in the seven colours due to different angles of deflection, the second prism combines the spectrum along a single ray and the colours again combine to give white light as the emergent light. 1



1

26. Excess generation of biodegradable wastes can be harmful as -

Its decomposition is a slow process leading to production of foul smell and gases. 1

It can be the breeding ground for germs that create unhygienic conditions. 1

SECTION - C

27. (*i*) Displacement ½

- $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$ 1
- $Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4(aq) + Cu(s)$
- $Pb(s) + CuCl_2(aq) \longrightarrow PbCl_2(aq) + Cu(s)$

(Any one of the reactions or other displacement reaction.)

(*ii*) Double displacement ½

$Na_2SO_4\ (aq) + BaCl_2(aq) \longrightarrow BaSO_4\ (s) + 2NaCl(aq)$ 1

(Any other double displacement reaction.)

28. (*a*) Anode: Chlorine; ½

Cathode: Hydrogen ½

(*b*) Chlor alkali process as the products obtained are alkali, chlorine gas and hydrogen gas. 1

(*c*) $2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{Electric current}} 2NaOH(aq) + Cl_2(g) + H_2(g)$ 1

29. No photosynthesis will occur so no glucose will be made. Also no respiration will take place as no oxygen will be taken in. 1

No transpiration will occur so there would be no upward movement of water or minerals from the soil as there will be no transpirational pull. 1

Temperature regulation of leaf surface will be affected. 1

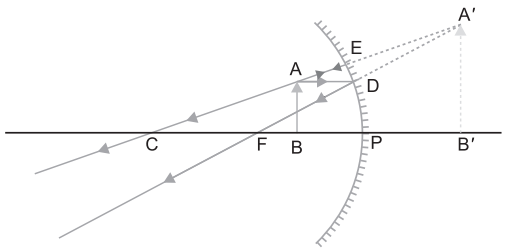
OR

Lymph carries digested and absorbed fat from the intestine and drains excess fluid from extracellular space back into the blood. 1+1

Blockage of lymphatic system will lead to water retention and poor fat absorption in the body. 1

30. (*a*) The object has to be placed at a distance between 0 - 40 cm. This is because image is virtual, erect and magnified when the object is placed between F and P. 1

(*b*) 1



(*c*) It is used as shaving mirror or used by dentists to get enlarged image of teeth. (any one use) 1

31. (*a*) Given, image distance (v) = – 25 cm, focal length (f) = 5 cm, magnification (m) =?

From lens formula, $\frac{1}{f}=\frac{1}{v}-\frac{1}{u} \Rightarrow \frac{1}{u}=\frac{1}{v}-\frac{1}{f}$

$$\frac{1}{u}=\frac{1}{-25}-\frac{1}{5}=\frac{-1-5}{25}=\frac{-6}{25}$$

Object distance, $u=\frac{-25}{6}$ cm

We know that, $m=\frac{v}{u}=\frac{-25\times 6}{-25}=6.$ 2

(*b*) This is because the least distance of distinct vision is 25 cm. 1

32. (*a*) When iron filings are placed in a magnetic field around a bar magnet, they behave like tiny magnets. The magnetic force experienced by these tiny magnets make them rotate and align themselves along the direction of field lines. 1

(*b*) The physical property indicated by this arrangement is the magnetic field produced by the bar magnet. 1

(*c*) Magnetic field lines never intersect, magnetic field lines are closed curves. 1

OR

(*a*) The deflection in the compass needle increases as magnetic field of the current carrying conductor is directly proportional to current flowing through it. 1½

(*b*) The deflection in the needle decreases as the magnetic field is inversely proportional to the perpendicular distance from the wire. 1½

33. Damage to the ozone layer is a cause for concern because the ozone layer shields the surface of earth from harmful UV radiations from the sun which cause skin cancer in human beings.

Synthetic chemicals like chlorofluorocarbons (CFCs) which are used as refrigerants and in the fire - extinguishers are the main reason for the depletion of the ozone layer.

Steps taken to limit this damage— Many developing and developed countries have signed and are obeying the directions of UNEP (United Nations Environment Programme) to freeze or limit the production and usage of CFCs at 1986 levels. 1 × 3 = 3

SECTION - D

34. (*a*) A – Ethanoic acid/any other carboxylic acid ½

C – Sodium salt of ethanoic acid/ any other carboxylic acid/ sodium ethanoate. ½

(*b*) Use of A – dil. solution used as vinegar in cooking/ preservative in pickles. 1

Use of B – making perfumes, flavoring agent. 1

(*c*) $CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$ 1

$CH_3COOC_2H_5 + NaOH \longrightarrow CH_3COONa + C_2H_5OH$ 1

OR

(*a*) Sulphuric acid acts as dehydrating agent 1

$C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4,\ 443\ K} C_2H_4 + H_2O$ 1

(*b*) By reaction with sodium carbonate/ bicarbonate with the samples, ethanol will not react whereas ethanoic acid gives brisk effervescence. 1+1

$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

OR

$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$ 1

35. (*a*) The reason is that many multi-cellular organisms are not simply a random collection of cells. Specialised cells are organised as tissues, and tissues are organised into organs, which then have to be placed at definite positions in the body. Therefore, cell-by-cell division would be impractical. 2

(*b*) Sexual maturation of reproductive tissues is a necessary link for reproduction because of the need for specialised cell called germ-cells to participate in sexual reproduction. The body of the individual organism has to grow to its adult size, the rate of general body growth begins to slow down, reproductive tissues begin to mature. 1½

A whole new set of changes in the appearance of the body takes place like change in body proportions, new features appear. This period during adolescence is called puberty.

There are also changes taking place that are different between boys and girls. In girls, breast size begins to increase, with darkening of the skin of the nipples at the tips of the breasts. Also, girls begin to menstruate at around this time. Boys begin to have new thick hair growth on the face and their voices begin to crack. 1½

OR

(*a*) If the niche were drastically altered, the population could be wiped out. However, if some variations were to be present in a few individuals in these populations, there would be some chance for them to survive. Variation is thus useful for the survival of species over time. 2

(*b*) (*i*) The lining of the uterus thickens and is richly supplied with blood to nourish the growing embryo. ½

(*ii*) The embryo gets nutrition from the mother's blood with the help of placenta. It is embedded in the uterine wall. ½

(*iii*) It contains villi on the embryo's side of the tissue. On the mother's side are blood spaces, which surround the villi. ½

(*iv*) This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The developing embryo will also generate waste

substances which can be removed by transferring them into the mother's blood through the placenta. 1

(*v*) The child is born as a result of rhythmic contractions of the muscles in the uterus. ½

36. (*a*) All spaces are connected in parallel. 1

(*b*) Let Resistance of Space 5 and 4 be R ohms respectively . 2

Resistance of Space 1 = 2 R ohms

Resistance of Space 2 = 30 ohms

Resistance of Space 3 = 20 ohms

Current = 22 A

V= 220 V

Total Resistance $= \frac{V}{I} = \frac{220}{22}\ \Omega$

$$\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\frac{1}{R_4}+\frac{1}{R_5}=\frac{1}{R_{eq}}$$

$$\frac{1}{2R}+\frac{1}{30}+\frac{1}{20}+\frac{1}{R}+\frac{1}{R}=\frac{1}{R_{eq}}$$

$$\frac{30+2R+3R+60+60}{60\,R}=\frac{1}{R_{eq}}$$

$$\frac{150+5R}{60R}=\frac{1}{R_{eq}}$$

$$R_{eq}=\frac{60R}{150+5R}=\frac{220}{22}$$

$60\,R = 10(150 + 5R)$

$60\,R = 1500 + 50R$

$10R = 1500$

$R = 150\ \Omega$

(*c*) Current $= \frac{V}{R} = \frac{220}{20} = 11$ A 1

(*d*) Fuse 1

SECTION - E

37. (*a*) Rusting occurs in both A and B so there is an increase in mass. 1

As the surface area of B is more, extent of rusting is more. 1

(*b*) Galvanization is the process of rust prevention. 1

Methods to prevent rusting are: Oiling/ greasing/ painting/ alloying/ chromium plating or any other. (any two ½ mark each) 1

OR

(*b*) Maximum rusting will occur in C - Iron hinges on a gate

Reason: Iron is in contact with both atmospheric oxygen and moisture/ water vapour. 2

38. (*a*) Yes, green eye colour is recessive as it will express only in homozygous condition ½ + ½

(*b*) BB, Bb 1

(*c*) bb*Bb ½

	B	b
b	Bb	bb
b	Bb	bb

Genetic cross 1

50% of the offsprings can have green eye colour. ½

OR

(*c*) Brother is heterozygous(Bb) and wife is green(bb) 1

Wife bb*Bb brother

	B	b
b	Bb	bb
b	Bb	bb

50% of the offsprings can have green eye colour as per the cross shown. 1

39. (*a*) Convex Lens 1

(*b*) Negative as the image is real and inverted. 1

(*c*) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{20} = \frac{1}{v} - \frac{1}{-21}$

$\frac{1}{v} = \frac{1}{20} - \frac{1}{21}$

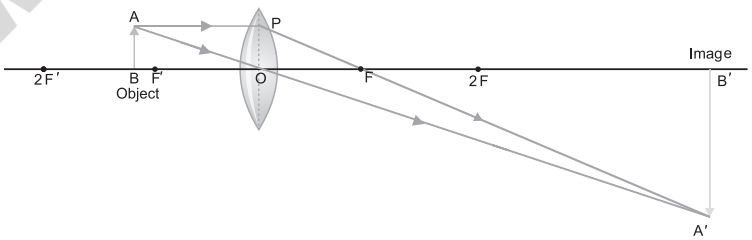
$= \frac{21 - 20}{420}$

$= \frac{1}{420}$

$v = 420$ cm 2

OR

(*c*) 2



Blue Print Science-X

Based on CBSE Sample Question Paper–2023

Unit	Chapters / Form of Questions	Objective Type Questions (1 mark)		VSAQ (2 marks)	SAQ (3 marks)	LAQ (5 marks)	Case-based/ Data-based (4 marks)	Total
		MCQ	A/R					
Chemical Substances	1. Chemical Reactions and Equations	2(2)	1(1)	2(1)	3(1)		4(1)	25(13)
	2. Acids, Bases and Salts	3(3)			3(1)			
	3. Metals and Non-metals	1(1)						
	4. Carbon and its Compounds	1(1)				5(1)		
World of Living	5. Life Processes	2(2)	1(1)	4(2)	3(1)			25(13)
	6. Control and Coordination	1(1)		2(1)				
	7. How do Organisms Reproduce?	1(1)				5(1)		
	8. Heredity	1(1)	1(1)				4(1)	
Natural Phenomena	9. Light—Reflection and Refraction				6(2)		4(1)	12(4)
	10. The Human Eye and the Colourful World			2(1)				
Effects of Current	11. Electricity	2(2)				5(1)		13(7)
	12. Magnetic Effects of Electric Current	2(2)	1(1)		3(1)			
Natural Resources	13. Our Environment			2(1)	3(1)			5(2)
	Total	**16(16)**	**4(4)**	**12(6)**	**21(7)**	**15(3)**	**12(3)**	**80(39)**

Note: 1. Number of question(s) is/are given in the brackets.

2. Case-based/Data-based Questions contain both Very Short Answer Questions (VSAQ) and Short Answer Questions (SAQ).

3. The above Blue Print is only a sample. Suitable internal variations may be made for generating similar Blue Prints keeping the overall weightage to different form of questions and typology of questions same.

1 SAMPLE PAPER [SOLVED]

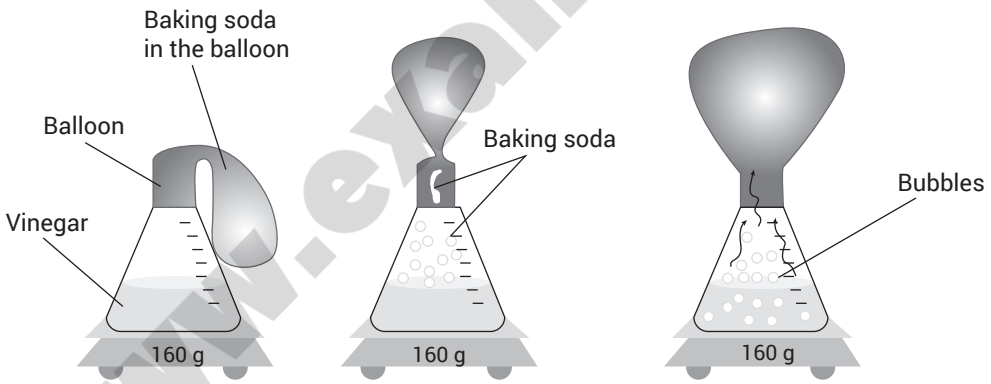
Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20**

1. A student poured 100 mL of water in a bottle and added 40 mL vinegar to it. A balloon was filled with 20 g baking soda and was fixed at the mouth of the bottle. Slowly the shape of the balloon changed, as shown.



The student claims that a chemical change happened when the two substances were mixed. Is the claim made by the student correct?

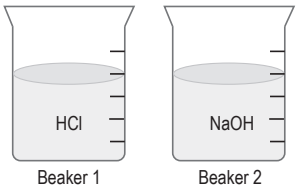
(*a*) Yes, as a new substance was formed in the form of a gas.

(*b*) No, as the formation of bubbles in the mixture shows a physical change.

(*c*) Yes, as the mass remains the same throughout the experiment.

(*d*) No, as the change in the shape and size of the balloon shows a physical change.

2. A student placed 10 mL HCl and NaOH in two separate beakers as shown.



In beaker 1, 4 mL of NaOH is added whereas in beaker 2, 4 mL of HCl is added. The student notes the possible changes in pH in both solutions.

	Change in pH (Beaker 1)	Change in pH (Beaker 2)
A	increase	increase
B	reduce	increase
C	increase	reduce
D	reduce	reduce

Which change in pH is correct?

(*a*) A (*b*) B (*c*) C (*d*) D

3. The reaction between iron oxide and hydrogen is given below.

$Fe_3O_4 + 4H_2 \longrightarrow 3Fe + 4H_2O$

Which option shows the compounds undergoing oxidation and reduction?

	Oxidation	Reduction
(*a*)	$4H_2$	Fe_3O_4
(*b*)	Fe_3O_4	$4H_2O$
(*c*)	$4H_2O$	Fe_3O_4
(*d*)	3Fe	$4H_2$

4. Sodium hydrogencarbonate when added to acetic acid evolves a gas. Which of the following statements is true about the gas evolved?

(*i*) It turns lime water milky.

(*ii*) It extinguishes a burning splinter.

(*iii*) It dissolves in a solution of sodium hydroxide.

(*iv*) It has a pungent odour.

(*a*) (*i*) and (*ii*) (*b*) (*i*), (*ii*) and (*iii*) (*c*) (*ii*), (*iii*) and (*iv*) (*d*) (*i*) and (*iv*)

5. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. Which of the following statement is true for solution 'A' and 'B'?

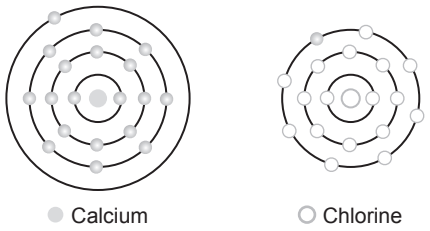
(*a*) A is strongly basic and B is a weak base.

(*b*) A is strongly acidic and B is a weak acid.

(*c*) A has pH greater than 7 and B has pH less than 7.

(*d*) A has pH less than 7 and B has pH greater than 7.

6. **A scientist is attempting to represent an ionic bond between calcium and chlorine. The figure below shows the progress he has made so far.**



What should be the next step in his representation of the ionic bond?

(*a*) Transfer an electron from the calcium atom to the chlorine atom.

(*b*) Transfer an electron from the chlorine atom to the calcium atom.

(*c*) Add another chlorine atom to accept an electron from the calcium atom.

(*d*) Add another calcium atom to donate an electron to the chlorine atom.

7. **Several factories were pouring their wastes in rivers A and B. Water samples were collected from these two rivers. It was observed that sample collected from river A was acidic while that of river B was basic. The factories located near A and B are**

(*a*) soaps and detergents factories near A and alcohol distillery near B

(*b*) soaps and detergents factories near B and alcohol distillery near A

(*c*) lead storage battery manufacturing factories near A and soaps and detergents factories near B

(*d*) lead storage battery manufacturing factories near B and soaps and detergents factories near A

8. **The correct sequence of anaerobic reactions in yeast is**

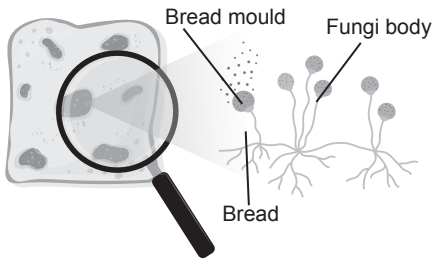
(*a*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate $\xrightarrow{\text{Mitochondria}}$ Ethanol + Carbon dioxide

(*b*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate $\xrightarrow{\text{Cytoplasm}}$ Lactic acid

(*c*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate $\xrightarrow{\text{Mitochondria}}$ Lactic acid

(*d*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate $\xrightarrow{\text{Cytoplasm}}$ Ethanol + Carbon dioxide

9. **The image shows the bread moulds on a bread. How do these fungi obtain nutrition?**



(*a*) By using nutrients from the bread to prepare their own food.

(*b*) By allowing other organisms to grow on the bread and then consuming them.

(*c*) By breaking down the nutrients of bread and then absorbing them.

(*d*) By eating the bread on which it is growing.

10. Select the statements that describe characteristics of genes.

(*i*) Genes are specific sequence of bases in a DNA molecule.

(*ii*) A gene does not code for proteins.

(*iii*) In individuals of a given species, a specific gene is located on a particular chromosome.

(*iv*) Each chromosome has only one gene.

(*a*) (*i*) and (*ii*) (*b*) (*i*) and (*iii*)

(*c*) (*i*) and (*iv*) (*d*) (*ii*) and (*iv*)

11. Which option correctly shows the order of events when a bright light is focused on our eyes?

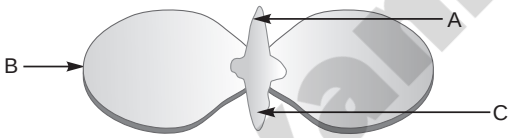
(*a*) Bright light → receptors in eyes → sensory neuron → spinal cord → motor neurons → eyelid closes

(*b*) Bright light → receptors in eyes → spinal cord → sensory neuron → motor neurons → eyelid closes

(*c*) Bright light → receptors in eyes → sensory neuron → motor neurons → spinal cord → eyelid closes

(*d*) Bright light → receptors in eyes → spinal cord → motor neurons → sensory neuron → eyelid closes

12. In Figure, the parts A, B and C are sequentially \



(*a*) cotyledon, plumule and radicle (*b*) plumule, radicle and cotyledon

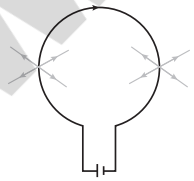
(*c*) plumule, cotyledon and radicle (*d*) radicle, cotyledon and plumule

13. In an electrical circuit two resistors 2 Ω and 4 Ω respectively are connected in series to a 6 V battery. The heat dissipated by the 4 Ω resistor in 5 s will be

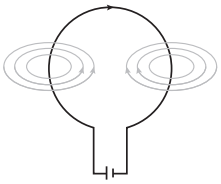
(*a*) 5 J (*b*) 10 J (*c*) 20 J (*d*) 30 J

14. Which diagram shows the magnetic field lines around a current carrying circular loop?

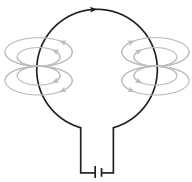
(*a*)



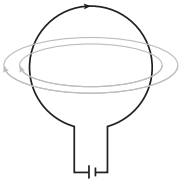
(*b*)



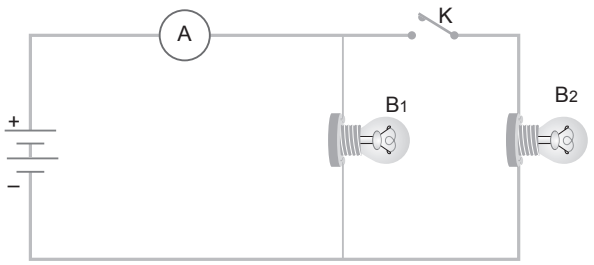
(*c*)



(*d*)



15. Bulbs B_1 and B_2 are exactly identical. When the key *K* is pressed, the reading of the ammeter will



(*a*) remain unchanged (*b*) be doubled

(*c*) be halved (*d*) become four times

16. Column I contains some features of AC supply in India and column II contains their relevant values/details. Match columns I and II.

Column I	Column II
(A) Value of the frequency of AC supply in India	(*i*) Green (yellow)
(B) Colour of the earth wire in household wiring.	(*ii*) 50
(C) Colour of the wire in which the 'switch' needs to be put in a domestic electric circuits.	(*iii*) 15
(D) Rating of the fuse wire (in A) used in domestic power circuits.	(*iv*) Red/Brown

(*a*) A–(*i*), B—(*ii*), C—(*iii*), D—(*iv*) (*b*) A–(*iii*), B—(*i*), C—(*ii*), D—(*iv*)

(*c*) A–(*ii*), B—(*i*), C—(*iv*), D—(*iii*) (*d*) A–(*iv*), B—(*iii*), C—(*ii*), D—(*i*)

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : In a reaction of copper with oxygen, copper serves as a reducing agent.

Reason (*R*) : The substance which gains oxygen in a chemical reaction acts as a reducing agent.

18. Assertion (*A*) : Bile is essential for digestion of lipids.

Reason (*R*) : Bile juice contains enzymes.

19. Assertion (*A*) : A geneticist crossed a pea plant having violet flowers with a pea plant with white flowers, he got all violet flowers in first generation.

Reason (*R*) : White colour gene is not passed on to next generation.

20. Assertion(*A*) : The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is inversely proportional to the current flowing through the solenoid.

Reason (*R*) : The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is directly proportional to the number of turns per unit length of a solenoid.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Give reasons:

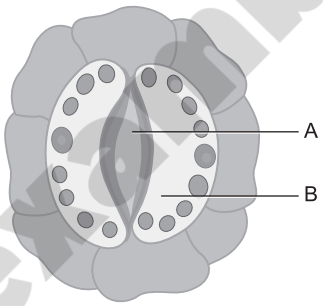
(*i*) Aluminium is a reactive metal but is still used for packing food articles.

(*ii*) Red litmus paper turns blue when touched with aqueous solution of magnesium oxide.

OR

Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented. Under what conditions do these grapes ferment? Is it a chemical or a physical change?

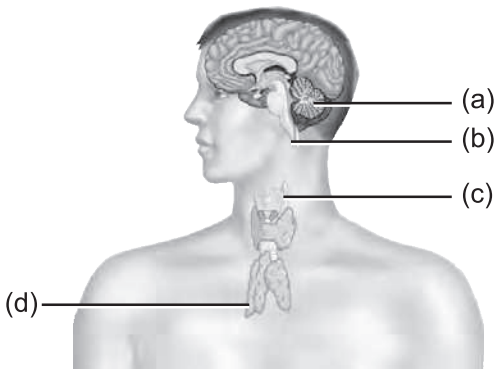
22. Study the given diagram:



Name the parts 'A' and 'B' and state one function of each.

23. State the function of Bowman's capsule and glomerulus.

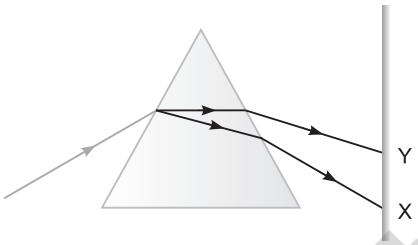
24. Label the endocrine glands in figure.



25. Complete the following table:

	Oxygen	Ozone
Formula	(*i*) _____	(*ii*) _____
Benefits to biotic component	(*iii*) _____	(*iv*) _____

26. In the given figure, a narrow beam of white light is shown to pass through a triangular glass prism. After passing through the prism it produces a spectrum XY on a screen.



(*i*) State the colour seen at X and Y.

(*ii*) Why do different colours of white light bend through different angles with respect to the incident beam of light?

OR

A person needs a lens of power – 4.5 D for correction of her vision.

(*i*) What kind of defect in vision is she suffering from?

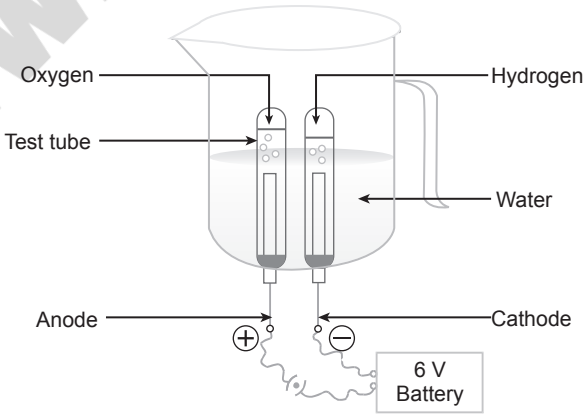
(*ii*) What is the focal length of the corrective lens?

(*iii*) What is the nature of the corrective lens?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Study the figure given below and answer the following questions:



(*i*) Name the process depicted in the diagram.

(*ii*) Write the composition of the anode and the cathode.

(*iii*) Write the balanced chemical equation of the reaction taking place in this case.

(*iv*) The reaction does not take place if a few drops of dilute sulphuric acid are not added to water. Why?

28. (*i*) Draw a labelled diagram to show the preparation of hydrogen chloride gas in laboratory.

(*ii*) Test the gas evolved first with dry and then with wet litmus paper. In which of the two cases, does the litmus paper show change in colour?

(*iii*) State the reason of exhibiting acidic character by dry HCl gas/HCl solution.

29. (*i*) In the process of respiration, state the function of alveoli.

(*ii*) Rate of breathing in aquatic organisms is much faster than that in terrestrial organisms. Give reasons.

(*iii*) Complete the following pathway showing the breakdown of glucose:

$$\underset{\text{(6-carbon molecules)}}{\text{Glucose}} \xrightarrow{\text{in cytoplasm}} \text{(i)}\ \underset{\substack{\text{(3-carbon molecules + energy)}}}{\text{?}} \xrightarrow[\text{in mitochondria}]{\text{Presence of } O_2} \text{(ii)}\ \text{?} + H_2O + \text{Energy}$$

OR

(*i*) Name the correct substrates for the following enzymes.

(*a*) Trypsin (*b*) Amylase

(*c*) Pepsin (*d*) Lipase

(*ii*) Explain the role of mouth in digestion of food.

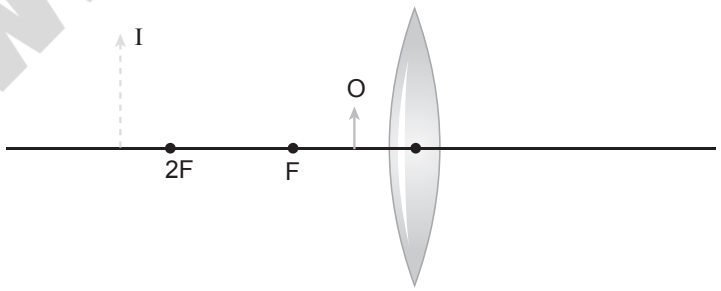
30. A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm?

(*i*) Position of the image (*ii*) Size of the image

(*iii*) Nature of the image

Draw a labelled ray diagram to justify your inferences.

31. The diagram given below shows an object O and its image I.



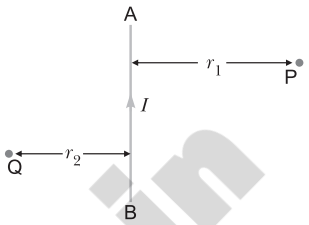
Without actually drawing the ray diagram, state the following :

(*i*) Type of lens (Converging/Diverging)

(*ii*) Name two optical instruments where such an image is obtained.

(*iii*) List three characteristics of the image formed if this lens is replaced by a concave mirror of focal length '*f*' and an object is placed at a distance '*f*/2' in front of the mirror.

32. (*i*) AB is a current-carrying conductor in the plane of the paper as shown in figure. What are the directions of magnetic fields produced by it at points P and Q? Given $r_1 > r_2$, where will the strength of the magnetic field be larger?

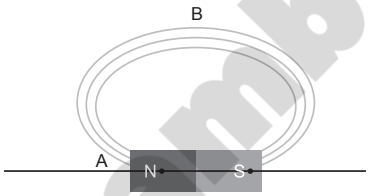


(*ii*) (*a*) How is the direction of magnetic field at a point determined?

(*b*) What is the direction of magnetic field at the centre of a current-carrying circular loop?

OR

Magnetic field lines are shown in the given diagram. A student makes a statement that the magnetic field at 'A' is stronger than at 'B'. Justify this statement. Also redraw the diagram and mark the direction of magnetic field lines.



33. (*i*) From the following group of organisms create a food chain which is the most advantageous for human beings in terms of energy.

Hawk, Rat, Cereal plant,
Goat, Snake, Human being

(*ii*) State the possible disadvantage if the cereal plant is growing in soil rich in pesticides.

(*iii*) Construct a food web using the organisms mentioned above.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

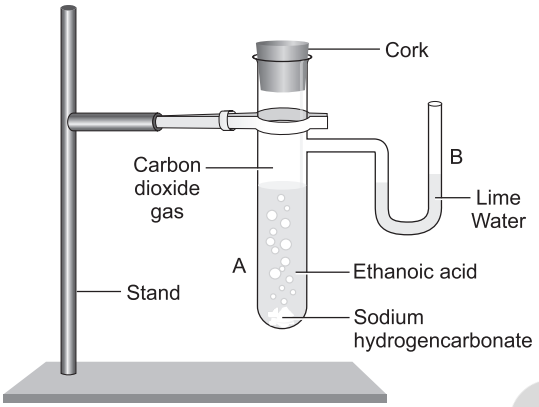
34. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds:

(*i*) Poor conductors of electricity? and

(*ii*) Have low melting and boiling points? What happens when this compound burns in oxygen?

OR

Look at the figure and answer the following questions:



(*i*) What change would you observe in the calcium hydroxide solution taken in tube B?

(*ii*) Write the reaction involved in A and B respectively.

(*iii*) If ethanol is given instead of ethanoic acid, would you expect the same change?

(*iv*) How can a solution of lime water be prepared in the laboratory?

35. (*i*) List three different categories of contraception methods.

(*ii*) Why has Government of India prohibited prenatal sex determination by law? State its benefits in the long run.

(*iii*) Unsafe sexual act can lead to various infections. Name two bacterial and two viral infections caused due to unsafe sex.

OR

(*i*) Draw a diagram showing germination of pollen on stigma of a flower and mark on it the following organs/parts:

(*a*) Pollen grain (*b*) Pollen tube

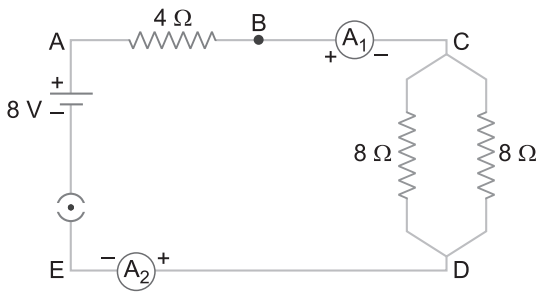
(*c*) Stigma (*d*) Female germ cell

(*ii*) State the significance of pollen tube.

(*iii*) Name the parts of flower that develop after fertilisation into

(*a*) Seed (*b*) Fruit

36. Find out the following in the electric circuit given in figure alongside:



(*i*) Effective resistance of two 8 Ω resistors in the combination

(*ii*) Current flowing through 4 Ω resistor

(*iii*) Potential difference across 4 Ω resistance

(*iv*) Power dissipated in 4 Ω resistor

(*v*) Difference in ammeter readings, if any

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. In **single-replacement reactions**, an element, symbolized as A, reacts with a compound, BC, to take the place of one of the component of the compound. This type of reaction can be represented by the following general equation.

$$A + BC \longrightarrow AC + B$$

In **double-replacement reactions**, two compounds, AB and CD, can be thought of as "exchanging partners" to produce two different compounds, AD and CB.

$$AB + CD \longrightarrow AD + CB$$

The positive ion, A, in the first compound combines with the negative ion, D, in the second compound while the positive ion, C, of the second compound combines with the negative ion, B, in the first compound.

***Source*:** *Section 10.4—Classifying Reactions, Page No. 293, 'Essentials of Chemistry' by Ralph A-Burns.*

(*i*) On keeping the iron nails dipped in copper sulphate solution for about 30 minutes, what are the changes that you will observe?

(*ii*) What is the colour of the precipitate obtained when aqueous silver nitrate and sodium chloride are mixed?

(*iii*) On adding dilute hydrochloric acid to the reaction mixture of sodium sulphite and barium chloride, white precipitate disappears. Give reason.

OR

(*iii*) A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of the chemical reaction.

38. Mendel was educated in a monastery and went on to study science and mathematics at the University of Vienna. Failure in the examinations for a teaching certificate did not suppress his zeal for scientific quest. He went back to his monastery and started growing peas. Many others had studied the inheritance of traits in peas and other organisms earlier, but Mendel blended his knowledge of science and mathematics and was the first one to keep count of individuals exhibiting a particular trait in each generation. This helped him to arrive at the laws of inheritance.

The picture below represents traits studied by Mendel in garden pea.

Seed		Flower	Pod		Stem	
Form	Cotyledon	Colour	Form	Colour	Place	Size
						
Green & Round	Yellow	White	Full	Yellow	Axial pods, Flowers along	Long (6-7 ft)
						
White & Wrinkled	Green	Violet	Constricted	Green	Terminal pods, Flowers top	Short (0-1 ft)
1	2	3	4	5	6	7

(*i*) Identify the dominant trait in pod colour, and stem place.

(*ii*) Why did Mendel select a pea plant for his experiments?

(*iii*) The given picture represents the alleles for flower colour in pea plants.

		
BB X	Bb Y	bb Z

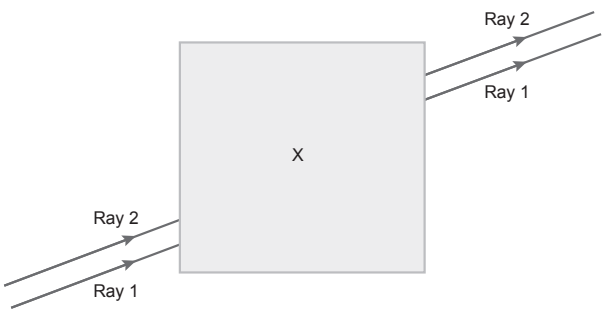
Flower "Y" has same colour as that of flower "X". Why?

OR

(*iii*) Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive

(*i*) yellow seed (*ii*) round seed

39. Noor, a young student, was trying to demonstrate some properties of light in her Science project work. She kept 'X' inside the box (as shown in the figure) and with the help of a laser pointer made light rays pass through the holes on one side of the box. She had a small butter-paper screen to see the spots of light being cast as they emerged.

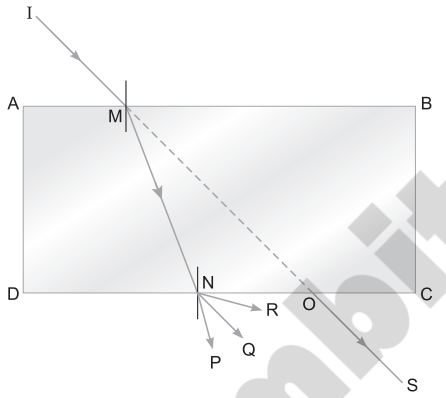


(*i*) What could be the 'X' that she placed inside the box to make the rays behave as shown? Give reason

(*ii*) She measured the angles of incidence for both the rays on the left side of the box to be 48.6°. She knew the refractive index of the material 'X' inside the box was 1.5. What will be the approximate value of angle of refraction?

OR

(*ii*) What change will be on the lateral shift of the rays if the object inside the box was made of a material with a refractive index less than 1.5? If a light ray IM is incident on the surface AB as shown, identify the correct emergent ray.



Answers

SECTION–A

1. (*a*) When vinegar reacts with baking soda, carbon dioxide gas is produced.

2. (*c*) Addition of a base to an acid increases the pH and addition of an acid to a base reduces the pH.

3. (*a*) H_2 is gaining oxygen to form H_2O so it is getting oxidised while Fe_3O_4 is losing oxygen to form Fe so it is getting reduced.

4. (*b*) Carbon dioxide gas is evolved, which has the property of turning lime water milky. It can extinguish the burning candle or splinter and it gets dissolved in sodium hydroxide solution to form sodium carbonate but this gas is odourless in nature.

5. (*c*) Phenolphthalein gives pink colour in basic medium so pH of A is greater than 7. It is colourless in acidic medium so pH of B is less than 7.

6. (*c*)

7. (*b*) Soaps and detergents are basic and the wastes of alcohol distillery is acidic.

8. (*d*)

9. (*c*) Bread mould and mushrooms break down the food material outside the body and then absorb it.

10. (*b*) A gene is a specific sequence of bases present in a stretch of DNA molecule. In an individual of a given species, gene has fixed location on a particular chromosome. An alternate form of a gene exists and is called as allele.

11. (*a*)

12. (*c*)

13. (*c*) $R_{eq} = R_1 + R_2$

$= 2 + 4 = 6\Omega$

$I = \frac{V}{R}$

$= \frac{6}{6} = 1\ A$

$H = I^2Rt$

$= 1^2 \times 4 \times 5$

$= 20\ J$

14. (*b*)

15. (*b*) Let us assume resistance of bulbs B_1 and B_2 be $R\ \Omega$.

When key is open, $I_1 = \frac{V}{R}$

When key is closed, $I_2 = \frac{V}{R/2}$

$I_2 = \frac{2V}{R}$

$I_2 = 2\ I_1$

16. (*c*)

17. (*a*)

18. (*c*) Bile juice contains bile salts which help in lipid degradation. They do not contain any enzymes.

19. (*c*) White colour gene will be passed on to the next generation. Since, violet flower colour gene is dominant over white colour gene so it would not be expressed in the first generation.

20. (*d*) The magnitude of the magnetic field at a point on the axis of a current carrying solenoid is directly proportional to the current and number of turns per unit length of a solenoid.

SECTION–B

21. (*i*) On exposure to air, aluminium forms a hard protective layer of aluminium oxide (Al_2O_3) which prevent further oxidation.

(*ii*) Magnesium oxide is an oxide of a metal, so, it is basic in nature. Due to its basic character it turns red litmus paper blue when touched with its aqueous solution.

OR

Grapes when attached to the plants are living and therefore, their own immune system prevents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions these can be fermented. This is a chemical change.

22. **A** → Stomatal pore

Function: Massive amounts of gaseous exchange takes place in the leaves through these pores for the purpose of photosynthesis.

B → Guard cell

Function: The opening and closing of the stomatal pore is a function of the guard cell.

23. Bowman's capsule and glomerulus have semipermeable walls. The glomerulus, is a tuft of capillaries contained in Bowman's capsule. The water and dissolved substances (wastes and useful) are filtered into the Bowman's capsule and from here they are filtered into the tubule. Thus, both the structures act as filtering apparatus.

24. The endocrine glands are as follows:

(*a*) Pineal gland (*b*) Pituitary gland

(*c*) Thyroid gland (*d*) Thymus

25. (*i*) O_2

(*ii*) O_3

(*iii*) Breathing/Respiration

(*iv*) Absorbs harmful ultra violet (UV) radiations.

26. (*i*) X — Violet Y — Red

(*ii*) Different colours of white light bend through different angles with respect to the incident beam of light due to difference in speed of light of different wavelengths.

OR

(*i*) Myopia

(*ii*) $f = \frac{1}{-4.5} = -\frac{2}{9}\text{m} = -0.22\text{ m}$

(*iii*) Concave lens

SECTION–C

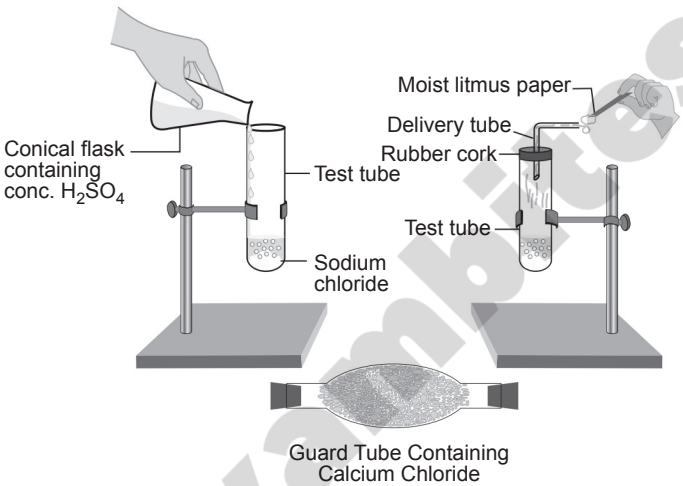
27. (*i*) Electrolysis of water

(*ii*) Carbon electrodes/Graphite rod

(*iii*) $2H_2O \xrightarrow[\text{Current}]{\text{Electric}} 2H_2 + O_2$

(*iv*) Pure water is a non-conductor of electricity/electric current is carried through the acidic solution by ions.

28. (*i*)



(*ii*) We observe that dry HCl gas does not change the colour of the dry litmus paper. But in case of wet blue litmus paper, HCl gas changes the colour of blue litmus paper to red.

(*iii*) Hydrogen ions in HCl are produced in the presence of water. The separation of H^+ ion from HCl molecule occur in the absence of water. Hydrogen chloride is a gas. It only shows its acidic properties when we dissolve it in water.

$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$

29. (*i*) Exchange of gases.

(*ii*) Because amount of oxygen dissolved in water is fairly low as compared to the air.

(*iii*) (*a*) Pyruvate

(*b*) Carbon dioxide

OR

(*i*) (*a*) Protein (*b*) Starch (*c*) Protein (*d*) Fats

(*ii*) (*a*) Food is crushed into small pieces by the teeth.

(*b*) It mixes with saliva and the enzyme amylase (found in saliva) breaks down starch into sugars.

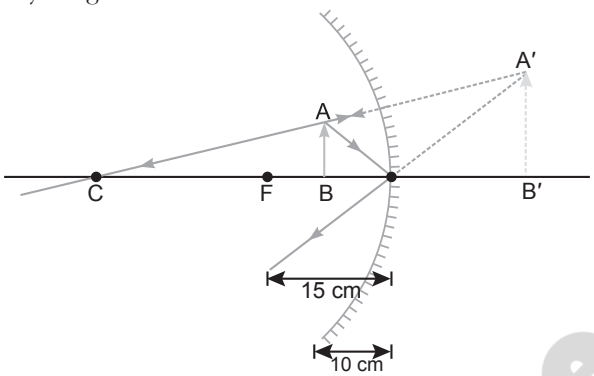
(*c*) Tongue helps in thorough mixing of food with saliva.

30. (*i*) Behind the mirror

(*ii*) Magnified

(*iii*) Virtual and erect

Labelled ray diagram



31. (*i*) Converging Lens

(*ii*) Magnifying Glass, Microscope

(*iii*) Three Characteristics of the image :

(*a*) Virtual (*b*) Erect (*c*) Magnified

32. (*i*) Magnetic field at P is into the plane of paper and at Q it is out of the plane of paper.

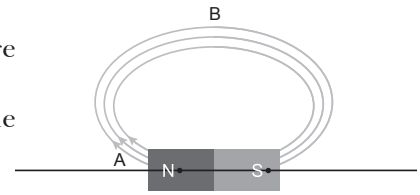
The strength of the magnetic field at Q will be larger as strength of the field $\propto \frac{1}{r}$.

(*ii*) (*a*) The direction of the magnetic field at a point can be found by placing a small magnetic compass at that point. The north end of the needle of a compass indicates the direction of magnetic field at a point where it is placed.

(*b*) The direction of magnetic field at the centre of a current-carrying circular loop is perpendicular to the plane of the loop.

OR

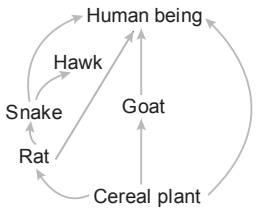
- Closeness (crowding) of magnetic field lines is directly related to the strength of the magnetic field.
- Strength of magnetic field at point 'A' (Pole) is more than at point 'B'.
- If the student redraws the diagram and mark the arrows correctly (N to S).



33. (*i*) Cereal ⟶ Plant ⟶ Human Beings.

(*ii*) Pesticides being non-biodegradable accumulate progressively at each trophic level/ Leads to Biomagnification.

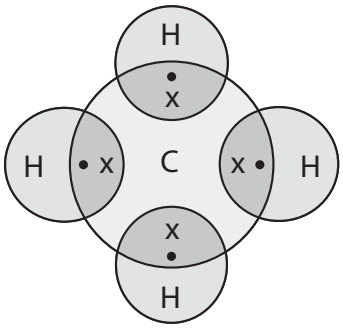
(*iii*)



SECTION–D

34. Methane is a carbon compound which is widely used as a fuel and is a major component of Compressed Natural Gas (CNG) and biogas. Its formula is CH_4.

Electron dot structure of methane:



The type of bonds formed in methane is covalent bond.

(*i*) The bond is formed by sharing of electrons so no charged particles are formed. As no charged particles are present to conduct electric current, they are poor conductors of electricity.

(*ii*) Covalently bonded molecules have weak intermolecular forces of attraction. So, they have low melting and boiling points.

When methane burns in oxygen, carbon dioxide and water are produced along with the release of large amount of heat and light.

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$ + Heat and light

OR

(*i*) It will turn milky.

(*ii*) $CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2\uparrow$ (in A)

$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$ (in B)

With excess CO_2, milkiness disappears.

(*iii*) As C_2H_5OH and $NaHCO_3$ do not react, a similar change is not expected

$C_2H_5OH + NaHCO_3 \longrightarrow$ No change

(*iv*) The lime water is prepared by dissolving calcium oxide in water and decanting the supernatant liquid.

35. (*i*)
- Chemical Method
- Barrier Method
- Surgical Method

(*ii*) Increase in female foeticide / Declining child sex ratio (*Any one*)

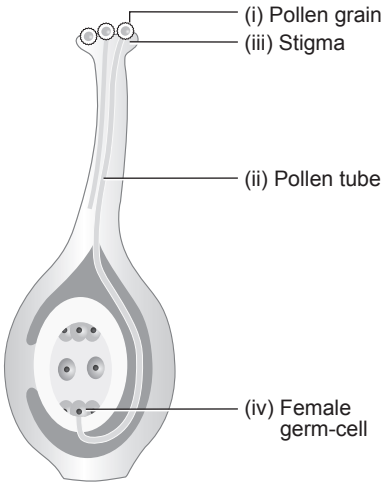
Benefit: Maintaining male-female sex ratio for a healthy society

(*iii*) Bacterial → Gonorrhoea
Syphilis

Viral → Warts
AIDS

OR

(*i*)



(*ii*) Pollen tube carries the male germ cell to reach the ovary and fuse with the female germ cell.

(*iii*) (*a*) Seed ← Ovule

(*b*) Fruit ← Ovary

36. (*i*) $R = \dfrac{R_1 R_2}{R_1 + R_2} = \left(\dfrac{8 \times 8}{8 + 8}\right) = 4\ \Omega$

(*ii*) $I = \dfrac{V}{R} = \dfrac{8}{4 + \left(\dfrac{8 \times 8}{8 + 8}\right)} = \dfrac{8}{8} = 1\ \text{A}$

(*iii*) $V = IR = 1 \times 4 = 4\text{V}$

(*iv*) $P = I^2R = 1^2 \times 4 = 4\text{W}$

(*v*) No difference, same current flows through each ammeter in the given circuit.

SECTION-E

37. (*i*) Iron nails become brownish in colour and the blue colour of copper sulphate solution changes to light green. This is because iron displaces copper from copper sulphate solution and forms ferrous sulphate which is light green in colour.

$$Fe(s) + CuSO_4\ (aq) \longrightarrow FeSO_4\ (aq) + Cu(s)$$

(*ii*) When aqueous solutions of silver nitrate and sodium chloride are mixed, double displacement of ions takes place. As a result of which, a white precipitate of silver chloride and a solution of sodium nitrate are formed.

$$AgNO_3\ (aq) + NaCl\ (aq) \longrightarrow AgCl\ (s) + NaNO_3\ (aq)$$

(*iii*) When sodium sulphite reacts with barium chloride, $BaSO_3$ is formed. $BaSO_3$ is a salt of a weak acid (H_2SO_3), therefore dilute acid such as HCl decomposes barium sulphite to produce sulphur dioxide gas which has the smell of burning sulphur.

$BaCl_2$ is soluble in water and therefore white precipitate disappears.

$$BaSO_3(s) + 2HCl(aq) \longrightarrow BaCl_2(aq) + H_2O(l) + SO_2(g)$$

OR

(*iii*) $KCl(aq) + AgNO_3(aq) \longrightarrow \underset{\text{(White ppt.)}}{AgCl(s)} + KNO_3(aq)$

It is a double displacement and precipitation reaction.

38. (*i*) Yellow pod colour and axial position are dominant traits.

(*ii*) Mendel selected pea plant because:

(*a*) the pea plant can be easily grown and has several contrasting characters.

(*b*) they are naturally self-pollinating but can also be cross-pollinated.

(*c*) many generations can be studied within a short period of time.

(*iii*) Flowers X and Y have same colour because their genotype consists of a dominant allele. The dominant allele expresses itself even in the presence of recessive allele. X and Y both have same colour because they both have dominant allele B.

OR

(*iii*) (*i*) yellow — dominant (*ii*) round — dominant

green — recessive wrinkled — recessive

39. (*i*) X is parallel- sided glass block. In this case, the emergent ray which comes out from the surface is parallel to the incident ray which falls on the surface.

(*ii*) Refractive index of medium $= \frac{\sin i}{\sin r}$

$$1.5 = \frac{\sin 48.6°}{\sin r}$$

$$1.5 = \frac{0.75}{\sin r}$$

$$\sin r = \frac{0.75}{1.5}$$

$$\sin r = 0.5$$

$$r = \sin^{-1}(0.5)$$

$$r = 30°$$

OR

(*ii*) Lateral shift of the rays would have been less.

Here, NQ is parallel to OS. Therefore, NQ is the correct emergent ray.

2 SAMPLE PAPER [SOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20**

1. Three beakers labelled as A, B and C each containing 25 mL of water were taken. A small amount of NaOH, anhydrous $CuSO_4$ and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statements(s) is (are) correct?

(*i*) In beakers A and B, exothermic process has occurred.

(*ii*) In beakers A and B, endothermic process has occurred.

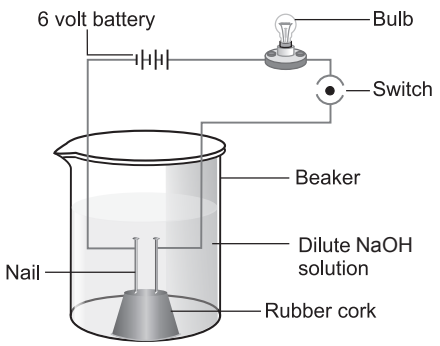
(*iii*) In beaker C exothermic process has occurred.

(*iv*) In beaker C endothermic process has occurred.

(*a*) (*i*) only (*b*) (*ii*) only

(*c*) (*i*) and (*iv*) (*d*) (*ii*) and (*iii*)\

2. In an attempt to demonstrate electrical conductivity through an electrolyte, the alongside apparatus was set up. Which among the following statement(s) is(are) correct?



(*i*) Bulb will not glow because electrolyte is not acidic.

(*ii*) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.

(*iii*) Bulb will not glow because circuit is incomplete.

(*iv*) Bulb will not glow because it depends upon the type of electrolytic solution.

(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*)

(*c*) (*ii*) only (*d*) (*iv*) only

3. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of a:

(*a*) Combination reaction (*b*) Displacement reaction

(*c*) Decomposition reaction (*d*) Double displacement reaction

4. Which of the following is (are) true when HCl (*g*) is passed through water?

(*i*) It does not ionise in the solution as it is a covalent compound.

(*ii*) It ionises in the solution.

(*iii*) It gives both hydrogen and hydroxyl ion in the solution.

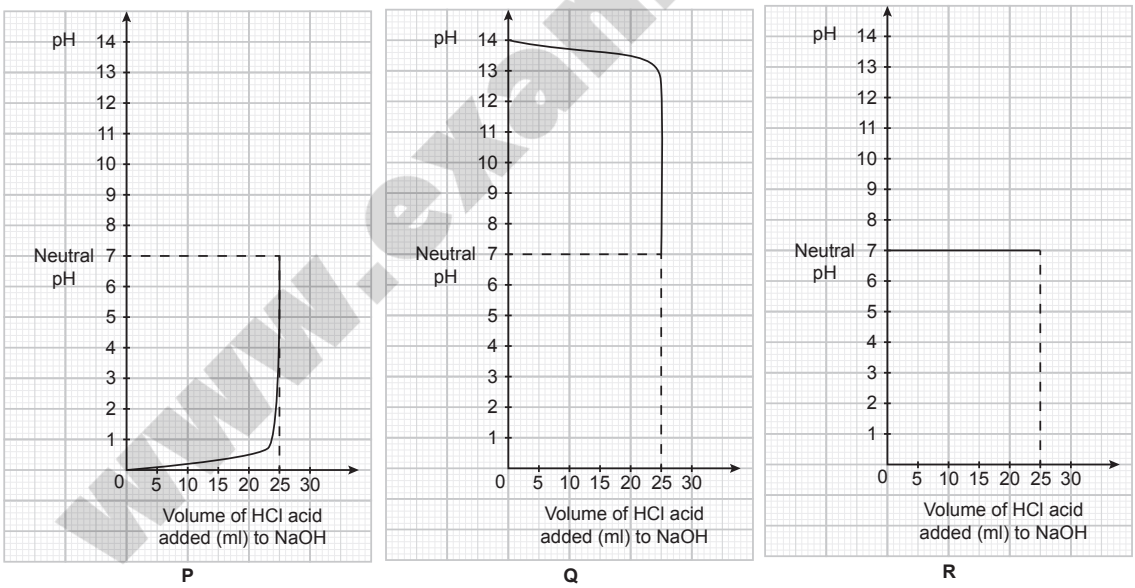
(*iv*) It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule.

(*a*) (*i*) only (*b*) (*iii*) only

(*c*) (*ii*) and (*iv*) (*d*) (*iii*) and (*iv*)

5. Aditi adds dropwise 25 ml of concentrated HCl to 25 ml of concentrated NaOH and continuously monitors the pH in the mixture. She finds that the pH of the mixture at the end of the experiment is 7.

Which of the following graph correctly demonstrates the change in pH in the mixture during the experiment?



(*a*) Only P (*b*) Only Q

(*c*) Either P or Q (*d*) Any of them - P, Q or R

6. Given below are reactions involving metals P, Q, R and S and their salt solutions in water.

Metal P salt solution + Q ⟶ Metal Q salt solution + P

Metal Q salt solution + R ⟶ Metal R salt solution + Q

Metal S salt solution + Q ⟶ Metal Q salt solution + S

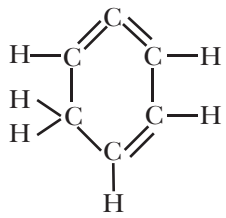
Metal P salt solution + S ⟶ No reaction

Which metal is the MOST reactive?

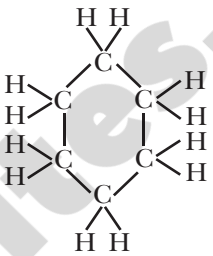
(*a*) P (*b*) Q (*c*) R (*d*) S

7. Structural formula of benzene is

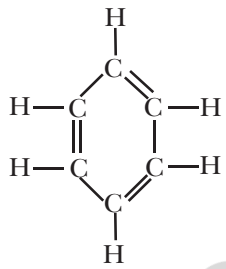
(*a*)



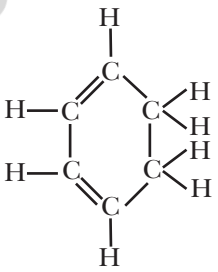
(*b*)



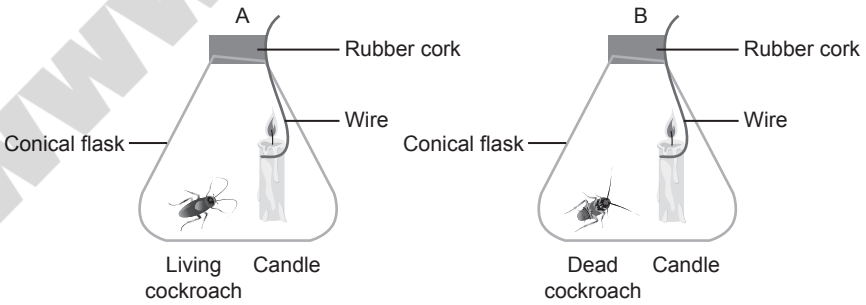
(*c*)



(*d*)



8. A student set up an experiment to study the human respiratory system. In the experiment, the student places candle and a living cockroach in the flask A, while a candle and a dead cockroach in flask B. The burning of candle needs oxygen.



After 10 minutes, the student observes that the candle in flask A extinguishes faster while candle in flask B keeps burning for a longer time. What can be evaluated from this experiment?

(*a*) Water vapours produced by living beings prevents burning of candle.

(*b*) Living beings consume oxygen during respiration.

(*c*) Burning of candle decreases the life span of cockroach.

(*d*) Candle produces high amount of carbon dioxide.

9. The liver secretes bile, needed to digest fats in our food. The pancreas secretes several enzymes needed to break down food.

Which of the following is true of the food that we eat?

(*a*) It passes only through our liver.

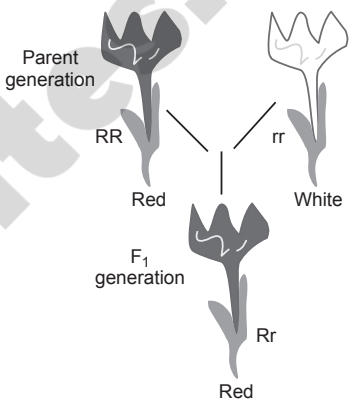
(*b*) It passes only through our pancreas.

(*c*) It passes through both our liver and pancreas.

(*d*) It passes neither through our liver nor pancreas.

10. The inheritance of color trait in flower is as shown.

R and r denote two different genes for color. Which law of Mendel can be explained using the image?



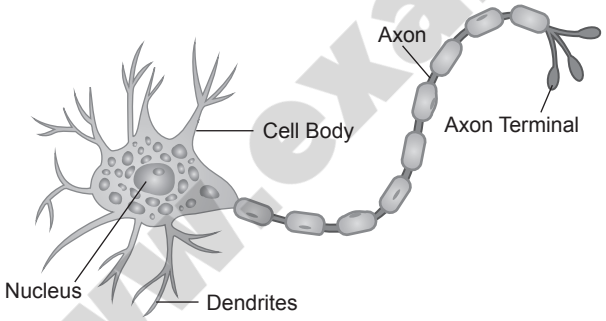
(*a*) Law of segregation and law of independent assortment

(*b*) Only Law of segregation

(*c*) Law of segregation and law of dominance

(*d*) Only Law of independent assortment

11. The image shows structure of a neuron.



After our nose senses a smell, which option shows the mechanism of the travelling of sense in our body?

(*a*) olfactory receptors- dendritic tip of a nerve cell- axon- nerve ending-release of signal-dendritic tip of other nerve cell

(*b*) olfactory receptors- dendritic tip of a nerve cell- axon- cell body- release of signal-dendritic tip of other nerve cell

(*c*) gustatory receptors- dendritic tip of a nerve cell- cell body- axon- release of signal-dendritic tip of other nerve cell

(*d*) gustatory receptors- dendritic tip of a nerve cell- axon- cell body- release of signal-dendritic tip of other nerve cell

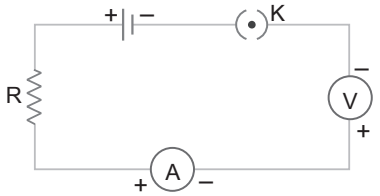
12. A population of thermophilic archaebacteria are generally found in hot springs. Any change to the temperature of the water affects the survival of the archaeabacteria. If the temperature of hot springs gets reduced, change in which component can allow survival of few members of these archaeabacteria?

(*a*) cell wall (*b*) cytoplasm

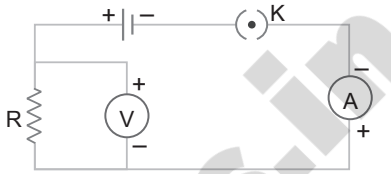
(*c*) DNA (*d*) ribosomes

13. Identify the circuit in which the electrical components have been properly connected.

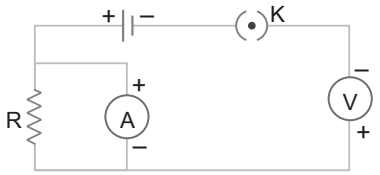
(*a*)



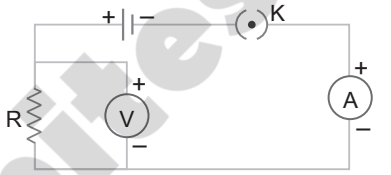
(*b*)



(*c*)

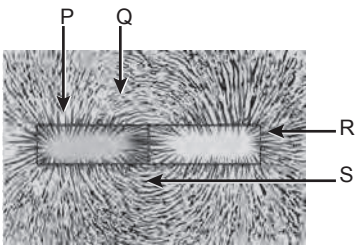


(*d*)



14. A student places some iron fillings around a magnet. The iron fillings arrange themselves as shown in image.

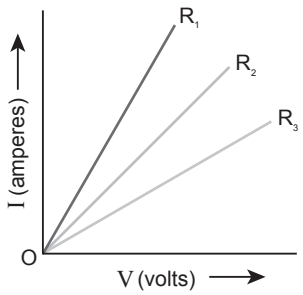
The student labelled four different regions around the magnet. Where would be the magnetic field the strongest?



(*a*) S (*b*) R

(*c*) Q (*d*) P

15. A student carries out an experiment and plots the V–I graph of three samples of nichrome wire with resistances R_1, R_2 and R_3 respectively. Which of the following is true?



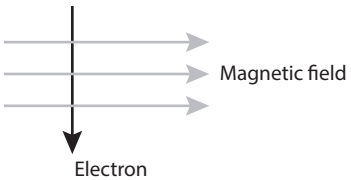
(*a*) $R_1 = R_2 = R_3$

(*b*) $R_1 > R_2 > R_3$

(*c*) $R_3 > R_2 > R_1$

(*d*) $R_2 > R_3 > R_1$

16. An electron enters a magnetic field at right angles to it, as shown in figure. The direction of force acting on the electron will be



(*a*) to the right

(*b*) to the left

(*c*) out of the page

(*d*) into the page

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Following is a balanced chemical equation for the action of steam on iron:

$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$

Reason (*R*) : The law of conservation of mass holds good for a chemical equation.

18. Assertion (*A*) : The rate of breathing in aquatic organisms is much faster than in terrestrial organisms.

Reason (*R*) : The amount of oxygen dissolved in water is much lower than the amount of oxygen in air.

19. Assertion (*A*) : The sex of a child in human beings will be determined by the type of chromosome he/she inherits from her father.

Reason (*R*) : The child who inherits 'X' chromosome from his father would be a girl (XX), while a child who inherits a 'Y' chromosome from the father would be a boy (XY).

20. Assertion (*A*) : On changing the direction of flow of current through a straight conductor, the direction of a magnetic field around the conductor is reversed.

Reason (*R*) : The direction of magnetic field around a conductor can be given in accordance with left hand thumb rule.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Complete the missing components/variables given as *x* and *y* in the following reactions:

(*i*) $Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow PbI_2(x) + 2KNO_3(y)$

(*ii*) $Cu(s) + 2AgNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + x(s)$

(*iii*) $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(x) + H_2(y)$

(*iv*) $CaCO_3(s) \xrightarrow{x} CaO(s) + CO_2(g)$

OR

Samuel had a silver coin which turned black. He kept the coin in a bowl lined with aluminium foil. Then he filled the bowl with water and boiled it. After sometime, he found that the coin has become new. Its blackness disappeared. How did it happen?

22. If a plant is releasing carbon dioxide and taking in oxygen during the day, does it mean that there is no photosynthesis occurring? Justify your answer.

23. Write one function of each of the following enzymes:

(*i*) Pepsin (*ii*) Lipase

24. Answer the following:

(*i*) Name the endocrine gland associated with brain.

(*ii*) Which gland secretes digestive enzymes as well as hormones?

(*iii*) Name the endocrine gland associated with kidneys.

(*iv*) Which endocrine gland is present in males but not in females?

25. In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes?

Plants ⟶ Rats ⟶ Snakes ⟶ Hawks

26. (*i*) What is meant by dispersion of white light? Name the various colours of spectrum of white light in proper sequence.

(*ii*) Why are 'danger' signal lights red in colour?

OR

What happens to the image distance in the normal human eye when we decrease the distance of an object, say 10 m to 1 m? Justify your answer.

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Mention with reason the colour changes observed when:

(*i*) Silver chloride is exposed to sunlight.

(*ii*) Copper powder is strongly heated in the presence of oxygen.

(*iii*) A piece of zinc is dropped in copper sulphate solution.

28. With the help of labelled diagram, show an experimental setup for the reaction of Magnesium with dilute sulphuric acid.

Give equation of the reaction involved.

29. (*i*) Define light reaction.

(*ii*) Define dark reaction.

(*iii*) Two green plants are kept separately in oxygen-free containers, one in the dark and the other in continuous light. Which one will live longer? Give reasons.

OR

List in tabular form three differences between blood and lymph.

30. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 cm from its pole.

(*i*) Which type of mirror should the student use?

(*ii*) Find the magnification of the image produced.

(*iii*) Find the distance between the object and its image.

(*iv*) Draw a ray diagram to show the image formation in this case and mark the distance between the object and its image.

31. (*i*) On entering in a medium from air, the speed of light becomes half of its value in air. Find the refractive index of that medium with respect to air?

(*ii*) A glass slab made of a material of refractive index n_1 is kept in a medium of refractive index n_2.

A light ray is incident on the slab. Draw the path of the rays of light emerging from the glass slab, if (*a*) $n_1 > n_2$ (*b*) $n_1 = n_2$ (*c*) $n_1 < n_2$

32. Give reasons for the following:

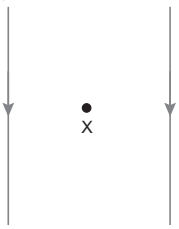
(*i*) There is either a convergence or a divergence of magnetic field lines near the ends of a current carrying straight solenoid.

(*ii*) The current carrying solenoid when suspended freely rests along a particular direction.

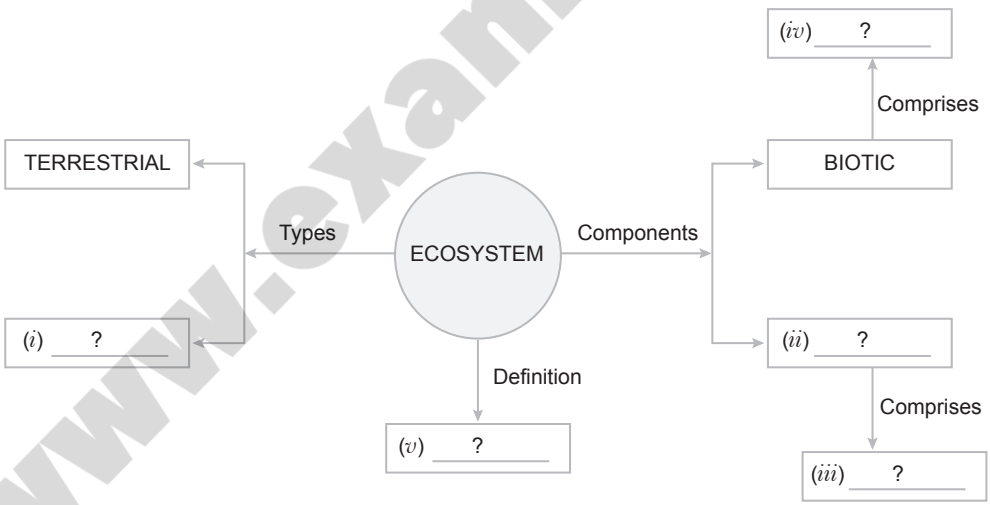
(*iii*) The burnt out fuse should be replaced by another fuse of identical rating.

OR

The following diagram shows two parallel straight conductors carrying, same current. Copy the diagram and draw the pattern of the magnetic field lines around them showing their directions. What is the magnitude of magnetic field at a point 'A' which is equidistant from the conductors? Give justification for your answer.



33. Complete the following flow chart based on ecosystem and its components.



SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. The formulae of four organic compounds are given below:

A	B	C	D
C_2H_4	CH_3COOH	C_2H_5OH	C_2H_6

(*i*) Which one of these compounds A, B, C or D is a saturated hydrocarbon?

(*ii*) Identify the organic acid and give its structural formula.

(*iii*) Which of the above compounds when heated at 443 K in the presence of concentrated H_2SO_4 forms ethene as the major product? What is the role played by concentrated H_2SO_4 in this reaction? Also write the chemical equation involved.

(*iv*) Give a chemical equation when B and C react with each other in presence of concentrated H_2SO_4. Name the major product formed and mention one of its important use.

OR

What is the difference between soaps and detergents? State in brief the cleansing action of soaps in removing an oily spot from a fabric. Why are soaps not very effective when a fabric is washed in hard water? How is this problem resolved?

35. (*i*) Describe the various steps involved in the process of binary fission with the help of a diagram.

(*ii*) Why do multicellular organisms use complex way of reproduction?

OR

(*i*) Describe the role of prostate gland, seminal vesicle and testes in the human male reproductive system.

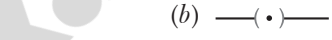
(*ii*) How is the surgical removal of unwanted pregnancies misused?

(*iii*) Explain the role of oral contraceptive pills in preventing conception.

36. (*i*) Name an instrument that measures electric current in a circuit. Define the unit of electric current.

(*ii*) What do the following symbols represent in a circuit diagram?

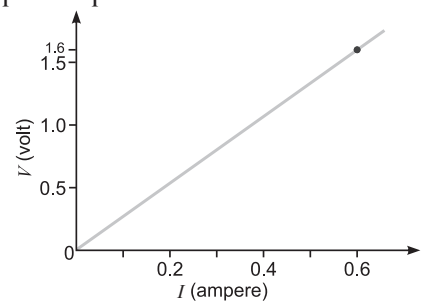
(*a*) 

(*b*) 

(*iii*) An electric circuit consisting of a 0.5 m long nichrome wire XY, an ammeter, a voltmeter, four cells of 1.5 V each and a plug key was set up.

(*a*) Draw the electric circuit diagram to study the relation between the potential difference maintained between the points 'X' and 'Y' and the electric current flowing through XY.

(*b*) Following graph was plotted between V and I values using above circuit:



What would be the values of $\frac{V}{I}$ ratios when the potential difference is 0.8 V, 1.2 V and 1.6 V respectively? What conclusion do you draw from these values?

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. Oxidation is the process of gaining of oxygen, or losing of hydrogen. Reduction is the process of losing of oxygen or gaining of hydrogen. The substance which undergoes oxidation is the reducing agent while the substance which undergoes reduction is known as the oxidising agent. Oxidation and reduction always take place together and these types of reactions are known as redox reactions. Some of the examples of redox reactions are given below:

I.	$Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$
II.	$2Mg + O_2 \longrightarrow 2MgO$
III.	$CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$
IV.	$V_2O_5 + 5Ca \longrightarrow 2V + 5CaO$
V.	$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$
VI.	$CuO + H_2 \longrightarrow Cu + H_2O$

(*i*) Name the reducing agents in the reaction IV and V.

(*ii*) Which colour is formed when hydrogen gas is passed over CuO?

(*iii*) Out of the examples shown in the table which of the redox reactions is also a combination reaction? Give reason.

OR

(*iii*) Name the oxidising and reducing agent in the following reaction:

$2H_2S + SO_2 \longrightarrow 2H_2O + 3S\downarrow$

38. A species of mammal has two phenotypes, white fur and brown fur.
Below table shows the parent genotypes.

Genotype	Phenotype
WW	White fur
Wb	White fur
bb	Brown fur

(*i*) Draw a Punnett square to show how an individual with white fur and an individual with brown fur produce a generation, F_1, all with white fur.

(*ii*) Draw a Punnett square to show how individuals from the F_1 generation produce a generation, F_2, with white fur and brown fur.

Identify the genotypes in the F_2 generation and calculate the proportion of individuals with brown fur.

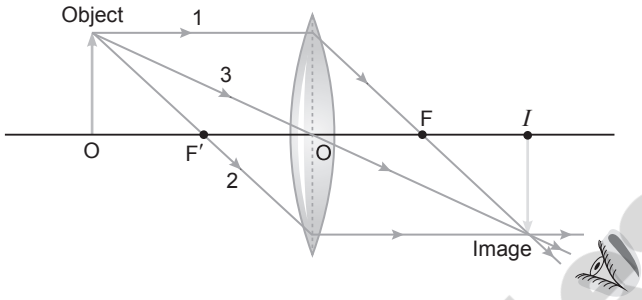
OR

(*ii*) The allele for tallness in pea plants is T. The allele for dwarfism in pea plants is t.

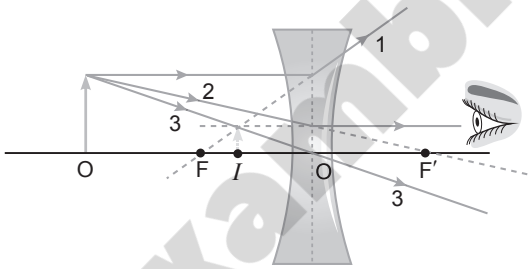
Draw a genetic diagram to show the genotypes of the offspring of a heterozygous tall pea plant and a homozygous dwarf pea plant.

State the ratio of the phenotypes.

39. If rays parallel to the axis fall on thin lens, they will be focused to a point called the focal point, F. This will not be precisely true for a lens with spherical surfaces. But it will be very nearly true; *i.e.*, parallel rays will be focused to a tiny region that is nearly a point, if the diameter of the lens is small compared to radii of curvature of the two lens surfaces. This condition is satisfied by a thin lens.



By drawing the same three rays we can determine the image position for diverging lens.



To find the image point by drawing rays would be difficult if we had to determine all the refractive angles. So, to find the image point, we need to consider only three rays which shows an arrow as the object and a converging lens forming an image to the right. The three rays are drawn as follows:

I. Ray 1 is drawn parallel to the axis; therefore it is refracted by the lens so that it passes along a line through the focal point F.

II. Ray 2 is drawn on a line, passing through the other focal point F and emerges from the lens parallel to the axis.

III. Ray 3 is directed towards the very centre of the lens where the two surfaces are essentially parallel to each other; this ray therefore emerges from the lens at the same angle as it entered.

Any two of these rays will suffice to locate the image point, which is the point where they intersect.

In this way, we can find the image point for one point of the object. The image points for all other points on the object can be found similarly to determine complete image of the object.

(*i*) How will the image formed by convex lens be affected if the upper half of the lens is wrapped with the black paper?

(*ii*) What will be the object distance to form an image twice the size of object, using a convex lens of focal length 20 cm?

(*iii*) The refractive index of glass with respect to air is 3/2 and the refractive index of water with respect to air is 4/3. What will be the refractive index of glass with respect to water?

OR

(*iii*) Define refractive index of a transparent medium. The speed of light in a medium of absolute refractive index 1.5 is 2×10^8 ms^{-1}. What is the speed of light in vacuum?

Answers

SECTION–A

1. (*c*) In beaker A:

$NaOH + H_2O \longrightarrow Na^+ + OH^- + H_2O + heat$

In beaker B:

$CuSO_4\,(s) + 5H_2O(l) \longrightarrow CuSO_4.5H_2O(s) + heat$

In beaker C, an endothermic reaction is taking place as heat is being absorbed, resulting in a decrease in temperature.

$NaCl + H_2O + heat \longrightarrow Na^+ + Cl^- + H_2O$

2. (*c*)

3. (*d*) The reaction is

$$H_2S + CuSO_4 \longrightarrow \underset{\text{Black ppt.}}{CuS\downarrow} + H_2SO_4$$

In this reaction, cupric ions from copper sulphate combine with sulphide ions to form CuS and hydrogen ions combine with sulphate ions to form H_2SO_4.

4. (*c*) HCl gas is a covalent compound but in the aqueous solution, it ionises to form hydrogen ions and chloride ions. In the aqueous solution, hydrogen ions react with a water molecule to form hydronium ions.

5. (*b*) Initially the pH of NaOH (strong base) is 14. When acid is added dropwise, the pH will keep decreasing till base gets neutralised by acid. At neutralisation point, the pH is 7.

6. (*c*) Q displaces P in equation 1, so Q is more reactive than P

R displaces Q in equation 2, so R is more reactive than Q

Q displaces S in equation 3, so Q is more reactive than S

S does not displace P in equation 4, so S is less reactive than P

So, the order of reactivity is S < P < Q < R

7. (*c*)

8. (*b*) The flame goes off faster in the flask A containing the living animal, showing that some oxygen has been used up by the live cockroach during respiration.

9. (*d*)

10. (*c*)

11. (*a*)

12. (*a*) If the temperature of hot springs gets reduced, a change in cell wall can allow the survival of a few members of these archaea bacteria.

13. (*b*) In circuits (b) and (d), the Voltmeter and Ammeter are connected in parallel and series respectively.

In circuit (d), the positive terminal of the ammeter is connected with the negative terminal of the cell. Hence it is not proper.

14. (*b*) The amount of iron filings that stick to a bar magnet depends on the strength of the magnet. The magnetism of a bar magnet is maximum at its two poles and minimum in the middle.

15. (*c*)

16. (*d*) According to Flemings left hand rule, direction of current is taken opposite to the direction of motion of electrons, thus force will be directed into the page.

17. (*b*) It is a balanced chemical equation because the number of atoms of Fe, H and O are equal on both the sides.

18. (*a*)

19. (*a*)

20. (*c*) The direction of magnetic field around a conductor can be given in accordance with right hand thumb rule.

SECTION–B

21. (*i*) *x* — (*s*); *y* — (*aq*) (*ii*) *x* — 2Ag

(*iii*) *x* — (*aq*); *y* — (*g*) (*iv*) *x* — Heat

OR

The blackness of silver coin is due to the formation of silver sulphide on its surface due to its exposure to air. On boiling, the aluminium foil reacts with the layer of silver sulphide and displaces silver from silver sulphide to form aluminium sulphide and silver. This makes the coin shiny.

$$3Ag_2S(s) + 2Al(s) \longrightarrow 6Ag(s) + Al_2S_3(s)$$

22. Release of CO_2 and intake of O_2 gives evidence that either photosynthesis is not taking place or its rate is too low. Normally during day time, the rate of photosynthesis is much more than the rate of respiration. So, CO_2 produced during respiration is used up for photosynthesis hence CO_2 is not released.

23. (*i*) Pepsin helps in breaking down or digestion of proteins.

(*ii*) Lipase breaks down emulsified fats.

24. (*i*) Pituitary (*ii*) Pancreas

(*iii*) Adrenal (*iv*) Testes

25. On applying the 10% law to the food chain,

Energy available to snakes from rats = 10% of 500 $= \frac{10}{100} \times 500 = 50$ J

So, energy available to hawks from snakes = 10% of 50 J

$$= \frac{10}{100} \times 50 = 5 \text{ J}$$

26. (*i*) The splitting of white light into its component colours is called dispersion of light. The band of the coloured components formed due to dispersion of white light is called 'spectrum'. Seven colours of spectrum are violet, indigo, blue, green, yellow, orange and red also known as 'VIBGYOR'.

(*ii*) Danger signal lights are red in colour because the red coloured light having longer wavelength is scattered the least by fog or smoke. Therefore, it can be seen clearly from a distance.

OR

The normal human eye have the ability to adjust focal length of its lens using ciliary muscles. This is called accommodation.

When we decrease the distance of an object from 10m to 1m, our eye changes its focal length so as to form image on retina itself.

So, when we change the object distance within specified limits, image distance remains same due to the ability of accommodation.

SECTION–C

27. (*i*) The colour changes from white to grey due to the decomposition reaction of silver chloride when exposed to sunlight.

$$\underset{\text{(White)}}{2AgCl} \xrightarrow{\text{Sunlight}} \underset{\text{(Grey)}}{2Ag} + Cl_2$$

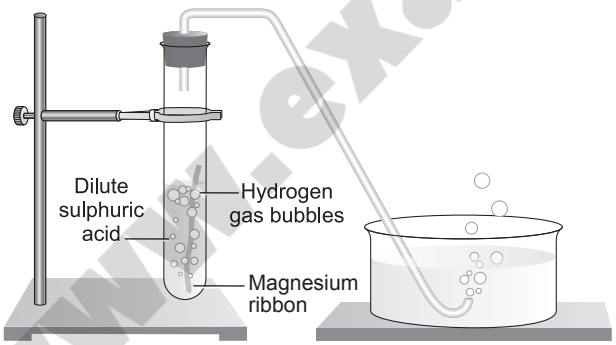
(*ii*) The colour changes from brown to black due to the oxidation of copper into copper oxide.

$$\underset{\text{(Brown)}}{2Cu} + O_2 \longrightarrow \underset{\text{(Black)}}{2CuO}$$

(*iii*) The colour changes from blue to colourless due to the displacement reaction as zinc is more reactive than copper.

$$\underset{\text{(Blue)}}{Zn + CuSO_4} \longrightarrow \underset{\text{(Colourless)}}{ZnSO_4} + Cu$$

28.



$$Mg + H_2SO_4 \xrightarrow{\text{Heat}} MgSO_4 + H_2\uparrow$$

29. (*i*) A chemical reaction, which take place only in the presence of light, is called light reaction or light dependent reaction. It takes place in grana of chloroplast.

(*ii*) A chemical reaction, which can take place even in the absence of light, is called a dark reaction or light independent reaction. It takes place in stroma of chloroplast.

(*iii*) Plant kept in continuous light will live longer because it will be able to produce oxygen required for its respiration by the process of photosynthesis.

OR

	Blood	Lymph
(*i*)	It is a fluid connective tissue consisting of plasma, red blood cells, white blood cells, platelets etc.	It is an extra cellular fluid consisting of plasma, proteins, white blood cells etc.
(*ii*)	It contains red blood cells and is red in colour due to presence of haemoglobin.	It lacks red blood cells and is therefore colourless.
(*iii*)	It contains more proteins.	It has lesser protein.
(*iv*)	It has many functions like transport of O_2, CO_2, food, nitrogenous wastes etc.	It carries absorbed fats from small intestine and drains extra fluid back into the blood vessels.

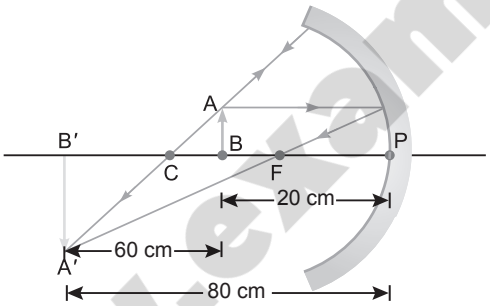
30. (*i*) Concave mirror should be used.

(*ii*) Object distance, $u = -20$ cm; image distance, $v = -80$ cm;
magnification, $m = ?$

$$m = -\frac{v}{u} = \frac{-(-80\text{ cm})}{(-20\text{ cm})} = -4$$

(*iii*) Distance between object and its image $= v - u = 60$ cm

(*iv*)



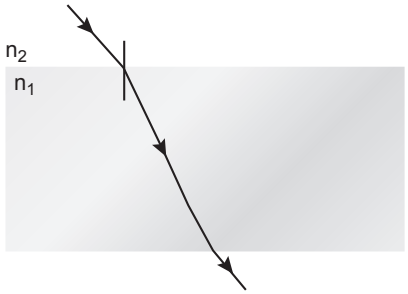
31. (*i*) Refractive Index of a medium (n) $= \dfrac{\text{Velocity of light in vacuum}}{\text{Velocity of light in the medium}}$

Let the velocity of light in vacuum be v_1 and velocity of light in the medium be v_2.

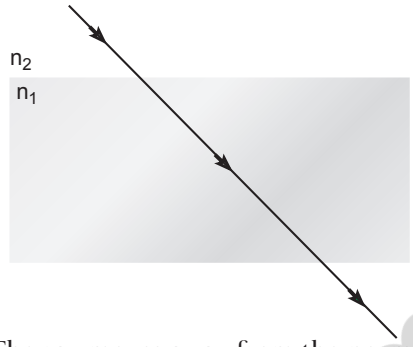
$$v_2 = \frac{v_1}{2}$$

Hence, $n = \dfrac{v_1}{v_2} = \dfrac{v_1}{\frac{v_1}{2}} = 2$

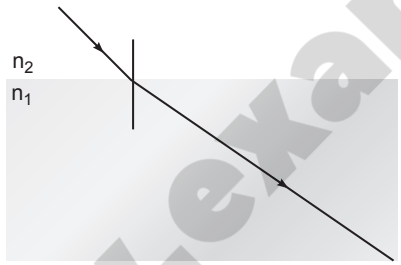
(*ii*) (*a*) The ray bends towards the normal.



(*b*) The ray moves undeviated.



(*c*) The ray moves away from the normal.



32. (*i*) Magnetic field lines are close together when field is strong. This is seen inside the magnet. However as the distance from the magnet increases, field strength decreases and the field lines begin to spread out. Thus at north pole, the field lines diverge and at south pole they again converge to form parallel lines within the magnet where they move from South to North.

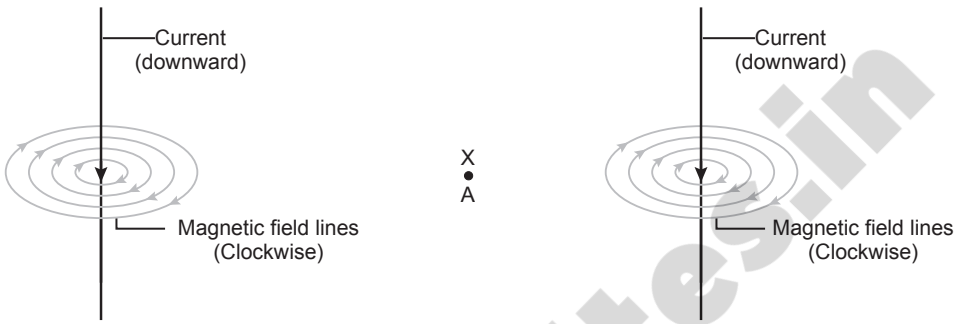
(*ii*) When current is passed through a solenoid, it gains a magnetic field. One end of the solenoid acts as the north pole while the other behaves like the south pole. Thus when freely suspended, it behaves like a freely suspended magnet and points in north-south direction.

(*iii*) A fuse is a protective device which melts when current above a specified values passes through it and hence breaks the circuit protecting it from unduly high current. A fuse is selected based on the current required to flow through the appliance. If a fuse melts it should be replaced with one of same rating. Otherwise,

if the rating is higher, more current than required will flow. If the rating is lower, it will melt even when less current flows. Thus since a specific value of current should flow through a circuit, a fuse of same rating should be used.

OR

The direction of magnetic field in a current carrying wire is given by right hand thumb rule. So, the pattern of the magnetic field around each wire is as such



Direction of magnetic field at A by left wire is out of the page (•) and direction of magnetic field at A by right wire is into the page (×) as shown in figure. Since the magnitude of the magnetic field due to each wire is same, hence the net magnetic field at point A is zero.

33. (*i*) Aquatic

(*ii*) Abiotic

(*iii*) Air/Water/Soil/Temperature /Non-living

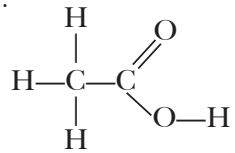
(*iv*) Living organism/plants and animals

(*v*) Definition – All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem /interaction between biotic and abiotic components.

SECTION–D

34. (*i*) D is a saturated hydrocarbon.

(*ii*) B is an organic acid.

Structural formula 

(*iii*) C is the compound.

In this reaction, H_2SO_4 acts as a dehydrating agent and removes a water molecule from ethanol.

$$\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow{\text{hot conc. } H_2SO_4} \underset{\text{Ethene}}{C_2H_4} + H_2O$$

(*iv*) $CH_3COOH + C_2H_5OH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Major product is Ester and it is used in making perfumes or flavouring agent.

OR

Soaps are sodium or potassium salts of long-chain carboxylic acids. Detergents are generally ammonium or sulphonate salts of long chain carboxylic acids.

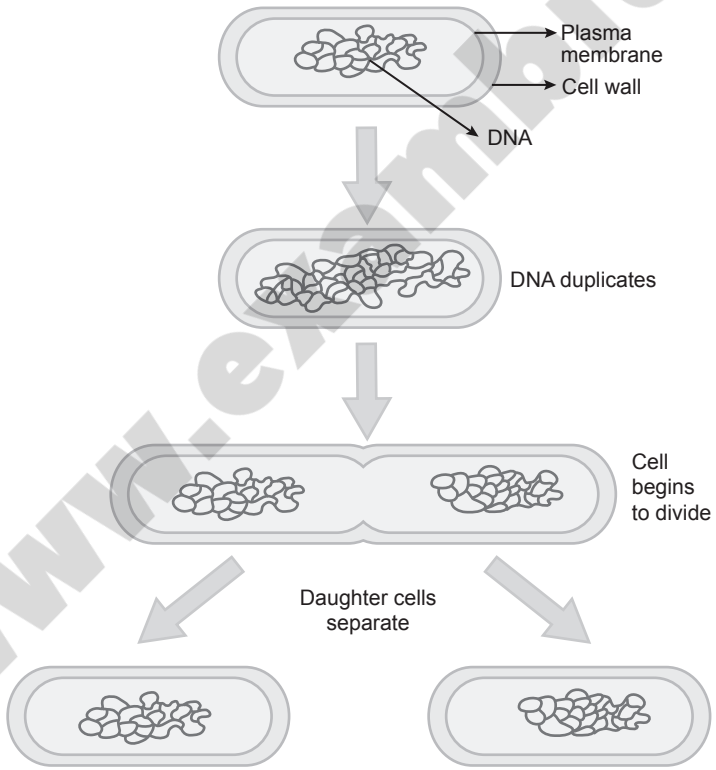
Cleansing action of soaps:

A soap molecule contains a hydrophilic polar end ($COO^- Na^+$) and a hydrophobic non-polar carbon chain. The hydrophobic part is soluble in oil whereas hydrophilic part is soluble in water. The non-polar end gets attached to oily or greasy particle on the cloth and the polar end remains in the water. This results in the formation of cluster. When the cloth is agitated, the grease or dirt gets removed along with the soap molecules.

Soaps do not form lather in hard water because hard water contains calcium and magnesium salts. Soap molecules react with calcium and magnesium salts to form an insoluble precipitate called scum.

This problem is resolved by using detergents in hard water or by boiling hard water. The charged ends of detergents do not form insoluble precipitates with the calcium and magnesium ions present in hard water. Thus, they remain effective in hard water.

35. (*i*)



(*ii*) Multicellular organisms cannot reproduce by cell because they are not a random collection of cells. In them, specialized cells are organised as tissues which are further organised into organs and organ systems. In such an organised condition, cell-by-cell division would not be possible. Multicellular organisms, therefore, require to use more complex ways of reproduction.

OR

(*i*) Prostate glands and seminal vesicle: These secrete fluid which helps in the mobility of sperm and their nourishment.

Testes secrete testosterone which brings about changes in the appearances in boys at the time of puberty. It also regulates the production of sperms.

(*ii*) Surgical removal of unwanted pregnancies can be misused for female foeticides or illegal sex selected abortion of girl child.

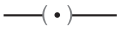
(*iii*) Oral contraceptives interfere in release of egg into the fallopian tube.

36. (*i*) An instrument that measures electric current in a circuit is called "ammeter".

The unit of electric current is ampere (A). 1 ampere is constituted by the flow of 1 coulomb of charge through any point in an electric circuit in 1 second.

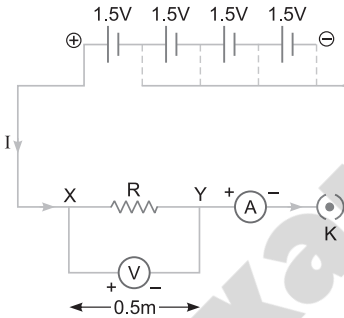
(*ii*) (*a*) 

Variable resistance or rheostat

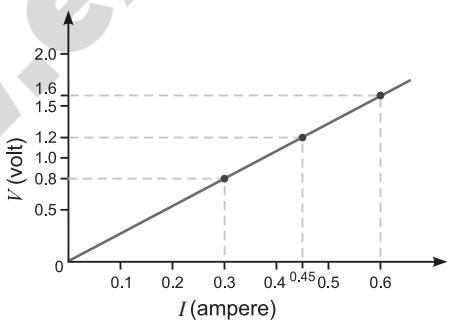
(*b*) 

Plug key or switch (closed)

(*iii*) (*a*)



(*b*) Following graph was plotted between *V* and I values.



At potential difference 0.8 V,

$$\frac{V}{I} = \frac{0.8}{0.3} = \frac{8}{3} \qquad ...(1)$$

At potential difference 1.2 V,

$$\frac{V}{I} = \frac{1.2}{0.45} = \frac{8}{3} \qquad ...(2)$$

At potential difference 1.6 V,

$$\frac{V}{I} = \frac{1.6}{0.6} = \frac{8}{3} \qquad ...(3)$$

Conclusion: If I be the current through XY resistor and V be the potential difference across it, then the ratio $\frac{V}{I}$ = constant.

$\Rightarrow$ $V \propto I$ and Ohm's law is obeyed.

SECTION–E

37. (*i*) Since Ca and Fe is gaining oxygen in the reaction IV and V respectively, *i.e.*, they are undergoing oxidation and therefore they act as reducing agent.

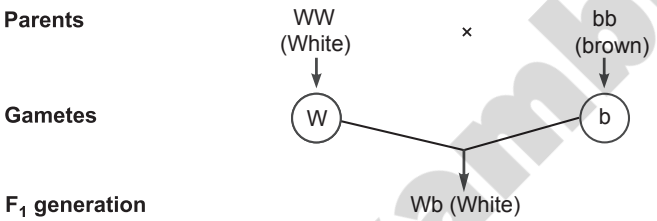
(*ii*) If hydrogen gas is passed over CuO, the opposite reaction takes place. The black coating turns brown and copper is obtained.

(*iii*) The (II) reaction is a combination reaction. This is because Mg is combining with O_2 to form MgO.

OR

(*iii*) H_2S is the reducing agent while SO_2 is the oxidising agent.

38.



(*i*)

Selection of bb and WW; Four Wb Crosses;		
	W	**W**
b	Wb (white)	Wb (white)
b	Wb (white)	Wb (white)

(*ii*)

	W	**b**
W	WW	Wb
b	Wb	bb

Genotypes; WW, Wb, bb;

Proportion of brown; ¼ / 25%

OR

(*ii*) Parent plants: Tt and tt;

Genotype of offspring: Tt, Tt, tt, tt;

Ratio: 1:1

39. (*i*) Brightness of the image will be reduced.

(*ii*) For virtual image, $u < f$ and for real image, u lies between f and $2f$. so, object will be between 20 cm and 40 cm.

(*iii*) n_{ga} = refractive index of glass with respect to air

$$n_{ga} = \frac{3}{2}$$

Now, $$n_{ag} = \frac{1}{3/2}$$

n_{wa} = refractive index of water w.r.t air

$$= \frac{4}{3}$$

and n_{gw} = refractive index of glass w.r.t water

Then, $n_{wa} \cdot n_{gw} \cdot n_{ag} = 1$

$$n_{gw} = \frac{1 \times 3 \times 3}{4 \times 2} = \frac{9}{8}$$

$$n_{gw} = 1.125$$

OR

(*iii*) Refractive index of a medium is defined as the ratio of speed of light in vacuum to the speed of light in the medium. *i.e.*,

$$\text{Refractive index (of a medium)} = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$$

$$n_B = \frac{c}{v_B}$$

Speed of light in vacuum, $c = n_B v_B$

$$= 1.5 \times 2 \times 10^8$$

$$= 3 \times 10^8 \text{ m/s}$$

3 SAMPLE PAPER [SOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

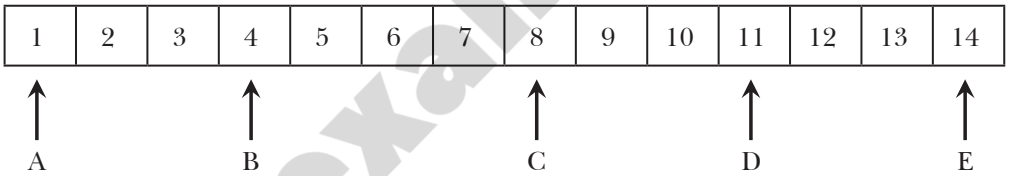
***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Reema took 5 mL of Lead Nitrate solution in a beaker and added approximately 4 mL of Potassium Iodide solution to it. What would she observe?

(*a*) The solution turned red. (*b*) Yellow precipitate was formed.

(*c*) White precipitate was formed. (*d*) The reaction mixture became hot.

2. Five solutions are labelled on a pH scale.



Which classification is correct?

(*a*)

Strongest Acid	Strongest Base
A	E

(*b*)

Strongest Acid	Strongest Base
B	E

(*c*)

Strongest Acid	Strongest Base
A	C

(*d*)

Strongest Acid	Strongest Base
B	C

3. A student makes a list of some activities he observes one day.

1. Baking a cake in an oven

2. Cutting an apple pie into slices

3. Crushing the can after drinking a soda

4. Carving a wooden log to make a stand

Which activity can the student classify as a chemical change?

(*a*) Activity 1, as the properties of the substances in the mixture change.

(*b*) Activity 2, as the physical state of the apple pie changes when cut.

(*c*) Activity 3, as the shape of the can changes.

(*d*) Activity 4, as the shape and size of the wooden log changes.

4. Common salt, besides being used in kitchen, can also be used as the raw material for making

(*i*) washing soda **(*ii*) bleaching powder**

(*iii*) baking soda **(*iv*) slaked lime**

(*a*) (*i*) and (*ii*) (*b*) (*i*), (*ii*) and (*iv*)

(*c*) (*i*) and (*iii*) (*d*) (*i*), (*iii*) and (*iv*)

5. If 10 mL of H_2SO_4 is mixed with 10 mL of $Mg(OH)_2$ of the same concentration, the resultant solution will give the following colour with universal indicator:

(*a*) Red (*b*) Yellow

(*c*) Green (*d*) Blue

6. The table lists the process which explains how pure metals are obtained from impure samples by electrolytic refining.

1. Keep impure metal at anode and pure metal at cathode.
2. Pass current in the electrolytic solution.
3. Insoluble impurities settle in the bottom of the anode as anode mud.
4. Pure metal from anode dissolves in the solution and pure metal from solution deposits on the cathode.

Which option range arranges the steps in the appropriate order?

(*a*) 2-1-3-4 (*b*) 1-2-4-3

(*c*) 4-2-3-1 (*d*) 3-1-4-2

7. The chemical reaction shows the addition of chlorine gas to hydrocarbon in the presence of sunlight.

$$CHCl_3 + Cl_2 \longrightarrow CCl_4 + HCl$$

How does chlorine react to a hydrocarbon compound in the presence of sunlight?

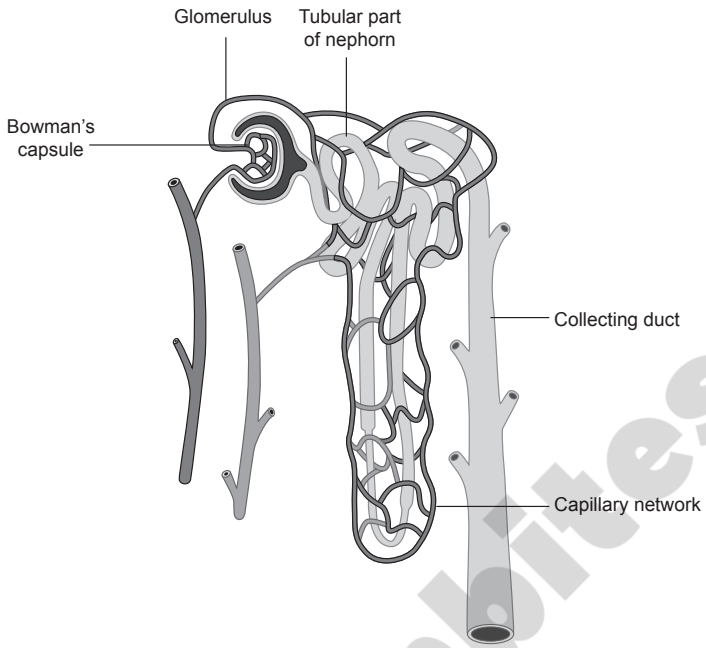
(*a*) It adds hydrogen into the compound.

(*b*) It breaks double and triple bonds into a single bond.

(*c*) It substitutes hydrogen atom from the compound.

(*d*) It adds an oxygen atom into the compound.

8. Observe the image of a single nephron.



The amount of liquid passing through in the form of glomerular filtrate is approximately 150 - 180 litres per day whereas the amount of urine flowing out of all the nephrons is only 1.5 to 1.8 litres per day.

Water is getting reabsorbed.

In which part of the nephron could the water be getting reabsorbed?

(*a*) in the Bowman's capsule (*b*) in the long tubular part

(*c*) in the collecting duct (*d*) in the glomerulus

9. Match the terms in column (A) with those in column (B).

Column (A)	**Column (B)**
(A) Trypsin	**(*i*) Pancreas**
(B) Amylase	**(*ii*) Liver**
(C) Bile	**(*iii*) Gastric Glands**
(D) Pepsin	**(*iv*) Saliva**

(*a*) A–(*i*), B–(*iv*), C–(*ii*), D–(*iii*) (*b*) A–(*ii*), B–(*i*), C–(*iv*), D–(*iii*)

(*c*) A–(*iv*), B–(*ii*), C–(*iii*), D–(*i*) (*d*) A–(*ii*), B–(*iii*), C–(*iv*), D–(*i*)

10. Two individuals are as shown using geometric shapes.

X^fY X^mX^m

Their sex chromosomes are respectively denoted by X^f, X^m, and Y. What are the possible combinations of sex chromosomes for their male and female offspring respectively?

(*a*) X^mY and X^mX^m (*b*) X^fY and X^mY

(*c*) X^fX^m and X^mX^m (*d*) X^mY and X^mX^f

11. Akshay potted some germinated seeds in a pot. He put the pot in a cardboard box that was open from one side. He keeps the box in a way that the open side of box faces sunlight near his window. After 2-3 days, he observes the shoot bends towards light as shown in image.

Which type of tropism did he observe?

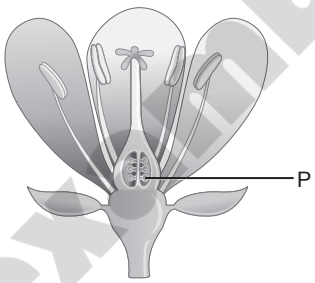
(*a*) Hydrotropism

(*b*) Phototropism

(*c*) Geotropism

(*d*) Chemotropism

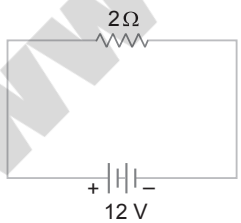
12. Which process will likely be disturbed or not occur, if labelled part is removed from the flower?



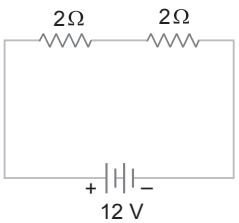
(*a*) Formation of fruit (*b*) Development of pollen tube

(*c*) Formation of pollen (*d*) Transport of pollen

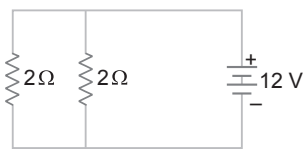
13. In the following circuits, heat produced in the resistor or combination of resistors connected to a 12 V battery will be



(i)



(ii)



(iii)

(*a*) same in all the three cases (*b*) minimum in case (*i*)

(*c*) maximum in case (*ii*) (*d*) maximum in case (*iii*)

14. Appliances that have metal body are generally connected to the earthing wire. What is the reason to earth these wires?

(*a*) to prevent excess of current

(*b*) to prevent the leakage of current

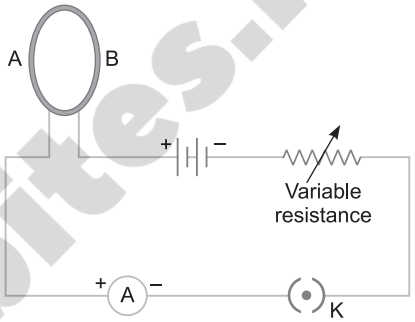
(*c*) to provide extra current to appliance

(*d*) to provide high resistance to the appliance

15. In order to move a charge of 3 C between two points on a conducting wire, 12 J of work is done. How much increase or decrease in the voltage will increase the work done on the same amount of charge to 36 J?

(*a*) – 8 V (*b*) +12 V (*c*) +8 V (*d*) –12 V

16. A circular loop placed in a plane perpendicular to O the plane of paper carries a current when the key (K) is ON. The current as seen from points A and B (in the plane of paper and on the axis of the coil) is anticlockwise and clockwise respectively. The magnetic field lines point from B to A. The North pole of the resultant magnet is on the close to



(*a*) A

(*b*) B

(*c*) A if current is small and B if current is large

(*d*) B if current is small and A if current is large

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : When HCl is added to zinc granules, a chemical reaction occurs.
Reason (*R*) : Evolution of a gas and change in colour indicate that the chemical reaction is taking place.

18. Assertion (*A*) : In plants there is no need of specialised respiratory organs.
Reason (*R*) : Plants do not have great demands of gaseous exchange.

19. Assertion (*A*) : Mendel selected the pea plant for his experiments.
Reason (*R*) : Pea plant is cross-pollinating and has unisexual flowers.

20. Assertion (*A*) : A compass needle is placed near a current carrying wire. The deflection of the compass needle decreases when the magnitude of an electric current in the wire is increased.
Reason (*R*) : Strength of a magnetic field at a point near the conductor increases on increasing the current.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Why do we store silver chloride in dark coloured bottles?

OR

On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained.

(*i*) Write a balanced chemical equation of the reaction involved.

(*ii*) What other name can be given to this precipitation reaction?

22. Write down the functions of lymph nodes.

23. In each of the following situations what happens to the rate of photosynthesis?

(*i*) Cloudy days

(*ii*) No rainfall in the area

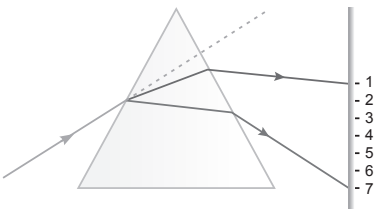
(*iii*) Good manuring in the area

(*iv*) Stomata get blocked due to dust

24. Sameer was studying in his room. Suddenly he smells something burning and sees smoke in the room. He rushes out of the room immediately. Was Sameer's action voluntary or involuntary? Why?

25. Give two differences between food chain and food web.

26. A beam of white light falling on a glass prism gets split up into seven colours marked 1 to 7 as shown in the diagram.



A student makes the following statements about the spectrum observed on the screen.

The colours at positions marked 3 and 5 are similar to the colour of the sky and the colour of gold metal respectively.

Is the above statement made by the student correct or incorrect? Justify.

OR

Why is Tyndall effect shown by colloidal particles? State three instances of observing the Tyndall effect.

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed.

(*i*) Write a balanced chemical equation of the reaction.

(*ii*) Identify the brown gas X evolved.

(*iii*) Identify the type of reaction.

(*iv*) What could be the pH range of aqueous solution of the gas X?

28. (*i*) Write the formula and chemical name of bleaching powder.

(*ii*) Write the chemical equation to represent the action of atmospheric CO_2 gas on bleaching powder when left exposed in open.

(*iii*) State for what purpose is bleaching powder used in water treatment plants.

29. (*i*) Name the energy currency in the living organisms. When and where is it produced?

(*ii*) What happens to the rate of breathing during vigorous exercise and why?

OR

Describe the structure of human kidney.

30. (*i*) List four characteristics of the images formed by plane mirrors?

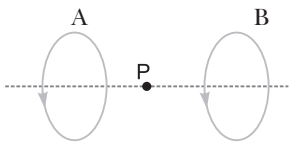
(*ii*) How can you distinguish between a plane mirror, a concave mirror and a convex mirror without touching them?

31. If the image formed by a mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it? Draw a ray diagram to justify your answer. Where and why do we generally use this type of mirror?

32. It is established that an electric current through a conductor produces a magnetic field around it. Is there a similar magnetic field produced around a thin beam of moving (*i*) alpha particles, (*ii*) neutrons? Justify your answer in each case.

OR

Two wires each carrying a steady current i are shown in two different configurations in column I. The magnetic field produced due to current in the wires is described in column II. Match the situations A and B in column I with all the correct statements in column II.

Column I	Column II
 A. Point P is situated midway between the wires above. B. Point P is situated at the mid point of the line joining the centres of the circular wires, which have same radii. 	(*i*) The magnetic fields B at P due to the current in the wires are in the same direction. (*ii*) The magnetic fields B at P due to the current in the wires are in the opposite directions. (*iii*) Magnetic field at P is zero.

33. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. (*i*) What is a hydrocarbon? Give its one example.

(*ii*) Give the structural difference between saturated and unsaturated hydrocarbons with two examples each.

(*iii*) Name the following compounds:

(*a*) $CH_3—OH$

(*b*) $CH_3—\overset{\overset{H}{|}}{\underset{\underset{O}{\|}}{C}}=O$

(*c*) $CH_3—\overset{\overset{O}{\|}}{C}—CH_3$

(*d*) $CH_3—\overset{\overset{O}{\|}}{C}—OH$

OR

Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with

(*i*) sodium metal (*ii*) hot concentrated sulphuric acid

35. Write two points of difference between asexual and sexual types of reproduction. Describe why variations are observed in the offspring formed by sexual reproduction.

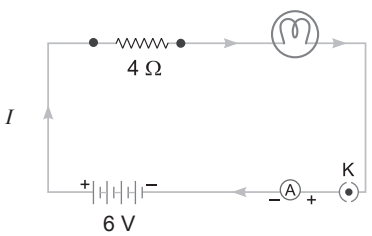
OR

(*i*) Draw a diagram to show spore formation in Rhizopus.

(*ii*) With the help of an example differentiate between the process of budding and fragmentation.

(*iii*) Why is vegetative propagation practiced for growing some type of plants?

36. An electric lamp of resistance 20 Ω and a conductor of resistance 4 Ω are connected to a 6 V battery as shown in the circuit. Calculate:



(*i*) the total resistance of the circuit,

(*ii*) the current through the circuit,

(*iii*) the potential difference across the

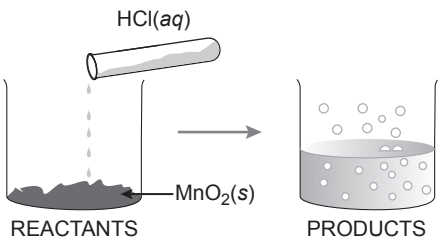
(*a*) electric lamp and (*b*) conductor, and

(*iv*) power of the lamp.

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The reaction between MnO_2 with HCl is depicted in the following diagram. It was observed that a gas with bleaching abilities was released.



(*i*) Which type of reaction is shown by the given diagram. Give reason.

(*ii*) What is the nature of MnO_2 in the given diagram? What will happen if we take dry HCl gas instead of aqueous solution of HCl?

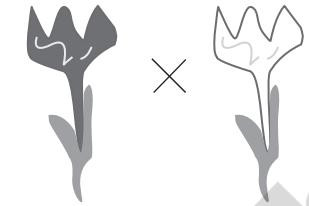
OR

(*ii*) (*a*) Identify the substance oxidised and reduced in the following reaction?

$$Fe\ (s)\ +\ CuSO_4\ (aq) \longrightarrow FeSO_4\ (aq) + Cu\ (s)$$

(*b*) Burning of Magnesium in presence of air produce Magnesium oxide. Is Magnesium oxidised or reduced?

38. A plant with red flower denoted by RR and a plant with white flower denoted by ww are allowed to undergo a cross with each other. There are two variations of the gene which controls the colour of the flower. The gene for red colour flower (R) is dominant over that for white colour flower (w).



	w	**w**
R	Rw	Rw
w	ww	ww

(*i*) List your observations below:

(*a*) Colour of flower in their F_1 progeny?

(*b*) What percentage of plants is likely to produce white flowers?

(*ii*) Based on the findings of this cross, what conclusion can be drawn?

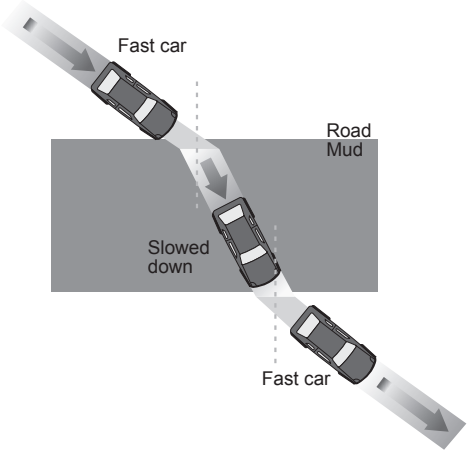
OR

(*ii*) List two differences in tabular form between dominant trait and recessive trait.

39. A ray of light travelling from a rarer medium to a denser medium slows down and bends towards the normal. When it travels from denser medium to a rarer medium, it speeds up and bends away from the normal.

Consider an analogy to assist in our understanding of these two important principles. Suppose that a fast car is travelling across the road towards a thick mud at an angle, the mud slows down one side of the car, and the path of the car bends.

The more it is slowed, the more it bends.

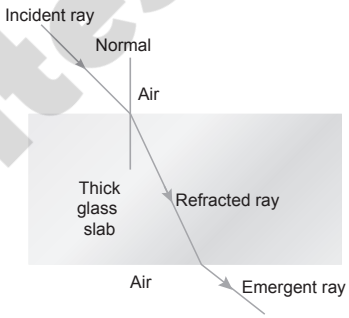


Upon exiting the thick mud on the opposite side, the car speeds up and achieves its original speed. In effect, this analogy would be representative of light wave crossing two boundaries.

At the first boundary (the road to thick mud boundary), the light ray (or the car) would be slowing down; and at the second boundary (the mud to road boundary), the light ray (or the car) would be speeding up. We can apply our two important principles listed above and predict the direction of bending and the path of the car as it travels through the thick mud. As indicated in the diagram, upon entering the mud, the car slows down and the path of the car bends towards the normal (perpendicular line drawn to the surface). Upon exiting the mud, the car speeds up and the path of the car bends away from the normal. The path of the car is closer to the normal in the slower medium and farther from the normal in the faster medium.

This analogy can be extended to the path of a light ray as it passes from air into and out of a rectangular block of glass.

(*i*) A student studies that when a ray of light travels from air into the glass slab, it bends towards the normal. But as refracted ray emerges out of the glass slab to the vacuum, it bends away from the normal, as shown.



Explain the law of refraction of light through the glass slab?

(*ii*) A student studies that speed of light in air is 300000 km/s whereas that of speed in a glass slab is about 197000 km/s. What causes the difference in speed of light in these two media?

(*iii*) The speed of light in air is 3×10^8 ms^{-1}, whereas that of the speed of light in water is 2.26×10^8 ms^{-1}. What is the refractive index of water with respect to air?

OR

(*iii*) What will be the angle of incidence when a ray of light continues moving along the same path while passing through air-glass interface?

Answers

SECTION–A

1. (*b*) $Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow 2KNO_3(aq) + PbI_2(s)$.

In the reaction, lead nitrate, $Pb(NO_3)_2$ reacts with potassium iodide, KI to form potassium nitrate, KNO_3 and yellow coloured precipitate lead iodide, PbI_2.

2. (*a*) A is the strongest acid as it has the lowest pH and E is the strongest base as it has the highest pH.

3. (*a*)

4. (*c*) $NaCl + NH_3 + CO_2 + H_2O \longrightarrow NaHCO_3\downarrow + NH_4Cl$

$2NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2$

$Na_2CO_3 + 10\ H_2O \longrightarrow \underset{\text{(Washing Soda)}}{Na_2CO_3.10H_2O}$

$NaCl + NH_3 + CO_2 + H_2O \longrightarrow \underset{\text{(Baking Soda)}}{NaHCO_3} + NH_4Cl$

Therefore we use NaCl as a raw material in the preparation of washing soda and baking soda.

5. (*c*) On dissociation, sulphuric acid produces,

$H_2SO_4\ (l) \longrightarrow 2H^+ + SO_4^{2-}$

Dissociation of magnesium hydroxide produces,

$Mg(OH)_2\ (l) \longrightarrow Mg^{2+} + 2OH^-$

On adding both the equations, we get a neutralization reaction resulting in salt and water as its products, hence it turns green.

6. (*b*)

7. (*c*) Chlorination is the substitution of hydrogen atoms by chlorine atom. It takes place in the presence of sunlight.

This reaction is an example of substitution reaction.

8. (*b*) As the filtrate flows along the tubule, useful substances such as glucose, amino acids, salts and water are reabsorbed into the blood by capillaries surrounding the nephron tubule.

9. (*a*)

10. (*b*) Male child : X^mY

Female child : $X^m\ X^f$

11. (*b*) As the shoot is bending towards light, so it shows phototropism.

12. (*a*)

13. (*d*) Using $H = I^2Rt$, for $t = 1$s [same for all circuit]

Case (*i*): $H = 36 \times 2 \times 1 = 72$ J

Case (*ii*): $H = 9 \times 4 \times 1 = 36$ J

Case (*iii*): $H = 144 \times 1 \times 1 = 144$ J

14. (*b*) The metallic body of electric appliances is connected to the earth using earth wire so that any leakage of electric current is transferred to the ground.

15. (*c*) Initially, $W = 12$ J

Using, $V = \frac{W}{Q}$

$\Rightarrow \quad V = \frac{12}{3}$

$\Rightarrow \quad V_i = 4$ V

Finally, $W = 36$ J

$\Rightarrow \quad V = \frac{36}{3}$

$\Rightarrow \quad V_f = 12$ V

Change in voltage $= V_f - V_i = 8$ V

16. (*a*)

17. (*b*) The reaction is $Zn + HCl \longrightarrow ZnCl_2 + H_2$. Only the evolution of gas takes place. There is no change in colour.

18. (*a*)

19. (*c*) Pea plant has bisexual flowers and are self pollinated.

20. (*d*) The deflection of the compass increases when current increases.

SECTION–B

21. Silver chloride on exposure to sunlight may decompose as per the following reaction.

$$2AgCl(s) \longrightarrow 2Ag(s) + Cl_2(g)$$

Therefore, it is stored in dark coloured bottles.

OR

(*i*) $\underset{\text{Sodium sulphite}}{Na_2SO_3(aq)} + \underset{\text{Barium chloride}}{BaCl_2(aq)} \longrightarrow \underset{\substack{\text{Barium sulphite}\\\text{(White precipitate)}}}{BaSO_3(s)} + \underset{\text{Sodium chloride}}{2NaCl(aq)}$

(*ii*) This reaction is also known as double displacement reaction.

22. Functions of lymph nodes are:

(*i*) Lymph nodes produce and maintain the lymphocytes of blood. These are only found in the mammals.

(*ii*) Lymph nodes filter the blood and remove poisonous and foreign substances, *e.g.*, bacteria, debris, etc.

23. (*i*) Decreases (*ii*) Decreases

(*iii*) Increases (*iv*) Decreases

24. Sameer's action was voluntary because rushing out of the room was under his conscious control. The smoke and smell were perceived by the receptors in the sense organs and signals are sent to the brain. The brain, then sent signals to the effector organs, *i.e.*, the muscles, to move out of the room.

25.

Food Chain	Food Web
1. Food chain is a series of organisms feeding on one another.	1. Food web consists of a number of interlinked food chains.
2. Members of higher trophic level feed upon a single type of organism of the lower trophic level.	2. Members of higher trophic level can feed upon organisms of the lower trophic levels of other food chain.

26. The statement made by the student is incorrect.

Positions marked 3 (yellow) and 5 (blue) are similar to the colour of gold metal and the colour of the sky respectively. The student is stating the nature of colours in reverse order.

OR

Because of scattering of light.

Instances:

- When a fine beam of light enters a smoke-filled dark room through a small hole.
- When sunlight passes through a canopy of dense forest in foggy/ misty conditions.
- Blue colour of sky.

SECTION–C

27. (*i*) $2Cu(NO_3)_2(s) \xrightarrow{\text{Heat}} 2CuO(s) + O_2(g) + 4NO_2(g)$

(*ii*) The brown gas X evolved is nitrogen dioxide (NO_2).

(*iii*) This is a decomposition reaction.

(*iv*) Nitrogen dioxide dissolves in water to form acidic solution because it is an oxide of non-metal. Therefore, pH of this solution is less than 7.

28. (*i*) Chemical formula: $CaOCl_2$

Chemical name: Calcium oxychloride

(*ii*) $\underset{\text{Bleaching powder}}{CaOCl_2(s)} + \underset{\text{Carbon dioxide}}{CO_2(g)} \longrightarrow \underset{\text{Calcium carbonate}}{CaCO_3(s)} + \underset{\text{Chlorine}}{Cl_2(g)}$

(*iii*) Bleaching powder is used in water treatment plants for disinfecting drinking water to make it free of germs.

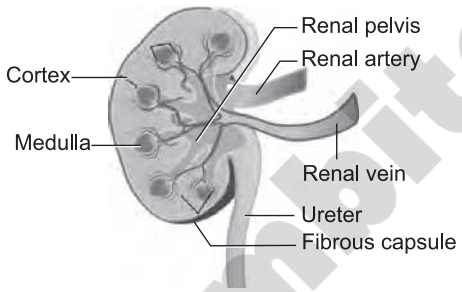
29. (*i*) Adenosine triphosphate (ATP) is the energy currency in the living organisms. It is produced in the mitochondria during respiration in living organisms and also during photosynthesis in plants.

(*ii*) During vigorous exercise, our body requires more energy and for this purpose more oxygen is needed, so the rate of breathing is increased. Oxygen intake rate increases by about 20 to 25 times.

OR

Kidneys are bean-shaped and located at the back of abdomen, one on either side of backbone.

Its inner concave surface has a depression called hilum through which renal artery enters and renal vein leaves the kidney. Kidney has two regions: outer cortex and inner medulla. Each kidney has a large number of filtering units called nephrons.



Longitudinal section of kidney

30. (*i*) (*a*) Image formed by a plane mirror is always virtual and erect.

(*b*) The size of the image is equal to that of the object.

(*c*) The image formed is as far behind the mirror as the object is in front of it.

(*d*) The image is laterally inverted.

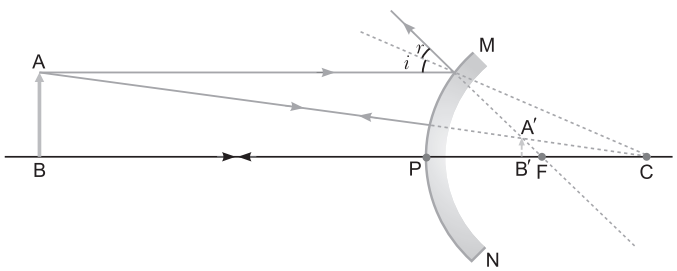
(*ii*) By observing the virtual images formed by the three mirrors, we can distinguish between the mirrors as:

(*a*) Plane mirror will produce an image of the same size,

(*b*) Concave mirror will produce a magnified image, and

(*c*) Convex mirror will produce a diminished image.

31. A convex mirror always produces an erect and diminished image of the object placed in front of it irrespective of the position of the object.



A convex mirror is used as a rear view mirror in vehicles. It enables the driver to view a much larger area of the traffic behind. It forms erect image.

32. In case of movement of a charged particle, the magnetic field is created around the path on which the charged particle moves.

(*i*) Yes, magnetic field is produced as a thin beam of α-particles (which are positively charged) is like a straight conductor carrying current in the direction of motion.

(*ii*) No, magnetic field is not produced as neutrons carry no charge so no magnetic field would be created around its path.

OR

(*a*) A matches with (*ii*) and (*iii*).

Applying Right Hand Thumb rule, the magnetic field at P due to current flowing in AB is perpendicular to the plane of paper pointing vertically downwards. The magnetic field at P due to current flowing in CD is perpendicular to the plane of paper pointing vertically upwards.

As P is the mid point, the two magnetic fields, cancel out each other. Therefore, magnetic field at P is zero.

(*b*) B matches with only (*i*) in column II.

Applying Right Hand Thumb rule, the magnetic field at P due to current in loop A is along the axial line towards right. The magnetic field at P due to current in loop B is also along the axial line towards right.

33.

S.No.	Biodegradable wastes	Non-biodegradable wastes
(*i*)	Waste materials which can be broken down into harmless substances in nature in due course of time by the action of microorganisms such as certain bacteria are called biodegradable wastes.	Waste materials which cannot be broken down into harmless substances by the action of microorganisms in nature are called non- biodegradable wastes.
(*ii*)	**Examples:** Cattle dung, wool, paper, compost.	**Examples:** Plastics, polythene bags, metal articles, glass objects.

People should adopt following changes in habit:

(*i*) Dispose household waste, chemical waste and hospital waste in a landfill.

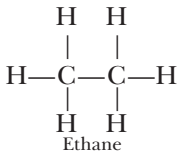
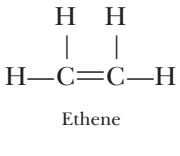
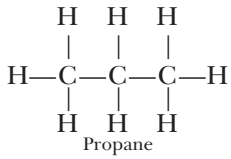
(*ii*) Broken plastic articles such as buckets, bowls, cups, plates, etc., should be sent to plastic processing factories.

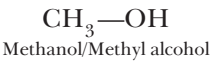
SECTION–D

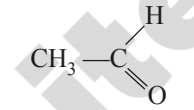
34. (*i*) Carbon compounds containing only carbon and hydrogen are called hydrocarbons.

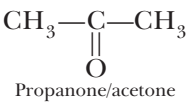
Example: Alkane

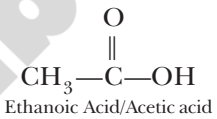
(*ii*)

Saturated Hydrocarbons	Unsaturated Hydrocarbons
Consists of only single bonds	Consists of double and triple bonds
 Ethane	 Ethene
 Propane	 Ethyne

(*iii*) (*a*)  Methanol/Methyl alcohol

(*b*)  Ethanal / Acetaldehyde

(*c*)  Propanone/acetone

(*d*)  Ethanoic Acid/Acetic acid

OR

The chemical name of the compound is ethanol. Its chemical formula is CH_3CH_2OH.

Uses:

1. It is used in medicines as a solvent.
2. It is used in paints, varnishes, etc.

(*i*) The product formed is sodium ethoxide and hydrogen gas.

$$\underset{\text{Ethanol}}{2C_2H_5OH} + 2Na \longrightarrow \underset{\text{Sodium ethoxide}}{2C_2H_5ONa} + H_2\uparrow$$

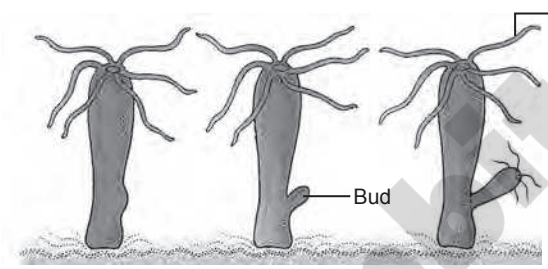
(*ii*) The product formed is ethene.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[\text{Heat}]{\text{conc. } H_2SO_4} \underset{\text{Ethene}}{CH_2{=}CH_2} + H_2O$$

35.

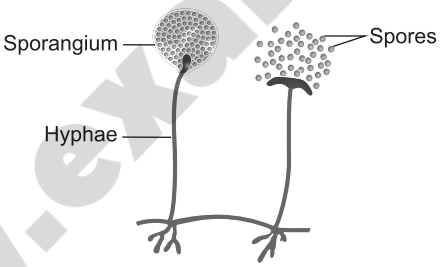
Asexual Reproduction	Sexual Reproduction
1. Involves only one parent.	1. Often involves two parents.
2. Gametes are not produced.	2. Gametes are produced.
3. No fertilisation and zygote formation.	3. Fertilisation and zygote formation is observed.
4. Meiosis does not occur at anytime during reproduction.	4. Meiosis occurs at the time of gamete formation.

During sexual reproduction two types of gametes fuse. Although the gametes contain the same number of chromosomes, their DNA is not identical. The difference in the genetic make up of DNA generate variations among the offsprings.



OR

(*i*)



(*ii*) Organisms such as *Hydra* use regenerative cells for reproduction in the process of budding. In *Hydra*, a bud develops as an outgrowth due to repeated cell division at one specific site (Fig.). These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.

In multi-cellular organisms with relatively simple body organisation, simple reproductive methods can still work. *Spirogyra*, for example, simply breaks up into smaller pieces upon maturation. These pieces or fragments grow into new individuals.

(*iii*) Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds. Such methods also make possible the propagation of plants such as banana, orange, rose and jasmine that have lost the capacity to produce

seeds. Another advantage of vegetative propagation is that all plants produced are genetically similar enough to the parent plant to have all its characteristics.

36. (*i*) $R = R_1 + R_2$

$= 20\ \Omega + 4\ \Omega = 24\ \Omega$

(*ii*) $I = \frac{V}{R}$

$= \frac{6\ \text{V}}{24\ \Omega} = 0.25\ \text{A}$

(*iii*) (*a*) For electric lamp:

$$\text{V} = \text{IR}$$
$$= \frac{6}{24} \times 20 = 5\text{V}$$

(*b*) For conductor:

$$\text{V} = \text{IR}$$
$$= \frac{6}{24} \times 4 = 1\text{V}$$

(*iv*) $\text{P} = \text{VI}$

$= 5\text{V} \times \frac{6}{24}\text{A} = 1.25\text{W}$

SECTION–E

37. (*i*) Redox reaction. MnO_2 is getting reduced to $MnCl_2$ whereas HCl is getting oxidised to Cl_2.

$$MnO_2 + HCl \longrightarrow MnCl_2 + H_2O + Cl_2$$

(*ii*) Basic oxide as it is an oxide of a metal. Reaction will not occur as the ions are not produced.

OR

(*ii*) (*a*) Here, Fe is gaining oxygen, so, it is oxidised. $CuSO_4$ is losing oxygen, so, it is reduced.

(*b*) $Mg + O_2 \longrightarrow MgO$

Magnesium gains oxygen, so it is oxidised.

38. (*i*) (*a*) Red as R is the dominant trait, the flowers will inherit Rw set of genes.

(*b*) 50%

(*ii*) The traits which are expressed in F_1 progeny are called dominant traits, whereas the traits which are unable to express themselves in F_1 progeny but reappear in the F_2 progeny are called recessive traits.

OR

(*ii*)

Dominant trait	Recessive trait
1. The trait which appears in the F_1 progeny is dominant.	1. The trait which remains hidden or which does not appear in the F_1 progeny is the recessive trait.
2. It appears in more numbers.	2. It appears in less number.

39. (*i*) All the refracted rays follow the first law of refraction *i.e.*, the incident ray, the refracted ray and the normal to the interface of two transparent media at a point of incidence, all lie in the same plane.

(*ii*) The speed of light varies with density as the medium with higher density decreases the speed of light and medium with lower density increases the speed of light.

(*iii*) Speed of light in air, $c = 3 \times 10^8$ m/s

Speed of light in water, $v = 2.26 \times 10^8$ m/s

Refractive index of glass, $n = c/v$

$n = 3 \times 10^8 \text{ ms}^{-1} / 2.26 \times 10^8 \text{ ms}^{-1} = 1.32$

OR

(*iii*) No bending of light occurs when light is incident normally on the boundary of two media since angle of incidence and angle of refraction both are zero.

SAMPLE PAPER [SOLVED] 4

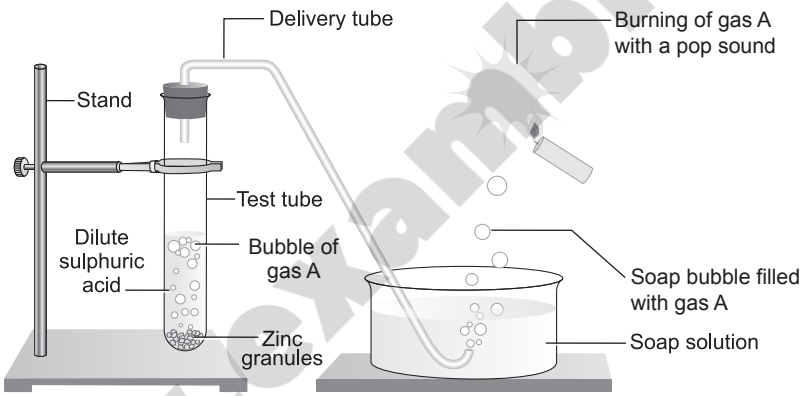
Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Identify gas A in the following experiment.



(*a*) Nitrogen (*b*) Hydrogen

(*c*) Oxygen (*d*) Carbon dioxide

2. A scientist in a chemistry lab wants to make salt of pH 5.5 using acid and base. The table shows the acid and base present in the lab.

1	HCl
2	NaOH
3	H_2CO_3
4	NH_4OH
5	CH_3COOH

Which of the acid and base he should use for the reaction?

(*a*) CH_3COOH and NaOH (*b*) HCl and NaOH

(*c*) HCl and NH_4OH (*d*) H_2CO_3 and NaOH

3. **Which among the following statement(s) is (are) true? Exposure of silver chloride to sunlight for a long duration turns grey due to**

   (*i*) the formation of silver by decomposition of silver chloride

   (*ii*) sublimation of silver chloride

   (*iii*) decomposition of chlorine gas from silver chloride

   (*iv*) oxidation of silver chloride

   (*a*) (*i*) only (*b*) (*i*) and (*iii*) (*c*) (*ii*) and (*iii*) (*d*) (*iv*) only

4. **Anand took four colourless solutions P, Q, R and S, and performed the following tests. What is the definite conclusion that Anand can reach?**

	Solution P	Solution Q	Solution R	Solution S
With methyl orange	No change in colour	Turns red	No change in colour	No change in colour
With phenolphthalein	No change in colour	No change in colour	No change in colour	Turns pink
With red litmus	No change in colour	No change in colour	No change in colour	Turns litmus blue
With blue litmus	No change in colour	Turns litmus red	No change in colour	No change in colour

   (*a*) Both P and S are salt solutions. (*b*) Both Q and S are basic solutions.

   (*c*) Both Q and R are salt solutions. (*d*) Both P and R are neutral solutions.

5. **A metal carbonate reacts with a solution X which forms a salt, water, and a gas Y. What are X and Y?**

   (*a*) X: sodium hydroxide; Y: carbon dioxide

   (*b*) X: sodium hydroxide; Y: hydrogen

   (*c*) X: hydrochloric acid; Y: carbon dioxide

   (*d*) X: hydrochloric acid; Y: hydrogen

6. **Listed here is the reactivity of certain metals.**

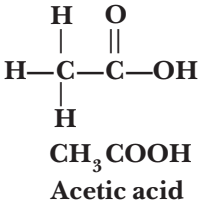
Metal	Reaction with air	Reaction with water	Reaction with dilute acids
Gold	Does not oxidise or burn	No reaction	No reaction
Sodium	Burns vigorously to form oxide	Violent reaction	Violent reaction
Zinc	Burns to form oxides	Reacts on heating with water	Reacts to produce hydrogen
Platinum	Does not oxidise or burn	No reaction	No reaction

   Which of the above metals are likely to be obtained in their pure states from the Earth's crust?

   (*a*) Gold only (*b*) Sodium only

   (*c*) Gold and platinum (*d*) Zinc and sodium

7. A student studies that acetic acid is a saturated compound. The structure of the compound is shown.



Why is acetic acid classified as a saturated compound?

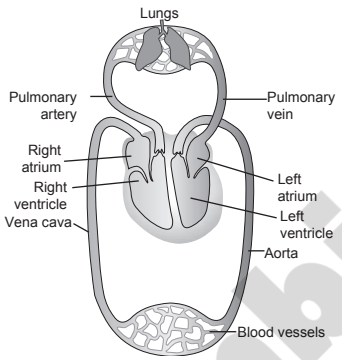
(*a*) Because there is a single bond between the carbon atoms.

(*b*) Because there is a double bond between the carbon and oxygen atoms.

(*c*) Because there is a single bond between the carbon and hydrogen atoms.

(*d*) Because there is a single bond between the carbon and hydroxide diatom.

8. The image shows the transport of gases in body through heart and lungs.



Which option correctly shows the transport of oxygen to the cell?

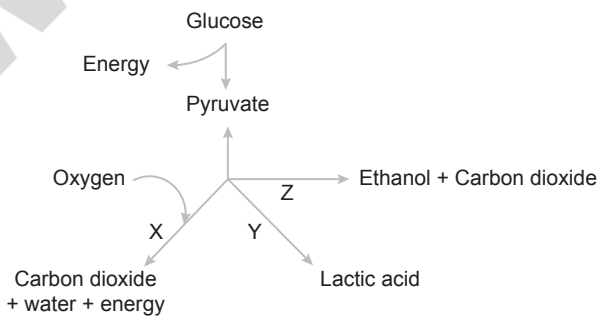
(*a*) Lungs ⟶ pulmonary vein ⟶ left atrium ⟶ left ventricle ⟶ aorta ⟶ body cells.

(*b*) Lungs ⟶ pulmonary artery ⟶ right atrium ⟶ right ventricle ⟶ vena cava ⟶ body cells.

(*c*) Lungs ⟶ pulmonary artery ⟶ left atrium ⟶ left ventricle ⟶ vena cava ⟶ body cells.

(*d*) Lungs ⟶ pulmonary vein ⟶ right atrium ⟶ right ventricle ⟶ aorta ⟶ body cells.

9. Which of the following occurs during oxygen shortage in muscle cells?



(*a*) Only X

(*b*) Only Y

(*c*) Only Z

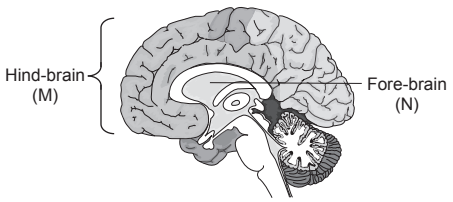
(*d*) Any of them - X, Y or Z

10. Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F_1 progeny that have round yellow (RrYy) seeds. When F_1 plants are self-pollinated, the F_2 progeny will have new combination of characters. Choose the new combination from the following

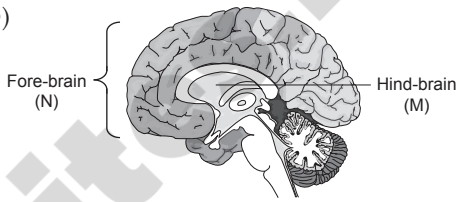
(*i*) Round, yellow
(*ii*) Round, green
(*iii*) Wrinkled, yellow
(*iv*) Wrinkled, green
(*a*) (*i*) and (*ii*)
(*b*) (*ii*) and (*iii*)
(*c*) (*i*) and (*iv*)
(*d*) (*i*) and (*iii*)

11. Which option illustrates the location of centre that controls the feelings associated with hunger (M) and the centre that allows a person to walk in a straight line (N)?

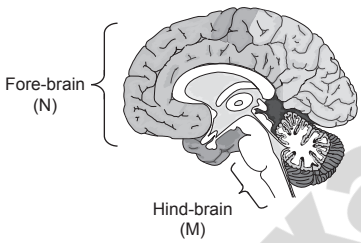
(*a*)



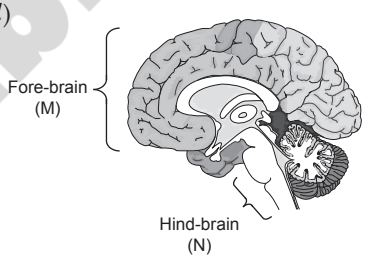
(*b*)



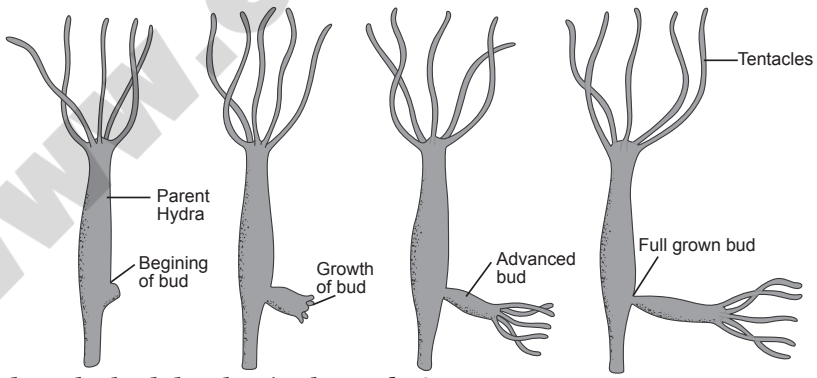
(*c*)



(*d*)



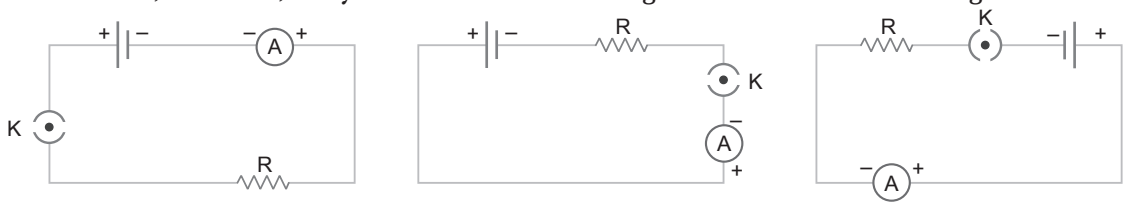
12. The image shows a bud developing on a *Hydra*.



How does the bud develop in the *Hydra*?

(*a*) bud develops due to separation of body parts of *Hydra*
(*b*) bud develops due to repetitive cell division at a specific site
(*c*) bud develops due to change in the environmental conditions
(*d*) develops due to attachment of another *Hydra* at a specific site

13. A cell, a resistor, a key and ammeter are arranged as shown in circuit diagrams.

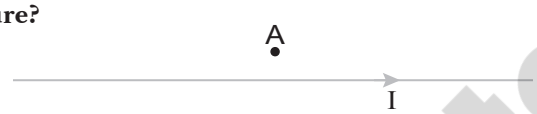


(i) ***(ii)*** ***(iii)***

The current recorded in the ammeter will be

(*a*) maximum in (*i*)
(*b*) maximum in (*ii*)
(*c*) maximum in (*iii*)
(*d*) same in all three circuits

14. What is the direction of magnetic field at a point A above the wire carrying current I as shown in figure?



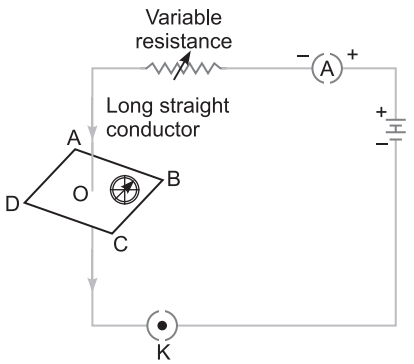
(*a*) Out of the page
(*b*) Into the page
(*c*) Up the page
(*d*) Down the page

15. In order to reduce electricity consumption at home, what kind of appliance should one purchase?

(*a*) one which draws low power
(*b*) one which produces less heat
(*c*) one which operates at a higher voltage
(*d*) one which draws a high amount of current

16. If the key (K) in the arrangement (figure) is taken out (i.e., circuit is made open) and the magnetic field lines are drawn over the horizontal plane ABCD, the lines are

(*a*) concentric circles
(*b*) elliptical in shapes
(*c*) straight lines parallel to each other
(*d*) concentric circles near the point O, but of elliptical shapes as we go away from it



Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*
(*b*) *Both A and R are true and R is not the correct explanation of A.*
(*c*) *A is true but R is false.*
(*d*) *A is false but R is true.*

17. Assertion(*A*) : The reaction

$MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$

is an example of a redox reaction.

Reason (*R*) : In this reaction, HCl is reduced to Cl_2 whereas MnO_2 is oxidised to $MnCl_2$.

18. Assertion(*A*) : Carbohydrate digestion mainly takes place in small intestine.

Reason (*R*) : Pancreatic juice contains the enzyme lactase.

19. Assertion(*A*) : A geneticist crossed two pea plants and got 50% tall and 50% dwarf in the progeny.

Reason (*R*) : One plant was heterozygous tall and the other was dwarf.

20. Assertion(*A*) : Alternating Current is used in household supply.

Reason (*R*) : AC electric power can be transmitted over long distances without much loss of energy.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Why do fire flies glow at night?

OR

A dilute ferrous sulphate solution was gradually added to the beaker containing acidified potassium permanganate solution. The light purple colour of the solution fades and finally disappears. Write the correct explanation for this observation.

22. "All plants give out oxygen during day and carbon dioxide during night". Do you agree with this statement? Give reason.

23. What is peptic ulcer? How is peptic ulcer caused?

24. List two different functions performed by pancreas in our body.

25. The number of malarial patients in a village increased tremendously when large number of frogs were exported from the village. What could be the cause for this?

26. Draw a ray diagram to explain the term angle of deviation.

OR

Write about power of accommodation of human eye. Explain why the image distance in the eye does not change when we change the distance of an object from the eye?

SECTION–C

Q. No. 27 to 33 are short answer questions.

27. 1 g of copper powder was taken in a China dish and heated. What change takes place on heating? When hydrogen gas is passed over this heated substance, a visible change is seen in it. Give the chemical equations of reactions, the name and the color of the products formed in each case.

28. A chemical compound 'X' is used in the soap and glass industry. It is prepared from brine.

(*i*) Write the chemical name, common name and chemical formula of 'X'.

(*ii*) Write the equation involved in its preparation.

(*iii*) What happens when it is treated with water containing Ca or Mg salts?

29. State the events occurring during the process of photosynthesis. Is it essential that these steps take place one after the other immediately?

OR

Bile juice does not have any digestive enzyme but still plays a significant role in the process of digestion. Justify the statement.

30. A student holding a mirror in his hand, directed the reflecting surface of the mirror towards the Sun. He then directed the reflected light on to a sheet of paper held close to the mirror.

(*i*) What should he do to burn the paper?

(*ii*) Which type of mirror does he have?

(*iii*) Will he be able to determine the approximate value of focal length of this mirror from this activity? Give reason and draw ray diagram to justify your answer in this case.

31. "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it." State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O, F and 2F in the diagram.

32. What is a solenoid? Draw the pattern of magnetic field lines of (*i*) a current carrying solenoid and (*ii*) a bar magnet. List two distinguishing features between the two fields.

OR

(*i*) Draw the pattern of magnetic field lines due to a magnetic field through and around a current carrying circular loop.

(*ii*) Name and state the rule to find out the direction of magnetic field inside and around the loop.

33. Plastic cups were used to serve tea in trains in early days—these could be returned to the vendors, cleaned and reused. Later, Kulhads were used instead of plastic cups. Now, paper cups are used for serving tea. What are the reasons for the shift from Plastic to Kulhads and then finally to paper cups?

SECTION - D

Q. No. 34 to 36 are Long answer questions.

34. What are esters? How are esters prepared? Write the chemical equation for the reaction involved. What happens when an ester reacts with sodium hydroxide? Write the chemical equation for the reaction and also state the name and use of this reaction.

OR

A compound C (molecular formula, $C_2H_4O_2$) reacts with Na-metal to form a compound R and evolves a gas which burns with a pop sound. Compound C on treatment with an alcohol A in presence of an acid forms a sweet smelling compound S (molecular formula

$C_3H_6O_2$). On addition of NaOH to C, it also gives R and water. S on treatment with NaOH solution gives back R and A.

Identify C, R, A, S and write down the reactions involved.

35. (*i*) Write the functions of each of the following parts in a human female reproductive system:

(*a*) Ovary (*b*) Uterus (*c*) Fallopian tube

(*ii*) Write the structure and functions of placenta in a human female.

OR

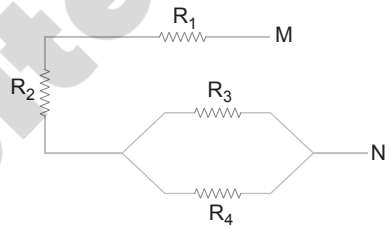
(*i*) "Use of a condom is beneficial for both the sexes involved in a sexual act." Justify this statement giving two reasons.

(*ii*) How do oral contraceptive help in avoiding pregnancies?

(*iii*) What is sex selective abortion ? How does it affect a healthy society?

(State any one consequence)

36. (*i*) For the combination of resistors shown in the following figure, find the equivalent resistance between M & N.



(*ii*) State Joule's law of heating.

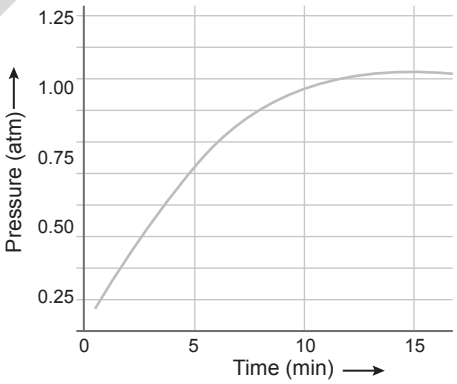
(*iii*) Why we need a 5 A fuse for an electric iron which consumes 1 kW power at 220 V?

(*iv*) Why is it impracticable to connect an electric bulb and an electric heater in series?

SECTION - E

Q. No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. A student added 10 g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below.



(*i*) During which interval did maximum decomposition took place?

(*ii*) Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.

(*iii*) What happens when calcium carbonate decompose? What could be done to increase the rate of decomposition of $CaCO_3$?

OR

(*iii*) Is decomposition of limestone endothermic? Give reason.

38. In human beings, the sex of the individual is largely genetically determined. When two germ cells combine, they will restore the normal number of chromosomes in the progeny, ensuring the stability of the DNA of the species. Nivedita has dark brown eyes, like her mother. But she has the same shaped nose as her father.

(*i*) Explain why Nivedita has features from both of her parents.

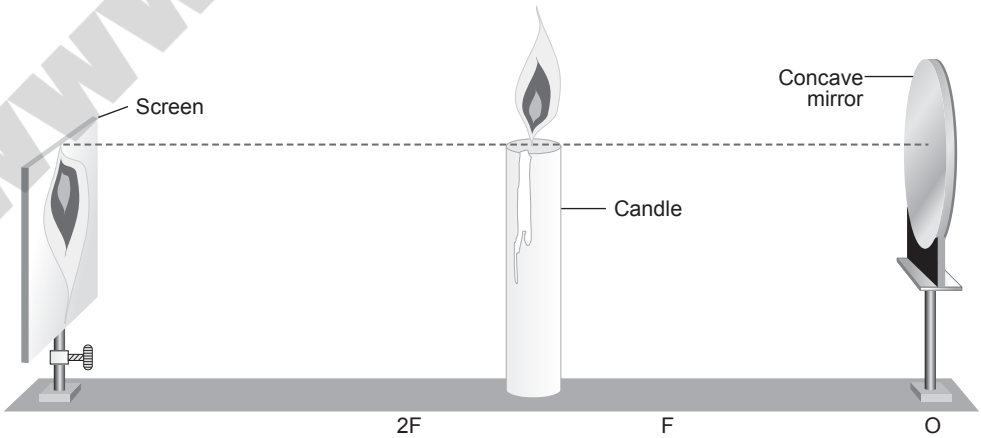
(*ii*) Explain why Nivedita is genetically female.

OR

(*ii*) In humans, the gene for black hair colour is B and gene for brown hair colour is b. What will be the hair colour of person having the genetic constitution

(*a*) BB (*b*) bb?

39.



We know that the characteristics of image formed by a concave mirror depend on the position of the object with respect to the mirror.

When an object is placed between *F* and infinity, the image formed is real and inverted. But when the object is placed between *F* and mirror it cannot be obtained on the screen. The image formed in this case is virtual, erect and magnified. Such image may be seen by looking in the mirror directly.

When the object is moved from focus towards infinity, the image moves from infinity towards focus and its size decreases.

When object is placed at 2*F* image of the same size is formed at 2*F*, itself.

(*i*) What will be the nature of image if an object is placed 10 cm in front of a concave mirror of focal length 20 cm?

(*ii*) What is the minimum distance between the object and its real image for concave mirror?

(*iii*) A candle flame 3 cm high is placed at a distance of 3 m from a wall. How far from the wall must a concave mirror be placed in order that it may form an image of the flame 9 cm high on the wall?

OR

(*iii*) Draw a ray diagram when an object is placed near a concave mirror at a distance of one- fourth the radius of curvature of the concave mirror?

Answers

SECTION–A

1. (*b*) When dilute sulphuric acid is poured on zinc granules, then zinc being more reactive than hydrogen displaces it from the acid and forms zinc sulphate and hydrogen gas.

Hydrogen is a combustible gas and burns with a popping sound.

2. (*c*) The salt having pH 5.5 is acidic. So, to prepare an acidic salt, a strong acid (HCl) and a weak base (NH_4OH) is required.

3. (*a*)

4. (*d*) Since there is no change in the colour of solution P and R with any of the indicators so they are neutral solutions.

5. (*c*)

6. (*c*) As gold and platinum do not react with air, water and dilute acids so they can be obtained in their pure states from the Earth's crust.

7. (*a*) This is because it contains single bond between two carbon atoms.

8. (*a*)

9. (*b*) Lactic acid is produced during oxygen shortage in muscle cells.

10. (*c*)

11. (*d*) Hunger is partly controlled by a part of your fore brain called the hypothalamus whereas the cerebellum is a major structure of the hindbrain that is located near the brainstem. The cerebellum is the part of the brain that is responsible for coordinating voluntary movements.

12. (*b*) Hydra reproduces asexually by budding. In Hydra, an outgrowth develops due to repeated cell division at a particular site.

13. (*d*) On rearranging the elements connected in series, there is no change in current in the circuit.

Thus, current will be same in all the three circuits.

14. (*a*) Using right hand thumb rule, if we place our thumb in the direction of current, magnetic field at point A will be out of the page.

15. (*a*)

16. (*c*) If key is taken out, then current will stop and no magnetic field exists due to the conductor. Therefore, at point O, there will be earth's magnetic field and they will be straight lines parallel to each other.

17. (*c*) MnO_2 is reduced to $MnCl_2$ and HCl is oxidised to Cl_2.

18. (*c*) Pancreatic juice contains the enzyme lipase, protease and amylase.

19. (*a*)

20. (*a*)

SECTION–B

21. Fire flies have a protein which in the presence of enzyme undergoes aerial oxidation. This is a chemical reaction which involves emission of visible light. Therefore, fire flies glow at night.

OR

Potassium permanganate solution ($KMnO_4$) is an oxidising agent. It oxidises ferrous sulphate ($FeSO_4$) to ferric sulphate [$Fe_2(SO_4)_3$].

22. During day time, as the rate of photosynthesis is more than the rate of respiration, the net result is evolution of oxygen. At night there is no photosynthesis, so they give out carbon dioxide due to respiration.

23. An ulcer on the inner membrane lining of the stomach is called peptic ulcer. Peptic ulcer is caused by the high acidity of gastric juice secretions.

24. (*i*) Pancreas act as a gland by secreting pancreatic juice which contains enzymes.

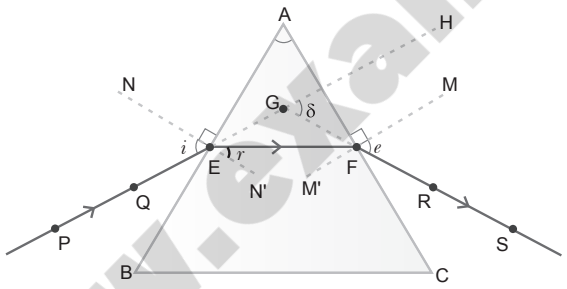
(*ii*) Secretes hormones like insulin/glucagon..

25. The food chain in the given situation will be:

Phytoplankton ⟶ Zooplankton ⟶ Mosquito larva ⟶ Frogs

In the absence of frogs (as they were exported), more mosquito larvae survived giving rise to large number of mosquitoes. The large number of mosquitoes caused increased incidences of malaria.

26.



∠ δ is the angle of deviation.

OR

Ability of the eye lens to focus nearby as well as distant objects on the retina by changing the curvature or focal length of the eye lens is known as power of accommodation.

Image distance in the eye is the distance between the eye lens and the retina and it is fixed. As the object approaches from infinity towards the eye, the focal length of the eye lens decreases (or vice-versa) so as to maintain the same image distance.

SECTION–C

27. A black colour is formed on the surface

$$\underset{\text{Brown}}{2Cu} + O_2 \xrightarrow{\text{Heat}} \underset{\substack{\text{Copper Oxide;}\\ \text{Black Colour}}}{2CuO}$$

Original/brown colour is restored.

$$CuO + H_2 \xrightarrow{\text{Heat}} \underset{\substack{\text{Copper}\\\text{Brown}}}{Cu} + H_2O$$

28. (*i*) Chemical Name – Sodium Carbonate decahydrate
Common Name – Washing Soda
Chemical Formula - $Na_2CO_3 .10H_2O$

(*ii*) $NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$

$2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + H_2O + CO_2$

$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3.10H_2O$

(*iii*) It helps in removing permanent hardness./ It forms insoluble Ca or Mg salts in the form of scum.

29. $\underset{\text{Carbon dioxide}}{6CO_2} + \underset{\text{Water}}{6H_2O} \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \underset{\text{Carbohydrate}}{C_6H_{12}O_6} + \underset{\text{Oxygen}}{6O_2}$

Events that take place during photosynthesis are:

(*i*) Absorption of light energy by chlorophyll.

(*ii*) Conversion of light energy into chemical energy and splitting of water molecule.

(*iii*) Reduction of carbon dioxide to carbohydrate.

These steps need not take place one after other immediately. For example, desert plants take up carbon dioxide at night and prepare an intermediate which is acted upon by the energy absorbed by chlorophyll during the day.

OR

Bile does not contain any enzyme but it is essential for digestion because bile is alkaline and contain salts which helps to emulsify the fat present in the food. So, the bile perform two functions:

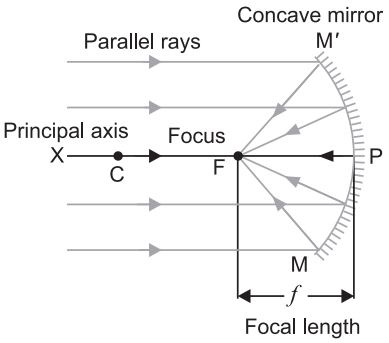
(*i*) The food coming from the stomach is acidic and has to be made alkaline for the pancreatic enzymes to act.

(*ii*) The bile salts breakdown the fat present in the food into smaller globules. This increases the efficiency of enzymes in the small intestine to digest the food effectively.

30. (*i*) To burn the paper, the student should move the mirror in such a way that paper is positioned at the focus of the mirror.

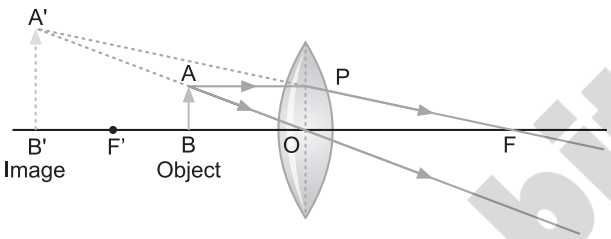
(*ii*) The student have concave (converging) mirror. An image of the sun is formed at the focus of the concave mirror.

(*iii*) Yes. Since the Sun's image is formed at the focus of the concave mirror, therefore, the distance of Sun's image (piece of paper) from the concave mirror will give the approximate value of focal length of the mirror.

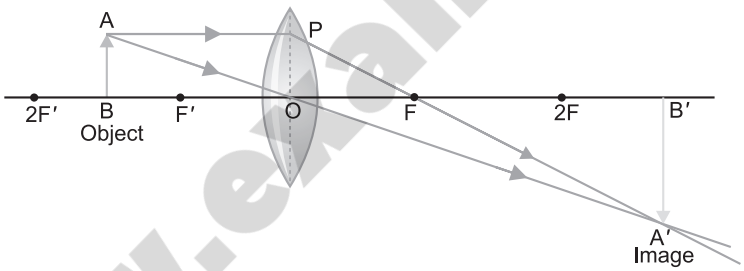


31. The lens is convex

(*i*) Magnified erect image

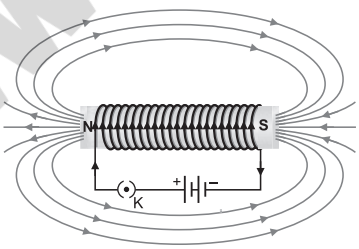


(*ii*) Magnified inverted image

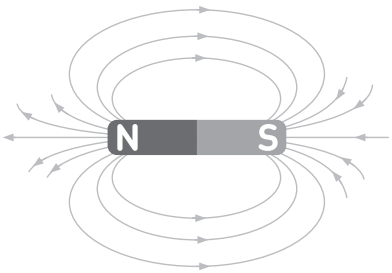


32. A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.

(*i*)



(*ii*)

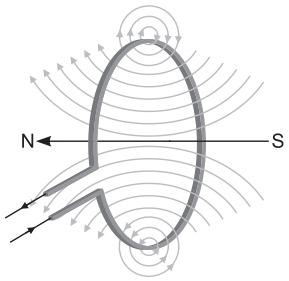


Distinguishing features:

Solenoid	Bar Magnet
1. Field disappear on stopping the current.	1. No effect of current on magnetic field.
2. Strength of the field can be changed by changing the current.	2. Strength cannot be changed.
3. Direction can be reversed by changing the direction of current through it.	3. Direction is fixed and cannot be reversed.

OR

(*i*)



(*ii*) Right hand thumb rule.

When a current carrying straight conductor is held in the right hand in such a way that the thumb points towards the direction of the current, then the fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

33. Plastic cups that could be returned to the vendor, cleaned and reused raised a concern towards hygiene and were replaced by disposable plastic cups. These plastic cups are non-biodegradable and harm the environment. So, they were replaced by Kulhads which is made up of clay. Making of these Kulhads on a large scale required a huge amount of clay and it resulted in the loss of top soil which is very fertile.

Now, disposable paper cups are being used because they can be recycled, are biodegradable and do not harm the environment.

SECTION–D

34. Esters: Pleasant smelling organic compounds

Esters are formed by the reaction of carboxylic acids and alcohols in the presence of acid.

Equation: $CH_3COOH + C_2H_5OH \longrightarrow CH_3COOC_2H_5 + H_2O$

Sodium ethanoate is formed when an ester reacts with sodium hydroxide.

$CH_3COOC_2H_5 + NaOH \longrightarrow CH_3COONa + C_2H_5OH$

Name of Reaction : Saponification

Use : Preparation of soap

OR

C — Ethanoic acid

R — Sodium salt of ethanoic acid (sodium acetate) and gas evolved is hydrogen

A — Methanol

S — Ester (Methyl acetate)

(*i*) $\underset{(C)}{2CH_3COOH} + 2Na \longrightarrow \underset{(R)}{2CH_3COONa} + H_2$

(*ii*) $\underset{(C)}{CH_3COOH} + \underset{(A)}{CH_3OH} \xrightarrow{\text{conc. } H_2SO_4} \underset{(S)}{CH_3COOCH_3} + H_2O$

(*iii*) $\underset{(C)}{CH_3COOH} + NaOH \xrightarrow{\text{conc. } H_2SO_4} \underset{(R)}{CH_3COONa} + H_2O$

(*iv*) $\underset{(S)}{CH_3COOCH_3} + NaOH \longrightarrow \underset{(R)}{CH_3COONa} + \underset{(A)}{CH_3OH}$

35. (*i*) (*a*) Ovary:

I. It produces female eggs or ova.

II It produces hormones like progesterone or oestrogen that bring changes in girls during puberty.

(*b*) Uterus:

I. It the site where implantation of zygote occurs.

II. It nourishes and provides nutrition to embryo.

(*c*) Fallopian Tube

I. It carries and take female ovum from ovary to womb.

II. It is the site of fertilisation.

(*ii*) Structure of Placenta:

(*a*) It is a disk like structure embedded in the uterine wall.

(*b*) It has villi on embroyal side and blood filled spaces on mother side surrounded by villi.

Functions of Placenta:

(*a*) It provides a large surface area for absorption of glucose and oxygen from mother blood to embryo.

(*b*) It also takes away wastes generated by embryo into mothers into mother's blood.

OR

(*i*) Two reasons:

(*a*) Avoids unwanted/undesirable pregnancies/ STD's

(*b*) Use of condom prevents the transmission of infections from one person to another.

(*ii*) Oral contraceptives change the hormonal balance of the body so that the eggs are not released.

(*iii*) Sex selective abortion is a procedure that is done for female foetuses / female foeticide. It adversely affects the male-female sex ratio.

36. (*i*) R_3 and R_4 are in parallel combination.

$\therefore$ $R_{parallel}$ is given by $\frac{1}{R_p} = \frac{1}{R_3} + \frac{1}{R_4}$

$$\frac{1}{R_p} = \frac{R_4 + R_3}{R_3 R_4}$$

$$R_p = \frac{R_3 R_4}{R_4 + R_3}$$

Now, R_1 R_2 and R_p are in series.

$\therefore$ $R_{eq} = R_1 + R_2 + R_p$

$$= R_1 + R_2 + \frac{R_3 R_4}{R_4 + R_3}$$

(*ii*) The heat produced in a resistor is directly proportional to

- square of current for a given resistance.
- the resistance for a given current and
- the time for which the current flows through the resistor.

(*iii*) $P = V I$ or $I = \frac{P}{V}$

$$I = \frac{1000 \text{ watt}}{220 \text{ volt}} = 4.54\text{A}$$

Since 4.54 ampere current flows in the circuit , a 5 A fuse must be used.

(*iv*) Electric bulb & electric heater will not get currents and voltages as per their requirement.

SECTION–E

37. (*i*) During 0–5 mins, maximum increase in pressure was observed. So, maximum decomposition took place.

(*ii*) Polluted water is acidic in nature hence it reacts with calcium carbonate

(*iii*) Calcium carbonate decomposes on heating to form calcium oxide and carbon dioxide. The rate of calcium carbonate decomposition increases when steam is applied. A catalytic effect occurs since the activation energy decreases without by-products formation.

OR

(*iii*) The decomposition of limestone ($CaCO_3$) to make lime (CaO) is also an endothermic process. It is necessary to heat limestone to a high temperature for this reaction to occur.

38. (*i*) DNA, also known as the genetic material is responsible for the transfer of traits/ features from parents to their offsprings. This is because in zygote, one half of the chromosomes is contributed by the mother, and the other half by the father.

(*ii*) The explanation lies in the fact that all human chromosomes are not paired. Most human chromosomes have a maternal and paternal copy, and we have 22 such pairs. But one pair, called the sex chromosomes, is odd in not always being a perfect pair. So, female have XX while male have XY pair of chromosomes.

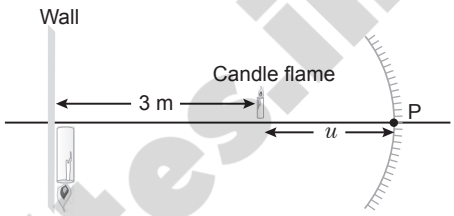
OR

(*ii*) (*a*) Black hair, (*b*) Brown hair.

39. (*i*) Concave mirror forms erect and enlarged image when held closer to the cavity.

(*ii*) The minimum distance is zero as concave mirror forms a real and inverted image at $2F$ of the object kept at $2F$.

(*iii*) Clearly, the image distance $= u + 3$



$$m = \frac{-v}{u} = \frac{I}{O};$$

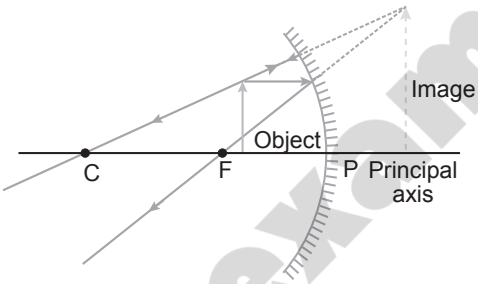
$$\Rightarrow \quad \frac{-(u+3)}{u} = \frac{-9}{3}$$

$$u = 1.5 \text{ m}$$

Distance of wall from the mirror $= u + 3 = 1.5 + 3 = 4.5$ m

OR

(*iii*)



SAMPLE PAPER [SOLVED] 5

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Identify '*x*', '*y*' and '*z*' in the following reaction:

$$2KClO_3(x) \xrightarrow{(y)} 2KCl(x) + O_2(z)$$

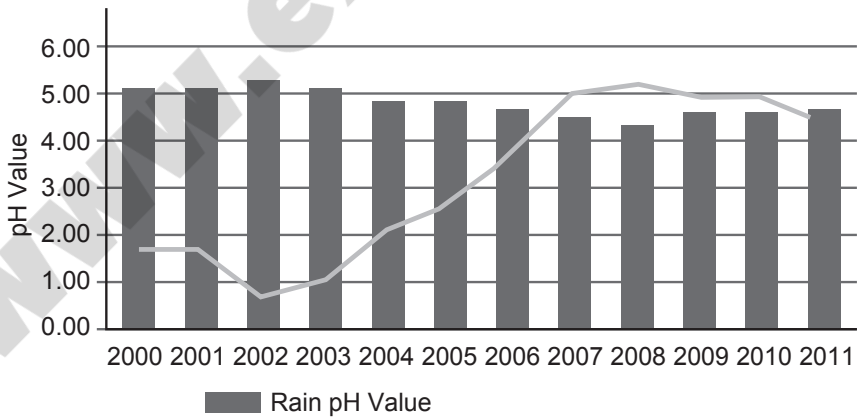
(*a*) *x* = gas; *y* = reaction condition; *z* = gas

(*b*) *x* = solid; *y* = liquid; *z* = gas

(*c*) *x* = number of moles of $KClO_3$; *y* = reaction condition; *z* = no. of molecules of oxygen

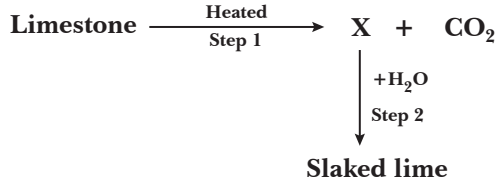
(*d*) *x* = physical state of $KClO_3$ and KCl; *y* = reaction condition; *z* = physical state of O_2

2. In which year is concentration of hydrogen ion the highest?



(*a*) 2002 (*b*) 2008

(*c*) 2011 (*d*) 2005

3. 

Identify the correct option from the given table which represents the type of reactions occurring in step 1 and step 2.

	Endothermic	Exothermic
(*a*)	✗	✓
(*b*)	✓	✗
(*c*)	✓	✓
(*d*)	✗	✗

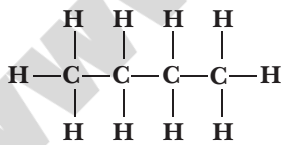
4. **Study the following table and choose the correct option:**

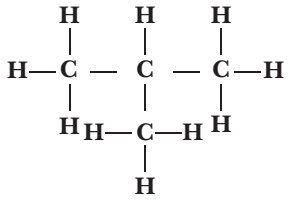
	Salt	Parent Acid	Parent Base	Nature of Salt
(*a*)	Sodium Chloride	HCl	NaOH	Basic
(*b*)	Sodium Carbonate	H_2CO_3	NaOH	Neutral
(*c*)	Sodium Sulphate	H_2SO_4	NaOH	Acidic
(*d*)	Sodium Acetate	CH_3COOH	NaOH	Basic

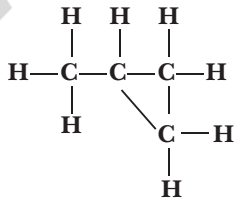
5. **Baking soda is a mixture of:**
   (*a*) Sodium carbonate and acetic acid
   (*b*) Sodium carbonate and tartaric acid
   (*c*) Sodium hydrogen carbonate and tartaric acid
   (*d*) Sodium hydrogen carbonate and acetic acid

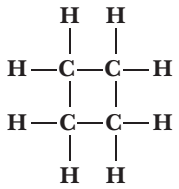
6. **An element 'X' reacts with O_2 to give a compound with a high melting point. This compound is also soluble in water. The element 'X' is likely to be:**
   (*a*) iron (*b*) calcium (*c*) carbon (*d*) silicon

7. **Which of the following are correct structural isomers of butane?**

(*i*) 

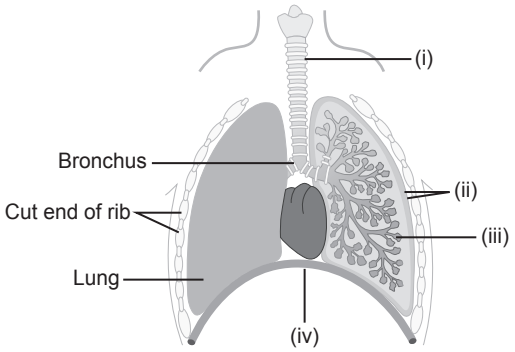
(*ii*) 

(*iii*) 

(*iv*) 

(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*ii*) (*d*) (*iii*) and (*iv*)

8. Carefully study the diagram of the human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and/or characteristic.



(*a*) (*i*) Trachea: It is supported by bony rings for conducting inspired air.
(*b*) (*ii*) Ribs: When we breathe out, ribs are lifted.
(*c*) (*iii*) Alveoli: Thin-walled sac like structures for exchange of gases.
(*d*) (*iv*) Diaphragm: It is pulled up when we breathe in.

9. Opening and closing of stomatal pore depends on:

(*a*) Atmospheric temperature
(*b*) oxygen concentration around stomata
(*c*) carbon dioxide concentration around stomata
(*d*) water content in the guard cells

10. In human males all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are

(*i*) large chromosome **(*ii*) small chromosome**
(*iii*) Y-chromosome **(*iv*) X-chromosome**

(*a*) (*i*) and (*ii*) (*b*) (*iii*) only (*c*) (*iii*) and (*iv*) (*d*) (*ii*) and (*iv*)

11. Match the terms of Column (A) with these of Column (B):

Column A	Column B
A.Olfactory receptors	(*i*) Tongue
B.Thermoreceptors	(*ii*) Eye
C.Gustatory receptors	(*iii*) Nose
D.Photoreceptors	(*iv*) Skin

(*a*) A–(*iii*), B–(*iv*), C–(*i*), D–(*ii*) (*b*) A–(*ii*), B–(*iii*), C–(*iv*), D–(*i*)
(*c*) A–(*iv*), B–(*iii*), C–(*ii*), D–(*i*) (*d*) A–(*i*), B–(*ii*), C–(*iii*), D–(*iv*)

12. Factors responsible for the rapid spread of bread mould on slices of bread are

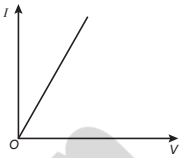
(*i*) large number of spores
(*ii*) availability of moisture and nutrients in bread

(*iii*) presence of tubular branched hyphae

(*iv*) formation of round shaped sporangia

(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*ii*) (*d*) (*iii*) and (*iv*)

13. I-V characteristic of a copper wire of length L and area of cross-section A is shown in figure. The slope of the curve becomes:



(*a*) less if the length of the wire is increased

(*b*) more if the length of the wire is increased

(*c*) more if the experiment is formed at higher temperature

(*d*) more if a wire of steel of same dimensions is used

14. According to international convention of colour coding in a wire

(*a*) live is red, neutral is black and earth is green

(*b*) live is brown, neutral is blue and earth is green

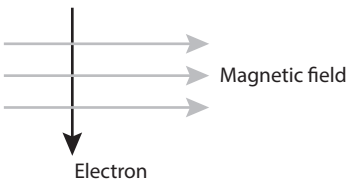
(*c*) live is brown, neutral is green and earth is black

(*d*) live is red, neutral is yellow and earth is blue

15. Two bulbs of 100 W and 40 W are connected in series. The current through the 100 W bulb is 1 A. The current through the 40 W bulb will be

(*a*) 0.4 A (*b*) 0.6 A (*c*) 0.8 A (*d*) 1 A

16. An electron enters a magnetic field at right angles to it, as shown in figure. The direction of force acting on the electron will be



(*a*) to the right (*b*) to the left

(*c*) out of the page (*d*) into the page

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : After white washing the walls, a shiny white finish on walls is obtained after two to three days.

Reason (*R*) : Calcium oxide reacts with carbon dioxide to form calcium hydrogen carbonate which gives shiny white finish.

18. Assertion (*A*) : Human heart is four-chambered.

Reason (*R*) : Vena cava is the only artery that supplies deoxygenated blood to the heart.

19. Assertion (*A*) : Free ear lobe is a dominant trait.

Reason (*R*) : It is more common as it is expressed both in homozygous and heterozygous conditions.

20. Assertion(*A*) : A compass needle is placed near a current carrying wire. The deflection of the compass needle decreases when the compass needle is displaced away from the wire.

Reason (*R*) : Strength of a magnetic field decreases as one moves away from a current carrying conductor.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal?

OR

Why is hydrogen peroxide kept in coloured bottles?

22. What processes would you consider essential for maintaining life?

23. What is the role of the acid in our stomach?

24. Nervous and hormonal system together perform the function of control and coordination in human beings. Justify the statement.

25. What are decomposers? What will be the consequence of their absence in an ecosystem?

26. State the cause of dispersion when white light enters a glass prism. Explain with a diagram.

OR

Why is the colour of the clear sky blue?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Identify the oxidising agent (oxidant) in the following reactions.

(*i*) $Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$

(*ii*) $2Mg + O_2 \longrightarrow 2MgO$

(*iii*) $CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$

(*iv*) $V_2O_5 + 5Ca \longrightarrow 2V + 5CaO$

(*v*) $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$

(*vi*) $CuO + H_2 \longrightarrow Cu + H_2O$

28. When zinc metal is treated with a dilute solution of a strong acid, a gas is evolved, which is utilised in the hydrogenation of oil. Name the gas evolved. Write the chemical equation of the reaction and also write a test to detect the gas formed.

29. Define the term transpiration. Design an experiment to demonstrate this process.

OR

Why does absorption of digested food occur mainly in the small intestine?

30. State the laws of refraction of light. Explain the term 'absolute refractive index of a medium' and write an expression to relate it with the speed of light in vacuum.

31. The image formed by a spherical mirror is real, inverted and is of magnification –2. If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror.

32. What is an electromagnet? Draw a circuit diagram and explain how a soft iron piece can be transformed into an electromagnet.

OR

Explain with the help of the pattern of magnetic field lines the distribution of magnetic field due to a current carrying a circular loop.

33. How can we help in reducing the problem of waste disposal? Suggest any three methods.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. A salt X is formed and a gas is evolved when ethanoic acid reacts with sodium hydrogen-carbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one which you have named. Also, write chemical equation of the reaction involved.

OR

(*i*) State the reason why carbon can neither form C^{4+} cation nor C^{4-} anions, but forms covalent bonds. Also state reasons to explain why covalent compounds

(*a*) are bad conductors of electricity.

(*b*) have low melting and boiling points.

(*ii*) Write the structural formula of benzene, C_6H_6.

35. Reproduction is essentially a phenomenon that is not for survival of an individual but for the stability of a species. Justify.

OR

(*i*) Draw the diagram of female reproductive system and mark the part(s):

(*a*) where block is created surgically to prevent fertilization

(*b*) where CuT is inserted

(*c*) inside which condom can be placed

(*ii*) Why do more and more people prefer to use condoms? What is the principle behind the use of condoms?

36. List three factors on which the resistance of a conductor depends. The resistivities of some substances are given below:

Materials	A	B	C	D	E
Resistivity (Ω m)	1.6×10^{-8}	6.4×10^{-8}	10×10^{-8}	96×10^{-8}	100×10^{-6}

Answer the following questions in relation to them giving justification for each:

(*i*) Which material is best for making connecting cords?

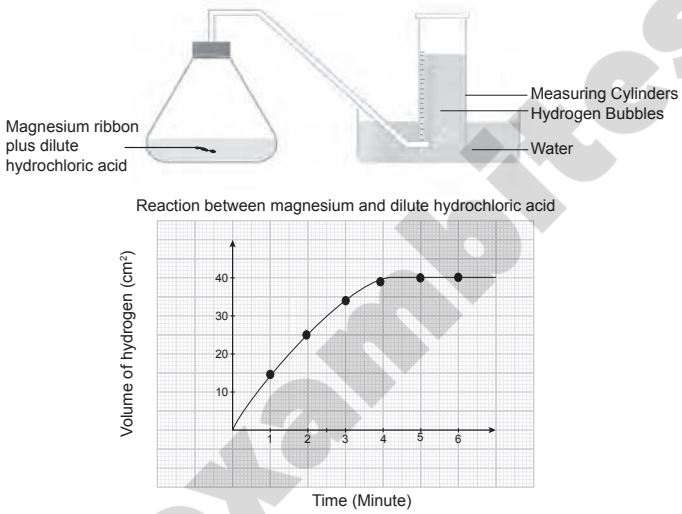
(*ii*) Which material do you suggest to be used in heating devices?

(*iii*) You have two wires of same length and same thickness. One is made of material A and another of material D. If the resistance of wire made of A is $2\,\Omega$, what is the resistance of the other wire?

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. In the given experiment, a piece of magnesium ribbon is added to a flask containing dilute HCl. Hydrogen gas is formed in the form of bubbles, which is collected in the measuring cylinder. The graph shows the amount of hydrogen formed with time. The line on the graph indicates the rate of chemical reaction occurring in the flask.



(*i*) When is the rate of reaction fastest in the flask?

(*ii*) Write a balanced chemical equation when magnesium reacts with HCl to form magnesium chloride and hydrogen gas?

(*iii*) What will be the effect on rate of reaction if magnesium ribbon is replaced by magnesium powder under the same conditions?

OR

(*iii*) How will you prove that the reaction shown in above experiment is an example of redox reaction?

38. Mendel blended his knowledge of Science and mathematics to keep the count of the individuals exhibiting a particular trait in each generation. He observed a number of contrasting visible characters controlled in pea plants in a field. He conducted many experiments to arrive at the laws of inheritance.

(*i*) If only one pair of contrasting characters like tall and short plants is taken, plants obtained F_1 generation are not medium height. Why?

(*ii*) Name the recessive traits in above case.

(*iii*) Mention the type of the new combinations of plants obtained in F_2 progeny along with their ratio, if F_1 progeny was allowed to self pollinate.

OR

(*iii*) If 1600 plants were obtained in F_2 progeny, write the number of plants having traits:

(*a*) Tall with round seeds

(*b*) Short with wrinkled seeds

Write the conclusion of the above experiment.

39. The table given below shows the results of an investigation using a lens.

Observation	**Object distance** u **(cm)**	**Image distance** v **(cm)**	**Object height** h_o **(cm)**	**image height** h_i **(cm)**
1	–10	–20.0	+5	+10
2	–30	+30.0	+5	–5
3	–45	+22.5	+5	–2.5
4	–60	+20.0	+5	–1.7
5	–75	+18.8	+5	–1.3
6	–90	----------	+5	----------

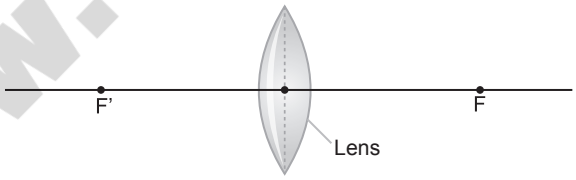
(*i*) Describe the focal length of a lens.

(*ii*) Using the values of u and v in observation 2, calculate the focal length f of the lens.

(*iii*) Calculate the image distance of observation 6.

OR

(*iii*) On the given figure, draw a ray diagram to show how the lens is used as a magnifying glass to produce an image of an object that is enlarged and virtual.



Answers

SECTION–A

1. (*d*)

2. (*a*) High concentrations of hydrogen ions yield a low pH (acidic substances), whereas low levels of hydrogen ions result in a high pH (basic substances). The overall concentration of hydrogen ions is inversely related to its pH.

3. (*c*) Step 1 is endothermic as heat is absorbed by Limestone to form CaO. Step 2 is exothermic as water is added to lime (CaO) to form slaked lime (calcium hydroxide), $Ca(OH)_2$. This reaction occurs when water is added to dry portland cement to make concrete, and heat evolution of energy as heat is evident because the mixture becomes warm.

4. (*d*) Since, sodium acetate is made up of weak acid (acetic acid) and a strong base (NaOH), it is basic in nature.

5. (*c*)

6. (*b*) The element is likely to be Calcium. Calcium reacts with oxygen to give a compound with a high melting point. Calcium is also soluble in water.

7. (*c*)

8. (*c*) Alveoli: Thin-walled sac like structures for exchange of gases.
Trachea is supported by cartilage rings for conducting inspired air.
Ribs: When we breathe out, ribs move down.
Diaphragm is pushed down when we breathe in.

9. (*d*) The opening of guard cells is facilitated by the entry of water inside guard cells. This makes the guard cell turgid. The closing of guard cells is also facilitated by water coming out of guard cells. This will make the guard cells flaccid.

10. (*c*) In human males, all the chromosomes are paired perfectly except one. These unpaired chromosomes are:
Y-chromosome and X-chromosome

11. (*a*)

12. (*c*) The factors responsible for the rapid spreading of bread mould on slices of bread are the presence of a large number of spores in the air and the presence of moisture and nutrients in bread that act as food for the fungi.

13. (*a*) Slope of the graph = $\frac{I}{V} = \frac{1}{R}$
If the length of the wire is increased, R increases and the slope becomes less.

14. (*b*)

15. (*d*) In a series connection, the current through each resistance remains same.
Thus, 40 W bulb will also get 1A.

16. (*d*); According to Flemings left hand rule, direction of current is taken opposite to the direction of motion of electrons, thus force will be directed into the page.

17. (*c*) Calcium oxide reacts with carbon dioxide to form calcium carbonate which gives white shiny finish to walls.

18. (*c*) Pulmonary artery is the only artery that supplies deoxygenated blood to the lungs.

19. (*a*)

20. (*a*)

SECTION–B

21. When an active metal like Zn reacts with HCl, the gas produced burns with a pop sound which indicates that it is a hydrogen gas.

$Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(s) + H_2(g)$

OR

This is done in order to cut off light because hydrogen peroxide decomposes into water and oxygen in the presence of light.

$2H_2O_2 \xrightarrow{\text{Light}} 2H_2O + O_2$

22. The important processes essential for maintaining life are: nutrition, respiration, transportation and excretion, and control and coordination.

23. (*i*) The acid (hydrochloric acid) secreted inside the stomach makes the medium acidic which is necessary for the activation of the enzyme pepsin. It converts inactive propepsin into active pepsin.

(*ii*) Hydrochloric acid kills any bacteria which may enter the stomach along with food.

24. For nervous and hormonal systems to control and coordinate in human beings, hypothalamus plays an important role in receiving the neural/nerve signals from brain and release hormones.

E.g. – In situation of iodine deficiency, hypothalamus releases hormones to stimulate pituitary gland, it further sends stimulating hormone to thyroid gland to secrete thyroxin that regulates carbohydrate metabolism.

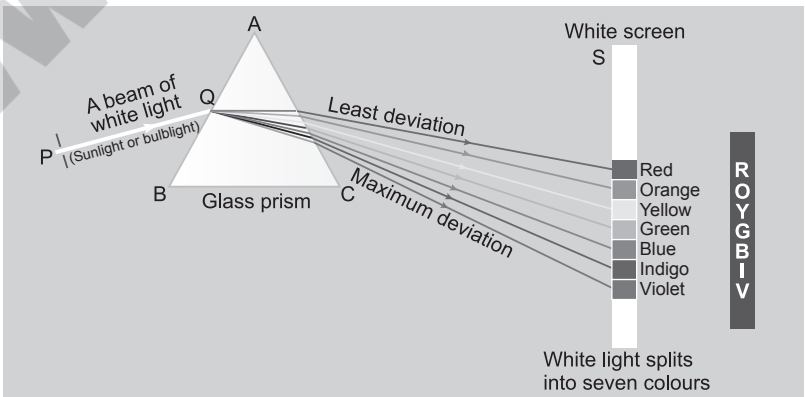
25. **Decomposers:** Microorganisms which break up the dead complex organic matter into simpler form. Example Fungi, Bacteria

Consequences:

(*i*) No nutrient recycling

(*ii*) Natural cleaning will not occur (Natural scavenger)

26. Light is made of different colours. Each colour travels at its own speed and wavelength inside a prism. Therefore, they bend at different angles.



OR

When sunlight passes through the atmosphere, the fine particles in the air scatter the blue colour (short wavelength) more strongly than red. The scattered blue colour enters our eyes.

SECTION–C

27. (*i*) Pb_3O_4 (*ii*) O_2 (*iii*) $CuSO_4$

(*iv*) V_2O_5 (*v*) H_2O (*vi*) CuO

28. When zinc reacts with dilute solution of strong acid, it forms salt and hydrogen gas is evolved.

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$$

When a burning splinter is brought near the mouth of the test tube, the gas burns with a pop sound.

29. The loss of water in the form of vapour from the aerial parts of the plants is known as transpiration.

(*i*) Take a healthy potted plant.

(*ii*) Cover its leaves by a plastic sheet.

(*iii*) Place the plant in bright sunshine for an hour or so and observe it.

You will observe droplets of water on the inner surface of the plastic sheet. This shows that water is lost by leaves through stomata as a result of transpiration.

OR

Maximum absorption occurs in small intestine because

(*i*) digestion is completed in small intestine

(*ii*) inner lining of small intestine is provided with villi which increases the surface area for absorption

(*iii*) wall of intestine is richly supplied with blood vessels which take the absorbed food to each and every cell of the body.

30. Laws of refraction of light:

First law: The incident ray, the refracted ray, and the normal at the point of incidence all lie in the same plane.

Second law (Snell's law): The ratio of sine of angle of incidence to the sine of angle of refraction is a constant for a given pair of media.

i.e., $$\frac{\sin i}{\sin r} = \text{Constant}$$

Absolute refractive index is the ratio of the speed of light in air or vacuum to the speed of light in medium.

i.e., $$n_m = \frac{\text{Speed of light in air or vacuum}}{\text{Speed of light in medium}} = \frac{c}{v}$$

31. $m = -2$

$v = -30$ cm

$u = ?$

$$m = \frac{-v}{u}$$

$$+2 = +\frac{(-30)}{u}$$

$$u = \frac{-30}{2}$$

$u = -15$ cm. The object distance is 15 cm.

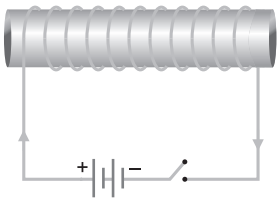
Using Mirror formula, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$$\frac{-1}{30} - \frac{1}{15} = \frac{-15-30}{450} = -\frac{45}{450} = \frac{1}{f}$$

$f = -10$ cm. The focal length is 10 cm .

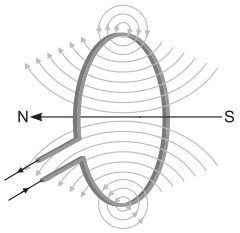
If the object is moved 10 cm towards the mirror, the image will be virtual, erect and the size will be enlarged.

32. The magnetic field produced due to current flowing in a coil or a solenoid can be used to magnetise a material like soft iron temporarily. The insulated copper wire is wrapped on a soft iron piece. When current is passed through the coil using a battery and a key, the iron piece behaves like a bar magnet as long as current is being passed. Such a magnet is called an electromagnet.



OR

At every point of a current carrying circular loop, the concentric circles represent magnetic field around it which become larger as we move away from the wire.



At the center of the loop, these lines appear as straight lines.

33. (*i*) Disposing of biodegradable wastes in biogas plants so that it can help in the preparation of biogas and manure.

(*ii*) Solid wastes should be buried in urban areas as landfills.

(*iii*) Some solid wastes (plastic, paper and metals) should be recycled.

(*iv*) Large amount of waste must be burnt at high temperature (incineration).

SECTION–D

34. X is sodium ethanoate.

Gas evolved is carbon dioxide.

Activity:

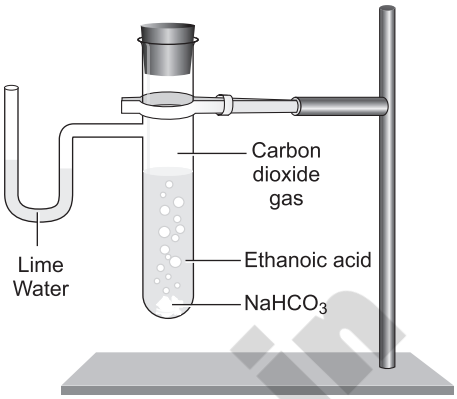
(*i*) Set up the apparatus as shown in the figure.

(*ii*) Take a spatula, full of sodium hydrogen carbonate in a test tube and add 2 mL of dilute ethanoic acid.

(*iii*) We observe that brisk effervescence of a gas is produced in the test tube.

(*iv*) Now pass the gas produced through freshly prepared lime water.

It is observed that lime water turns milky. Only carbon dioxide gas can turn lime water milky. So, this activity proves that when ethanoic acid reacts with sodium hydrogencarbonate, then carbon dioxide is evolved.



$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2\uparrow$$

OR

(*i*) Carbon has a tetrandency but can't gain on lose electrons because:

(*a*) If it gains 4 electrons, it will become C^{4-} negative charge. It is very difficult for 4 protons to hold on to 8 electrons and it becomes unstable.

(*b*) If it loses 4 electrons, it requires a lot of energy to lose it which it can't afford and again becomes unstable.

I. Covalent bonds are formed by sharing of electrons and share them as molecules, so no transfer of electrons or involvement of ions takes place.

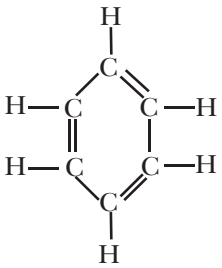
Since ions re responsible for conducting electricity and they do not have free ions. Thus, they are bad conductors of electricity.

e.g., CCl_4, H_2, CH_4 etc.

II. Since the molecules of 2 different elements share electrons, they have weak forces of attraction and weak electrostatic forces due to which their bond can be broken easily.

The bonds are strong within the molecule but inter ionic bonds are weak making them have low melting and boiling points. *e.g.* Napthalance has a melting point of about 80° C.

(*ii*) Benzene = C_6H_6



35. (*i*) Organisms need energy for survival which they obtain from life processes such as nutrition and respiration.

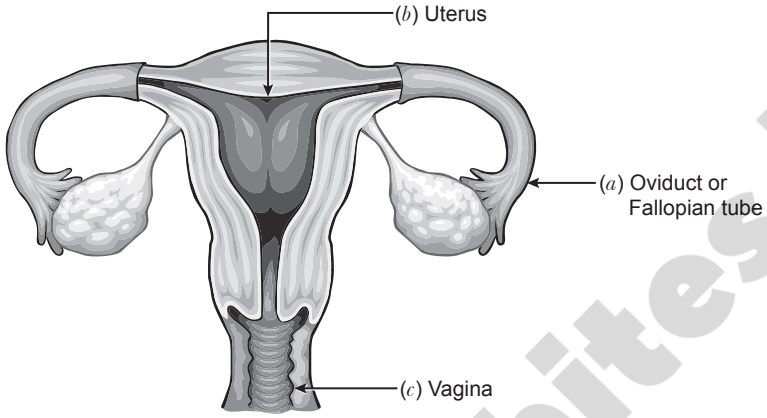
(*ii*) Reproduction needs a lot of energy.

(*iii*) Genetic material is transferred from one generation to the next as a result of reproduction through DNA copying.

(*iv*) DNA copying takes place with high constancy and considerable variations, that is, advantageous to the species for stability in the changing environment**.**

OR

(*i*)



(*a*) Fallopian Tube/Oviduct, (*b*) Uterus, (*c*) Vagina

(*ii*) More people prefer to use condoms because (*a*) it prevents sexually transmitted diseases (STDs), (*b*) it can act as a birth control measure.

Principle: Condoms create a physical barrier and prevent the meeting of sperm and egg.

36. Resistance of a conductor depends upon the following factors:

(*a*) Length of the conductor,

(*b*) Area of cross-section of the conductor,

(*c*) Material of the conductor

(*i*) Material A is best for connecting cords because it has very low resistivity which provides easy path to the flow of current.

(*ii*) Generally, alloys are used in electrical heating devices like electric iron, toaster etc. Metals and alloys have very low resistivity in the range of 10^{-8} Ω m to 10^{-6} Ω m but resistivity of an alloy is generally higher than of its constituent metals. So, material E is used to make heating devices.

(*iii*) **Material A** **Material D**

$\rho_A = 1.6 \times 10^{-8}\ \Omega\ m$ $\rho_D = 96 \times 10^{-8}\ \Omega\ m$

$R_A = 2\ \Omega$ $R_D = ?$

Length and thickness are same for two wires. If thickness is same means area is same for both wires.

We know, $R = \frac{\rho l}{A}$

$$R_A = \frac{\rho_A l}{A} \qquad \ldots(i)$$

$$R_D = \frac{\rho_D l}{A} \qquad \ldots(ii)$$

From (*i*) and (*ii*)

$$\frac{R_A}{R_D} = \frac{\rho_A l}{A} \times \frac{A}{\rho_D l}$$

$$\frac{2\ \Omega}{R_D} = \frac{1.6 \times 10^{-8}\ \Omega\ m}{96 \times 10^{-8}\ \Omega\ m}$$

$$R_D = \mathbf{120\ \Omega}$$

SECTION–E

37. (*i*) At 1 minute. This is largely to do with how much of the reactants are present. At the start of the reaction, when we first put magnesium in the hydrochloric acid, there is 100% of the magnesium to react with. As a result, there will be more successful collisions between the reactant particles.

(*ii*) $Mg + 2HCl \longrightarrow MgCl_2 + H_2$

(*iii*) Reaction rate will increase on replacing magnesium ribbon with magnesium powder as magnesium powder has a large surface area of reaction and hence, more reaction takes place.

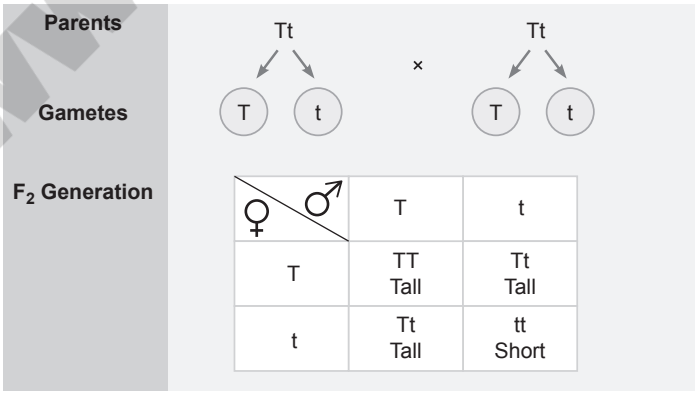
OR

(*iii*) Magnesium metal is being oxidized to magnesium cations, Mg^{2+}. Hydrogen is being reduced from hydrogen ions, H^+, to hydrogen gas, H_2. So we can conclude that the above reaction is a redox reaction.

38. (*i*) The traits are generated by two allelles. Only one allele expresses itself at one time (dominant allele) while the other is masked (recessive allele). There is no blending of traits.

(*ii*) The recessive trait in above case is short plants.

(*iii*) The cross would be as follows:

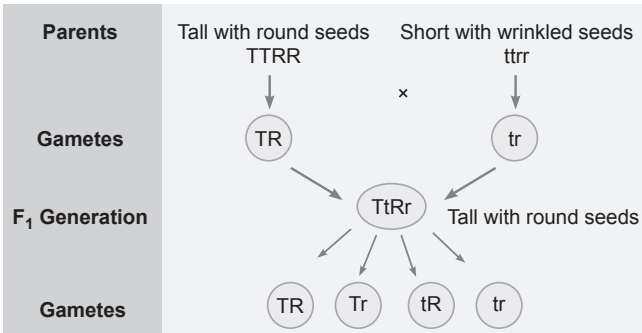


Phenotypic ratio = 3 Tall : 1 Short

Genotypic ratio = 1 TT : 2 Tt : 1 tt

OR

(*iii*) The cross will be depicted as:



F_2 Generation

♀ \ ♂	TR	Tr	tR	tr
TR	TTRR Tall, round	TTRr Tall, round	TtRR Tall, round	TtRr Tall, round
Tr	TTRr Tall, round	TTrr Tall, wrinkled	TtRr Tall, round	Ttrr Tall, wrinkled
tR	TtRR Tall, round	TtRr Tall, round	ttRR Short, round	ttRr Short, round
tr	TtRr Tall, round	Ttrr Tall, wrinkled	ttRr Short, round	ttrr Short, wrinkled

Phenotypic ratio = 9 tall with round seeds : 3 Tall with wrinkled seeds: 3 short with round seeds: 1 short with wrinkled seeds.

(*a*) No. of plants with tall and round seeds = $\frac{9}{16} \times 1600 = 900$

(*b*) No. of plants with short and wrinkled seeds = $\frac{1}{16} \times 1600 = 100$

Conclusion: During gamete formation the alleles segregate independently of each other (Law of segregation). The segregating pairs of alleles assort independently of each other at the time of fertilisation resulting in traits different from the parental traits. (Law of independent assortment)

39. (*i*) The distance from the centre of the lens to the focal point is called the focal length of lens.

(*ii*) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{f} = \frac{1}{30} - \left(\frac{1}{-30}\right)$

$\frac{1}{f} = \frac{1}{30} + \frac{1}{30}$

$\frac{1}{f} = \frac{2}{30}$

$f = \frac{30}{2} = 15$ cm;

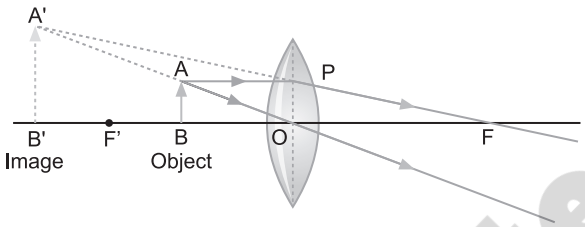
(*iii*) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{v} = \frac{1}{15} + \left(\frac{1}{-90}\right)$

$v = 12.9$ cm

OR

(*iii*)



6 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

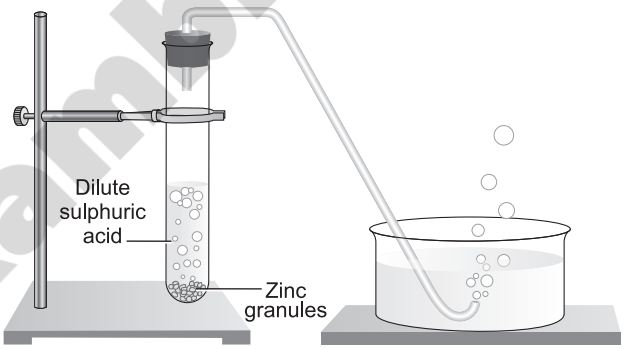
1. Study the diagram given alongside and identify the gas formed in the reaction.

(*a*) Carbon dioxide which extinguishes the burning candle.

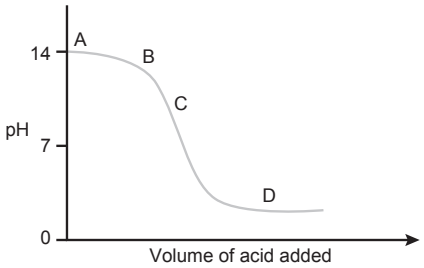
(*b*) Oxygen due to which the candle burns more brightly.

(*c*) Sulphur dioxide which produces a suffocating smell.

(*d*) Hydrogen which while burning produces a popping sound.



2. The graph given below depicts a neutralization reaction (acid + alkali ⟶ salt + water). The pH of a solution changes as we add excess of acid to an alkali.



Which letter denotes the area of the graph where both acid and salt are present?

(*a*) A (*b*) B (*c*) C (*d*) D

3. In the reaction of iron with copper sulphate solution:

$$CuSO_4 + Fe \longrightarrow Cu + FeSO_4$$

Which option in the given table correctly represents the substance oxidised and the reducing agent?

OPTION	Substance Oxidized	Reducing Agent
(*a*)	Fe	Fe
(*b*)	Fe	$FeSO_4$
(*c*)	Cu	Fe
(*d*)	$CuSO_4$	Fe

4. Which of the following are properties of acids?

P. They are bitter in taste.

Q. They react with metals to produce hydrogen gas.

R. They are easily soluble in water.

(*a*) only P (*b*) only P and R

(*c*) only Q and R (*d*) all - P, Q and R

5. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to:

(*a*) absorb the evolved gas (*b*) moisten the gas

(*c*) absorb moisture from the gas (*d*) absorb Cl^- ions from the evolved gas

6. A student adds an equal amount of copper sulphate solution in two beakers. He adds zinc in beaker P and silver in beaker Q. The student observes that the color of the solution in beaker P changes while no change is observed in beaker Q. Which option arranges the metals in increasing order of reactivity?

(*a*) Copper-silver-zinc (*b*) Zinc-copper-silver

(*c*) Silver-copper-zinc (*d*) Silver-zinc-copper

7. $CH_3 - CH_2 - OH \xrightarrow[\text{Heat}]{\text{Alkaline } KMnO_4} CH_3 - COOH$

In the above given reaction, alkaline $KMnO_4$ acts as

(*a*) reducing agent (*b*) oxidising agent

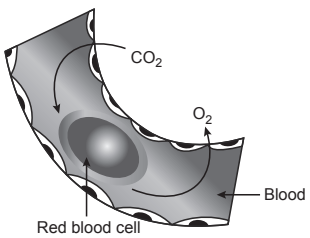
(*c*) catalyst (*d*) dehydrating agent

8. Which one among the following is not removed as a waste product from the body of a plant?

(*a*) Resins and Gums (*b*) Urea (*c*) Dry Leaves (*d*) Excess Water

9. Given below is a diagrammatic representation of a process taking place in the human body.

In which of these regions/organs could it be occurring?



(*i*) lungs (*ii*) heart (*iii*) brain

(*a*) only in (*i*)

(*b*) only in (*ii*)

(*c*) only in (*i*) and (*ii*)

(*d*) in all - (*i*), (*ii*) and (*iii*)

10. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F_2 is

(*a*) 1 : 3 (*b*) 3 : 1 (*c*) 1 : 1 (*d*) 2 : 1

11. Dramatic changes of body features associated with puberty are mainly because of the secretion of

(*a*) oestrogen from testes and testosterone from ovary

(*b*) estrogen from adrenal gland and testosterone from pituitary gland

(*c*) testosterone from testes and estrogen from ovary

(*d*) testosterone from thyroid gland and estrogen from pituitary gland

12. Which option correctly lists the changes that occur in males during puberty?

(*a*)
- thick hair grow on face
- cracking of voice
- enlargement of reproductive organ

(*b*)
- thin hairs growth occurs on the body
- size of the breasts increases
- pitch of the voice increases

(*c*)
- reproductive organs enlarge
- size of the breasts increases
- thick hairs grow on the body

(*d*)
- size of the breasts increases
- beginning of menstruation
- thick hairs grow on the body

13. A conducting wire carries 10^{21} electrons in 4 minutes. What is the current flowing through the wire?

(*a*) 40 A (*b*) 7 A (*c*) 4 A (*d*) 0.7 A

14. For a current in a long straight solenoid N and S poles are created at the two ends. Among the following statement, the incorrect statement is

(*a*) The field lines inside the solenoids are in the form of straight lines which indicate that the magnetic field is same at all points in the solenoid.

(*b*) The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material, when soft iron is placed inside the coil.

(*c*) The pattern of magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.

(*d*) The N and S poles exchange positions when the direction of current through the solenoid is reversed.

15. An electric toaster has a power rating of 200 W. It operates for 1 hour in the morning and 1 hour in the evening. How much does it cost to operate the toaster for 10 days at ₹ 5 per kW h?

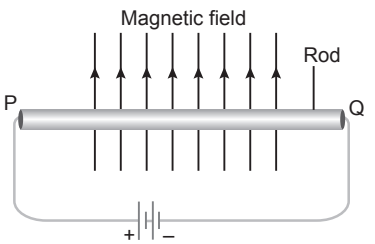
(*a*) ₹ 20 (*b*) ₹ 400 (*c*) ₹ 5000 (*d*) ₹ 10000

16. A metal rod PQ is placed in the magnetic field. The ends of the rod are connected with a battery using wires.

Where will the rod move?

(*a*) Into the field (*b*) Upward

(*c*) Downwards (*d*) Out of the field.



Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : In electrolysis of water, the volume of hydrogen liberated is twice the volume of oxygen formed.

Reason (*R*) : Water (H_2O) has hydrogen and oxygen in the ratio of 1 : 2 by volume.

18. Assertion (*A*) : Plants lack excretory organs.

Reason (*R*) : Plants usually absorb essential nutrients.

19. Assertion (*A*) : Law of independent assortment can be proved only through mono hybrid cross.

Reason (*R*) : In a dihybrid cross, besides the parent combination of traits, two new combinations are formed.

20. Assertion (*A*) : A compass needle is placed near a current carrying wire. The deflection of the compass needle decreases when the magnitude of an electric current in the wire is increased.

Reason (*R*) : Strength of a magnetic field at a point near the conductor increases on increasing the current.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Which among the following are physical or chemical changes?

(*i*) Evaporation of petrol

(*ii*) Burning of Liquefied Petroleum Gas (LPG)

(*iii*) Heating of an iron rod to red hot

(*iv*) Curdling of milk

(*v*) Sublimation of solid ammonium chloride

OR

Which among the following changes are exothermic or endothermic in nature?

(*i*) Decomposition of ferrous sulphate

(*ii*) Dilution of sulphuric acid

(*iii*) Dissolution of sodium hydroxide in water

(*iv*) Dissolution of ammonium chloride in water

22. What is the role of saliva in the digestion of food?

23. What is translocation? Why is it essential for plants?

24. List in tabular form three distinguishing features between cerebrum and cerebellum.

25. The flow of energy between various components of the environment has been extensively studied. Give an outline of the findings.

26. Due to gradual weakening of ciliary muscles and diminishing flexibility of the eye lens a certain defect of vision arises. Write the name of this defect. Name the type of lens required by such persons to improve the vision. Explain the structure and function of such a lens.

OR

(*i*) Why is red used as the stopping light at traffic signals?

(*ii*) Two triangular glass prisms are kept together connected through their rectangular side. A light beam is passed through one side of the combination. Will there be any dispersion? Justify your answer.

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.

(*i*) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.

(*ii*) Name the black substance formed and give its chemical formula.

28. In an industrial process used for the manufacture of sodium hydroxide, a gas 'A' is formed as a by-product. The gas 'A' reacts with lime water to give a compound 'B' which is used as a bleaching agent in the chemical industry. Identify 'A' and 'B'. Also give the chemical equations of the reactions involved.

29. Bile juice does not have any digestive enzyme but still plays a significant role in the process of digestion. Justify the statement.

OR

What are the adaptations of leaf for photosynthesis?

30. A lens produces a magnification of –0.5. Is this a converging or diverging lens? If the focal length of the lens is 6 cm, draw a ray diagram showing the image formation in this case.

31. Size of image of an object formed by a mirror having a focal length of 20 cm, is observed to be reduced to $\frac{1}{3}$rd of its size. At what distance the object has been placed from the mirror? What is the nature of the image and the mirror?

32. Draw the pattern of the field lines of the magnetic field around a current carrying straight conductor passing through and held perpendicular to a horizontal cardboard. State right-hand thumb rule and explain how this rule is useful to determine the direction of the magnetic field in the above case, if the direction of current in the conductor is vertically downwards.

OR

With the help of a labelled diagram, explain the distribution of magnetic field due to a current through a circular loop. Why is it that if a current carrying coil has n turns the field produced at any point is n times as large as that produced by a single turn?

33. How is ozone both beneficial and damaging? How can we prevent the damaging effect of ozone?

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. Why are certain compounds called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

OR

An organic compound A on heating with concentrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O. Identify the compounds A, B and C and write the chemical equations of the reactions involved.

35. Define pollination. Explain the different types of pollination. List two agents of pollination. How does suitable pollination lead to fertilization?

OR

(*i*) Write the reaction that occurs when glucose breaks down anaerobically in yeast.

(*ii*) Write the mechanism by which fishes breathe in water.

(*iii*) Name the balloon like structures present in lungs. List its two functions.

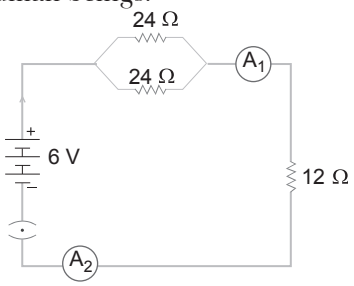
(*iv*) Name the respiratory pigment and write its role in human beings.

36. (*i*) How will you infer with the help of an experiment that the same current flows through every part of the circuit containing three resistors R_1, R_2 and R_3 in series connected to a battery of V volts?

(*ii*) Study the following circuit and find out :

(*a*) Current in 12 Ω resistor.

(*b*) Difference in the readings of A_1 and A_2, if any.



SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. For an internal combustion engine to move a vehicle down the road, it must convert the energy stored in the fuel into mechanical energy to drive the wheels. In your car, the distributor and battery provide this starting energy by creating an electrical "spark", which helps in combustion of fuels like gasoline. Below is the reaction depicting complete combustion of gasoline in full supply of air:

$2C_8H_{18}(l) + 25\ O_2\ (g) \longrightarrow 16\ X + 18\ Y$

(*i*) Identify the types of chemical reaction occurring during the combustion of fuels? Name the product 'X' and 'Y'.

(*ii*) 'Although nitrogen is the most abundant gas in the atmosphere, it does not take part in combustion'. Justify the statement.

(*iii*) 'A student while walking on the road observed that a cloud of black smoke belched out from the exhaust stack of moving trucks on the road.' Give reason.

OR

(*iii*) Write the balanced chemical equations for the following reaction and identify the type of reaction.

Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

38. Sahil performed an experiment to study the inheritance pattern of genes. He crossed tall pea plants (TT) with short pea plants (tt) and obtained all tall plants in F_1 generation.

(*i*) What will be set of genes present in the F_1 generation?

(*ii*) Give reason why only tall plants are observed in F_1 progeny.

(*iii*) When F_1 plants were self-pollinated, a total of 800 plants were produced. How many of these would be tall, medium height or short plants? Give the genotype of F_2 generation.

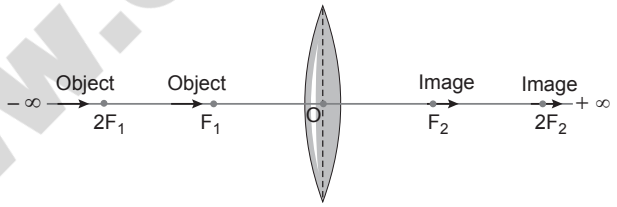
OR

(*iii*) When F_1 plants were cross - pollinated with plants having tt genes, a total of 800 plants were produced. How many of these would be tall, medium height or short plants? Give the genotype of F_2 generation.

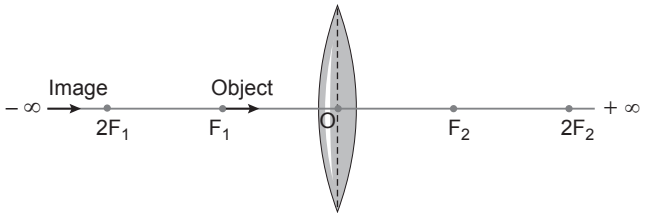
39. The image formed by a convex lens depends on the position of the object in front of the lens. When the object is placed anywhere between focus and infinity, the image formed by convex lens is real and inverted. The image is not obtained on the screen when the object is placed between focus and the lens.

The distance between the optical centre O of the convex lens and the focus point F_1 or F_2 is its focal length.

When the object shifts from $-\infty$ to F_1, the image moves from F_2 to $+\infty$.



When the object shifts from F_1 to O, the image moves from $-\infty$ to O.



A student did an experiment with a convex lens. He put an object at different distances from the lens. In each case he measured the distance of the image from the lens. The results were recorded in the following table.

Object distance (in cm)	25	30	40	60	120
Image distance (in cm)	100	24	60	30	40

Unfortunately his results are written in the wrong order.

(*i*) Arrange the image distance in the correct order (in cm).

(*ii*) Which of the object distances gives the biggest image? Give reason.

(*iii*) Find the focal length of this lens.

OR

(*iii*) What is the minimum distance between an object and its real image formed by a convex lens? Where should an object be placed to get a virtual image by convex lens?

Answers

1. (*d*) **2.** (*d*) **3.** (*a*) **4.** (*c*) **5.** (*c*) **6.** (*c*) **7.** (*b*)

8. (*b*) **9.** (*d*) **10.** (*c*) **11.** (*c*) **12.** (*a*) **13.** (*d*) **14.** (*c*)

15. (*a*) **16.** (*d*) **17.** (*c*) **18.** (*a*) **19.** (*d*) **20.** (*d*)

31. 80 cm (concave), 40 cm (convex) **36.** (*ii*) (*a*) 0.25 A

39. (*iii*) 20 cm

OR

(*iii*) When object is at $2F_1$ then image is formed at $2F_2$ then minimum distance between object and real image is $2F_1 + 2F_2 = 4F$, *i.e.*, ($F_1 = F_2$).

7 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Which of the following are combination reactions?

(*i*) $2KClO_3 \xrightarrow{Heat} 2KCl + 3O_2$ **(*ii*)** $MgO + H_2O \longrightarrow Mg(OH)_2$

(*iii*) $4Al + 3O_2 \longrightarrow 2Al_2O_3$ **(*iv*)** $Zn + FeSO_4 \longrightarrow ZnSO_4 + Fe$

(*a*) (*i*) and (*iii*) (*b*) (*iii*) and (*iv*)

(*c*) (*ii*) and (*iv*) (*d*) (*ii*) and (*iii*)

2. Vinay observed that the stain of curry on a white shirt becomes reddish-brown when soap is scrubbed on it, but it turns yellow again when the shirt is washed with plenty of water. What might be the reason for his observation?

(*i*) Soap is acidic in nature

(*ii*) Soap is basic in nature

(*iii*) Turmeric is a natural indicator which gives reddish tinge in bases

(*iv*) Turmeric is a natural indicator which gives reddish tinge in acids

(*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iii*)

(*c*) (*i*) and (*iv*) (*d*) (*ii*) and (*iv*)

3. A student performs some activities on two substances and records the observations in a table as shown.

Activity	Substance M	Substance N
Cut with a knife	Forms small pieces	Forms small pieces
Beaten with hammer	Shape changes	Changes into powder
Stricken with a metal rod	Makes a sound	Changes into powder

Which option classifies the substances into metals and non-metals?

(*a*) Both the substances are non-metals.

(*b*) Both the substances are metals.

(*c*) Substance M is metal while substance N is non-metal.

(*d*) Substance M is non-metal while substance N is metal.

4. Na^+ has

(*a*) 11 protons, 10 electrons

(*b*) 10 protons, 11 electrons

(*c*) 12 protons, 11 electrons

(*d*) 11 protons, 12 electrons

5. The composition of aqua regia is:

(*A*) DIL. HCl : CONC. HNO_3
3 : 1

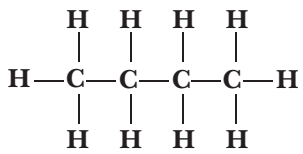
(*B*) CONC. HCl : DIL. HNO_3
3 : 1

(*C*) CONC. HCl : CONC. HNO_3
3 : 1

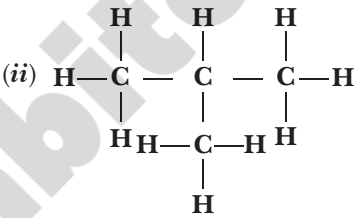
(*D*) DIL. HCl : DIL. HNO_3
3 : 1

6. Which of the following are correct structural isomers of butane?

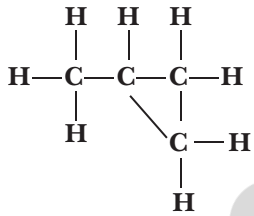
(*i*)



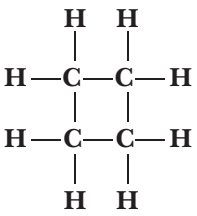
(*ii*)



(*iii*)



(*iv*)



(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*ii*) (*d*) (*iii*) and (*iv*)

7. Which of the following represents saponification reaction?

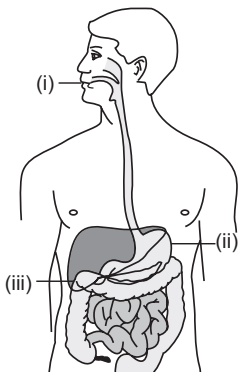
(*a*) $CH_3COONa + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$

(*b*) $CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$

(*c*) $2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2$

(*d*) $CH_3COOC_2H_5 + NaOH \longrightarrow CH_3COONa + C_2H_5OH$

8. Identify the option that indicates the correct enzyme that is secreted in location (*i*), (*ii*) and (*iii*).



(*a*) (*i*)—lipase, (*ii*)—trypsin, (*iii*)—pepsin

(*b*) (*i*)—amylase, (*ii*)—pepsin, (*iii*)—trypsin

(*c*) (*i*)—trypsin, (*ii*)—amylase, (*iii*)—carboxylase

(*d*) (*i*)—permease, (*ii*)—carboxylase, (*iii*)—oxidase

9. When we touch the leaves of "touch-me-not" plant, they begun to fold up and droop. How does the plant communicate the information of touch?

(*a*) The plant uses electrical signals to transfer information from external environment to cells.

(*b*) The plant uses electrical- chemical signals to transfer information from cell to cell.

(*c*) The plant uses electrical- chemical signals to transfer information from tissue to specialized cells.

(*d*) The plant uses electrical signals to transfer information from cell to specialized tissues.

10. Which of the following statement (s) is (are) true about nastic movements?

(*i*) These are slow movements.

(*ii*) These occur either towards or away from the stimulus.

(*iii*) These involve the use of electrochemical signals by the plants.

(*iv*) In such movements, the plant cells change shape by altering their water content.

(*a*) 1 and 2 only (*b*) 1 and 3 only (*c*) 3 and 4 only (*d*) 2 and 4 only

11. Which among the following statements are true for sexual reproduction in flowering plants?

(*i*) It requires two types of gametes.

(*ii*) Fertilisation is a compulsory event.

(*iii*) It always results in formation of zygote.

(*iv*) Offspring formed are clones.

(*a*) (*i*) and (*iv*) (*b*) (*i*), (*iii*) and (*iv*)

(*c*) (*i*), (*ii*) and (*iii*) (*d*) (*i*), (*ii*) and (*iv*)

12. A zygote which has an X-chromosome inherited from the father will develop into a

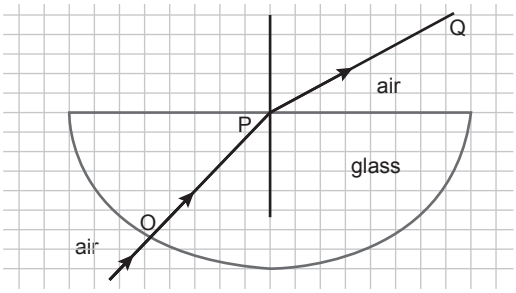
(*a*) Boy

(*b*) Girl

(*c*) X-chromosome does not determine the sex of a child

(*d*) either boy or girl

13.



The angle of incidence from air to glass at the point O on the hemispherical glass slab is

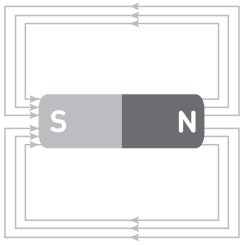
(*a*) 45° (*b*) 0° (*c*) 90° (*d*) 180°

14. Ten identical wires each having a resistance of 1Ω are connected in parallel. The combination will have a resistance of

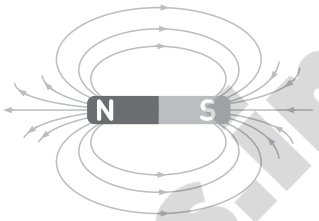
(*a*) 10 Ω (*b*) 1 Ω (*c*) 0.1 Ω (*d*) 0.01 Ω

15. A student learns that magnetic field strength around a bar magnet is different at every point.
Which diagram shows the correct magnetic field lines around a bar magnet?

(*a*)



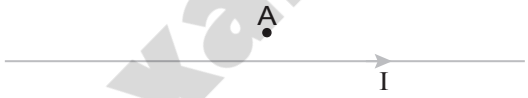
(*b*)



(*c*)

(*d*)

16. What is the direction of magnetic field at a point A above the wire carrying current I as shown in figure?



(*a*) Out of the page (*b*) Into the page

(*c*) Up the page (*d*) Down the page

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*
(*b*) *Both A and R are true and R is not the correct explanation of A.*
(*c*) *A is true but R is false.*
(*d*) *A is false but R is true.*

17. Assertion(*A*) : Fresh milk in which baking soda is added, takes a longer time to set as curd.
Reason (*R*) : Baking soda decreases the pH value of fresh milk to below 6.

18. Assertion(*A*) : Cyton region of nerve fibre collects information for the brain.
Reason (*R*) : Nerve fibres can either have or lack myelin sheath.

19. **Assertion (*A*) :** Clones are offspring of an organism formed by asexual reproduction.
Reason (*R*) : Clones have exact copies of DNA as their parent.

20. **Assertion (*A*) :** Alloys are commonly used in electrical heating devices, like electrical iron, toasters etc.
Reason (*R*) : Alloys do not oxidise (burn) readily at high temperatures.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. State the reason for the following:
(*i*) An iron strip dipped in a blue copper sulphate solution turns the blue solution pale green.
(*ii*) Calcium does not occur in free state in nature.

22. "All plants give out oxygen during day and carbon dioxide during night". Do you agree with this statement? Give reason.

23. In the experiment "To prepare a temporary mount of a leaf peel to show stomata", glycerine and safranin are used. When and why are these two liquids used? Explain.

OR

Trace the path of sperm during ejaculation and mention the gland and their functions associated with the male reproductive system.

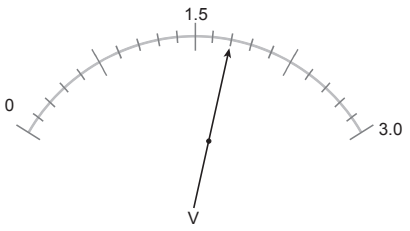
24. List two differences in tabular form between dominant trait and recessive trait. What percentage/proportion of the plants in the F_2 generation/progeny were round, in Mendel's cross between round and wrinkled pea plants?

25. What are the advantages of cloth bags over plastic bags during shopping?

26. Out of two electric bulbs of 50 W – 220 V and 100 W – 220 V, which one will glow brighter when they are connected (*i*) in series, and (*ii*) in parallel?

OR

Consider the scale of a voltmeter shown in the diagram and answer the following questions:
(*i*) What is the least count of the voltmeter?
(*ii*) What is the reading shown by the voltmeter?
(*iii*) If this voltmeter is connected across a resistor of 20 Ω, how much current is flowing through the resistor?



SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Identify the type of each of the following reactions. Also write balanced chemical equation for each reaction.
(*i*) A reaction in which the reaction mixture becomes warm.
(*ii*) A reaction in which an insoluble substance is formed.

OR

(*i*) Which of the following reactions is/are an endothermic reaction(s) where decomposition also happens?

(*a*) Respiration (*b*) Heating of lead nitrate

(*c*) Decomposition of organic matter (*d*) Electrolysis of acidified water

(*ii*) Silver chloride when kept in the open turns grey. Illustrate this with a balanced chemical equation.

28. 3 mL of ethanol is taken in a test tube and warmed gently in a water bath. A 5% solution of alkaline potassium permanganate is added first drop by drop to this solution, then in excess.

(*i*) How is 5% solution of $KMnO_4$ prepared?

(*ii*) State the role of alkaline potassium permanganate in this reaction. What happens on adding it in excess?

(*iii*) Write chemical equation of this reaction.

29. What is feedback mechanism of hormonic regulation? Take the example of insulin to explain this phenomenon.

OR

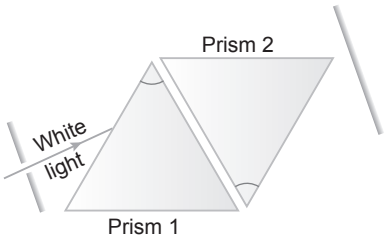
List in tabular form three distinguishing features between cerebrum and cerebellum.

30. If the image formed by a lens for all positions of an object placed in front of it is always erect and diminished, what is the nature of this lens ? Draw a ray diagram to justify your answer. If the numerical value of the power of this lens is 10D, what is its focal length in the Cartesian system ?

31. (*i*) State the relation between colour of scattered light and size of the scattering particle.

(*ii*) The apparent position of an object, when seen through the hot air, fluctuates or wavers. State the basic cause of this observation.

(*iii*) Complete the path of white light when it passes through two identical prisms placed as shown:



32. Write the essential function performed by ozone at the higher levels of the Earth's atmosphere. How is it produced? Name the synthetic chemicals mainly responsible for the drop of amount of ozone in the atmosphere. How can the use of these chemicals be reduced?

33. (*i*) With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.

(*ii*) In an electric circuit two resistors of 12 Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. Give reasons:

(*i*) Reactivity of Al decreases if it is dipped in HNO_3.

(*ii*) Carbon cannot reduce the oxides of Na or Mg.

(*iii*) NaCl is not a conductor of electricity in solid state whereas it does conduct electricity in aqueous solution as well as in molten state.

(*iv*) Iron articles are galvanised.

(*v*) Metals like Na, K, Ca and Mg are never found in their free state in nature.

35. (*i*) Mention any two components of blood.

(*ii*) Trace the movement of oxygenated blood in the body.

(*iii*) Write the function of valves present in between atria and ventricles.

(*iv*) Write one structural difference between the composition of artery and veins.

OR

(*i*) Define excretion.

(*ii*) Name the basic filtration unit present in the kidney.

(*iii*) Draw excretory system in human beings and label the following organs of excretory system which perform following functions:

(*a*) form urine.

(*b*) is a long tube which collects urine from kidney.

(*c*) store urine until it is passed out.

36. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

(*i*) What should be the range of distance of an object placed in front of the mirror?

(*ii*) Will the image be smaller or larger than the object. Draw ray diagram to show the formation of image in this case.

(*iii*) Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also to justify your answer.

Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.

OR

(*i*) Rohit claims to have obtained an image twice the size of object with a concave lens. Is he correct? Give reason for your answer.

(*ii*) Where should an object be placed in case of a convex lens to form an image of same size as of the object? Show with the help of ray diagram the position and the nature of the image formed.

(*iii*) With the help of ray diagram, illustrate the change in position, nature and size of the image formed if the convex lens in case of (***ii***) is replaced by concave lens of same focal length.

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The pH of a solution is a measure of its hydrogen ion (H^+) concentration. It is measured generally using pH scale. The values on pH scale ranges from 0 to 14.

A pH of 1 is very acidic and corresponds to a high concentration of H^+ ions. A pH of

14 is very basic and corresponds to a low concentration of H^+ ions. The pH of a neutral solution is 7. The table given below shows the pH and H^+ ion concentration of some common aqueous solutions. The leftmost column shows the number of moles of H^+ ions in 1 mole of liquid.

The pH and Hydrogen ion (H^+) Concentration of Some Solutions

H^+ Concentration (moles)	pH	Solution
10^{-1}	1	
10^{-2}	2	Gastric (stomach) juice, cola, lemon juice
10^{-3}	3	Vinegar
10^{-4}	4	Tomato juice
10^{-5}	5	Black coffee, rain water
10^{-6}	6	Urine
10^{-7}	7	Pure water
10^{-8}	8	Sea water
10^{-9}	9	Baking soda
10^{-10}	10	
10^{-11}	11	Milk of magnesia
10^{-12}	12	Household bleach
10^{-13}	13	Oven cleaner
10^{-14}	14	

(*i*) How is the hydrogen ion concentration and pH related to each other?

(*ii*) On the basis of above table, arrange the following in the decreasing order of H^+ concentration.

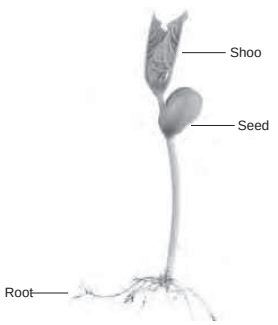
Pure water, tomato juice, milk of magnesia, sea water

(*iii*) A solution of pH 2 is filled in two separate beakers. A few drops of methyl orange and phenolphthalein are added into separate solutions. How will the colour of the indicators change?

OR

(*iii*) Two solutions X and Y have pH values of 3.0 and 9.5 respectively. Which of these will turn litmus solution from blue to red and which will turn phenolphthalein from colourless to pink?

38. The given figure shows how the root and shoot of a seed develop in response to stimull.



(*i*) (*a*) Identify the stimulus that causes the roots to grow in the direction shown in figure.

(*b*) State the name of this response.

(*ii*) (*a*) Identify the stimulus that cause the shoot to grow in the direction shown in figure.

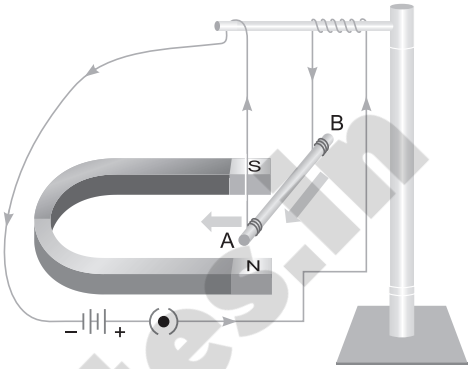
(*b*) State the name of this response.

OR

(*ii*) (*a*) State the name of the plant hormone that causes the root and shoot to develop in the way shown in figure.

(*b*) What is hydrotropism?

39. A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminium rod AB, a strong horse shoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions:



(*i*) Why does the rod get displaced on passing current through it?

(*ii*) State the rule that determines the direction of the force on conductor AB.

(*iii*) (*a*) In the above experimented set up, when current is passed through the rod, it gets displaced towards the left. What will happen to the displacement if the polarity of the magnet and the direction of current both are reversed?

(*b*) Name any two devices that use current carrying conductors and magnetic field.

OR

(*iii*) Draw the pattern of magnetic field lines produced around a current carrying straight conductor held vertically on a horizontal cardboard. Indicate the direction of the field lines as well as the direction of current flowing through the conductor.

Answers

1. (*d*)	**2.** (*b*)	**3.** (*c*)	**4.** (*a*)	**5.** (*c*)	**6.** (*c*)	**7.** (*d*)
8. (*b*)	**9.** (*b*)	**10.** (*c*)	**11.** (*c*)	**12.** (*b*)	**13.** (*b*)	**14.** (*c*)
15. (*b*)	**16.** (*a*)	**17.** (*c*)	**18.** (*d*)	**19.** (*b*)	**20.** (*a*)	

26. OR (*i*) 0.15 A (*ii*) 1.8 V (*iii*) 0.09 A **30.** –10 cm **33.** (*ii*) 1 A

SAMPLE PAPER [UNSOLVED] 8

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Which of the following statements about the reaction given below are correct?

$$MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$$

(*i*) HCl is oxidised to Cl_2 **(*ii*) MnO_2 is reduced to $MnCl_2$**

(*iii*) $MnCl_2$ acts as an oxidizing agent **(*iv*) HCl acts as on oxidizing agent**

(*a*) (*ii*), (*iii*) and (*iv*) (*b*) (*i*), (*ii*) and (*iii*)

(*c*) (*i*) and (*ii*) only (*d*) (*iii*) and (*iv*) only

2. Which of the following salts do not have the water of crystallisation?

(*i*) Bleaching Powder **(*ii*) Plaster of Paris**

(*iii*) Washing soda **(*iv*) Baking soda**

(*a*) (*ii*) and (*iv*) (*b*) (*i*) and (*iii*) (*c*) (*ii*) and (*iii*) (*d*) (*i*) and (*iv*)

3. 2 mL each of concentrated HCl, HNO_3 and a mixture of concentrated HCl and concentrated HNO_3 in the ratio of 3 : 1 were taken in test tubes labelled as A, B and C. A small piece of metal was put in each test tube. No change occurred in test tubes A and B but the metal got dissolved in test tube C respectively. The metal could be:

(*a*) Al (*b*) Au (*c*) Cu (*d*) Pt

4. The table shown below gives information about four substances: A, B, C and D.

Substance	Melting Point (K)	Electrical Conductivity	
		Solid	Liquid/Aqueous
A	295	Good	Good
B	1210	Poor	Good
C	1890	Poor	Good
D	1160	Poor	Poor

Identify ionic compounds from the above given substances.

(*a*) A, B (*b*) B, C (*c*) A, B, D (*d*) A, C, D

5. Although metals form basic oxides, which of the following metals form an amphoteric oxide?

(*a*) Na (*b*) Ca (*c*) Al (*d*) Cu

6. Identify the unsaturated compounds from the following

(*i*) Propane **(*ii*) Propene**

(*iii*) Propyne **(*iv*) Chloropropane**

(*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iv*)

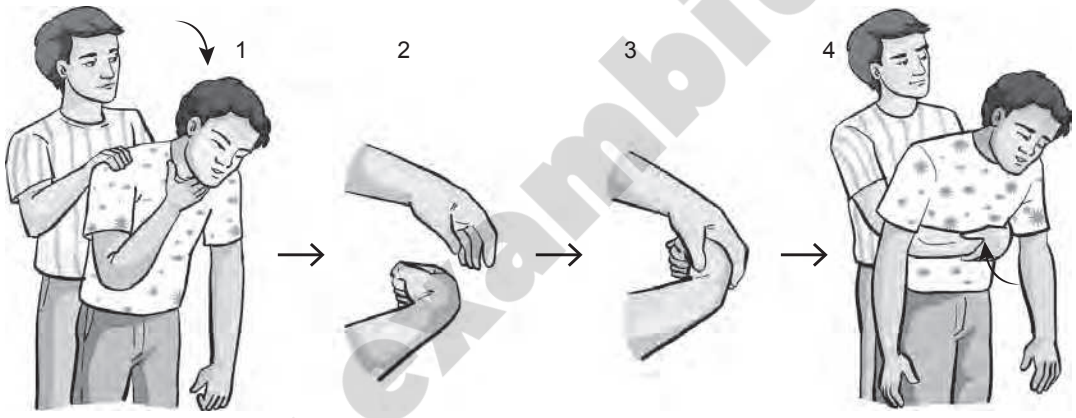
(*c*) (*iii*) and (*iv*) (*d*) (*ii*) and (*iii*)

7. Chlorine reacts with saturated hydrocarbons at room temperature in the

(*a*) absence of sunlight (*b*) presence of sunlight

(*c*) presence of water (*d*) presence of hydrochloric acid

8. A person can choke when a piece of food becomes lodged in the windpipe, blocking the flow of air. A first aid procedure to remove the blockage is the Heimlich manoeuvre described below:



By performing this procedure, the piece of food is pushed out of the windpipe. Which of the following causes this to happen?

(*a*) the expansion of the chest

(*b*) the air pressed out of the lungs

(*c*) the food pressed out of the stomach

(*d*) the upward movement of the wall of the food pipe

9. A doctor advised a person to take an injection of insulin because

(*a*) his blood pressure was low (*b*) his heart was beating slowly

(*c*) he was suffering from goitre (*d*) his sugar level in blood was high

10. The growth of pollen tubes towards ovules is due to

(*a*) hydrotropism (*b*) chemotropism (*c*) geotropism (*d*) phototropism

11. Offsprings formed by asexual method of reproduction have greater similarity among themselves because

(*i*) asexual reproduction involves only one parent

(*ii*) asexual reproduction does not involve gametes

(*iii*) asexual reproduction occurs before sexual reproduction

(*iv*) asexual reproduction occurs after sexual reproduction

(*a*) (*i*) and (*ii*) (*b*) (*i*) and (*iii*) (*c*) (*ii*) and (*iv*) (*d*) (*iii*) and (*iv*)

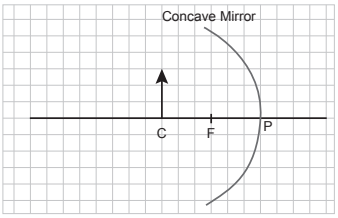
12. In human males all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are

(*i*) large chromosome **(*ii*) small chromosome**

(*iii*) Y-chromosome **(*iv*) X-chromosome**

(*a*) (*i*) and (*ii*) (*b*) (*iii*) only (*c*) (*iii*) and (*iv*) (*d*) (*ii*) and (*iv*)

13. Examine the figure given alongside and state which of the following option is correct? [one small box in the figure is equal to 1 cm]



(*a*) The mirror has a focal length of –6 cm and will produce an image of magnification +1.

(*b*) The mirror has a focal length of –3 cm and will produce an image of magnification –1.

(*c*) The mirror has a focal length of –3 cm and will produce an image of magnification +1.

(*d*) The mirror has a focal length of –6 cm and will produce an image of magnification –1.

14. The resistivity does not change if

(*a*) the material is changed

(*b*) the temperature is changed

(*c*) the shape of the resistor is changed

(*d*) both material and temperature are changed

15. The magnetic field lines due to a straight wire carrying a current are

(*a*) straight (*b*) circular (*c*) parabolic (*d*) elliptical

16. Choose the incorrect statement.

(*a*) Fuse is the most important safety device used for protecting the circuits.

(*b*) The right-hand thumb rule is used to find the direction of magnetic fields due to current carrying conductors.

(*c*) The difference between the direct and alternating currents is that the direct current always flows in one direction whereas the alternating current reverses the direction periodically.

(*d*) In India the ac changes direction after every $\frac{1}{50}$ second.

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. **Assertion (*A*) :** HCl gas does not change the colour of dry blue litmus paper.

Reason (*R*) : HCl gas dissolves in the water present in wet litmus paper to form H^+ ions.

18. **Assertion (*A*) :** The effect of auxin hormone on the growth of root is exactly opposite to that on a stem.

Reason (*R*) : Auxin hormone increases the rate of growth in root and decreases the rate of growth in stem.

19. **Assertion (*A*) :** Testes lie in penis outside the body.

Reason (*R*) : Sperms require temperature lower than the body temperature for development.

20. **Assertion (*A*) :** A cell is a device which converts chemical energy into electrical energy.

Reason (*R*) : Cell maintains a constant potential difference between its terminals for a long time.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. The following reaction takes place when aluminium powder is heated with MnO_2.

$$3MnO_2(s) + 4Al(s) \longrightarrow 3Mn(l) + 2Al_2O_3(l) + \text{Heat}$$

(*i*) Is aluminium getting reduced?

(*ii*) Is MnO_2 getting oxidised?

22. What happens to visible light of the Sun when it falls on chlorophyll?

23. What is a clone? Why do offsprings formed by asexual reproduction exhibit remarkable similarity?

OR

What are the benefits of using mechanical barriers during sexual act?

24. Answer the following:

(*i*) Which hormone is responsible for the changes noticed in females at puberty?

(*ii*) Dwarfism results due to deficiency of which hormone?

(*iii*) Blood sugar level rises due to deficiency of which hormone?

(*iv*) Iodine is necessary for the synthesis of which hormone?

25. In the following food chain, only 2J of energy was available to the peacocks. How much energy would have present in Grass? Justify your answer.

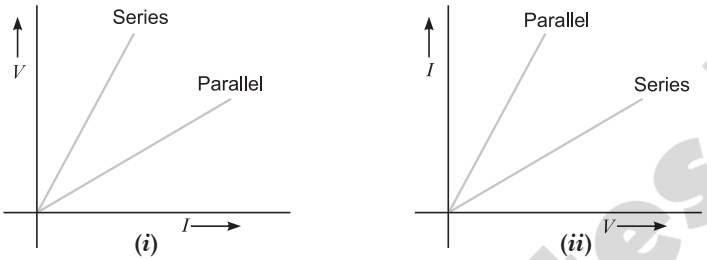
GRASS → GRASS HOPPER → FROG → SNAKE → PEACOCK

26. Two wires of equal length, one of copper and the other of manganin (an alloy) have the same thickness. Which one can be used for (*i*) electrical transmission lines (*ii*) electrical heating devices? Why?

OR

Two students perform the experiment on series and parallel combinations of two given resistors R_1 and R_2 and plot the following V-I graphs (*i*) and (*ii*).

Which of the graphs is (are) correctly labelled in terms of the words 'series' and 'parallel'? Justify your answer.



SECTION–C

Q.No. 27 to 33 are short answer questions.

27. 2 g of ferrous sulphate crystals are heated in a dry boiling tube.

(*i*) List any two observations.

(*ii*) Name the type of chemical reaction taking place.

(*iii*) Write balanced chemical equation for the reaction and name the products formed.

OR

A shining metal 'M', on burning gives a dazzling white flame and changes to a white powder 'N'.

(*i*) Identify 'M' and 'N'.

(*ii*) Represent the above reaction in the form of a balanced chemical equation.

(*iii*) Does 'M' undergo oxidation or reduction in this reaction? Justify.

28. How would you bring about the following conversions? Name the process and write the reaction involved.

(*i*) Ethanol to ethene

(*ii*) Propanol to propanoic acid

29. What are the advantages of the fact that most reflex actions are governed by spinal cord?

OR

Define geotropism. Draw a labelled diagram of a plant showing geotropic movements of its parts.

30. (*i*) What possible phenomenon can happen when light falls on a surface?

(*ii*) State the laws of refraction of light. If the speed of light in vacuum is 3×10^8 m/s, find the absolute refractive index of a medium in which light travels with a speed of 1.4×10^8 m/s.

31. (*i*) What is visible spectrum?

(*ii*) Why is red used as the stopping light at traffic signals?

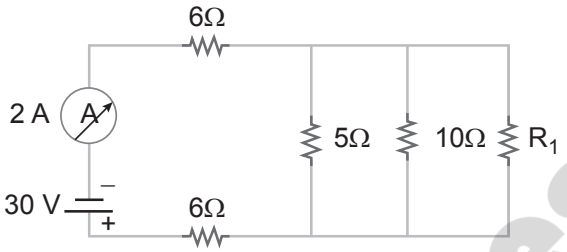
(*iii*) Two triangular glass prisms are kept together connected through their rectangular side. A light beam is passed through one side of the combination. Will there be any dispersion? Justify your answer.

32. Gas A, found in the upper layers of the atmosphere, is a deadly poison but is essential for all living beings. The amount of this gas started declining sharply in the 1980s.

(*i*) Identify Gas A. How is it formed at higher levels of the atmosphere?

(*ii*) Why is it essential for all living beings? State the cause for the depletion of this gas.

33.



In the above circuit, if the current reading in the ammeter A is 2A, what would be the value of R_1?

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. (*i*) What is thermit process? Where is this process used? Write balanced chemical equation for the reaction involved.

(*ii*) Where does the metal aluminium, used in the process, occurs in the reactivity series of metals?

(*iii*) Name the substances that are getting oxidised and reduced in the process.

35. (*i*) Why is there a difference in the rate of breathing between aquatic organisms and terrestrial organisms? Explain.

(*ii*) Draw a diagram of human respiratory system and label–pharynx, trachea, lungs, diaphragm and alveolar sac on it.

OR

(*i*) How do leaves of plants help in excretion ? Explain briefly.

(*ii*) Describe the structure and function of a nephron.

36. An object is placed at a distance of 30 cm from a concave lens of focal length 30 cm

(*i*) Use lens formula to determine the distance of the image from the lens.

(*ii*) List four characteristics of the image (nature position, size, erect/inverted) in this case.

(*iii*) Draw a labelled diagram to justify your answer of part (***ii***)

OR

A convex mirror used for rear-view on an automobile has a radius of curvature of 3.00 m. If a bus is located at 5.00 m from this mirror, find the position, nature and size of the image.

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The pH values of many common liquids are given in the table below.

Substance	pH
Battery acid	< 1.0
Lemon juice	2.4
Apple juice	3.5
Black tea	5.5
Milk	6.5
Human saliva	7.5
Soap	9.0–10.0
Ammonia	11.5

Substance	pH
Stomach acid	2.0
Cola	2.5
Black coffee	5.0
Acid rain	5.6
Distilled water	7.0
Sea water	8.0
Milk of magnesia	10.5
Bleach	12.5

Study the table and answer the questions that follow:

(*i*) Amit has black coffee with milk. What will be the pH of the resulting mixture?

(*ii*) Which of the following would be the best for a person suffering from acidity from above table?

(*iii*) (*a*) Arrange the following in the increasing order of acidic strength.

Gastric juice, milk, lemon juice.

(*b*) Why does tooth decay start when the pH of mouth is lower than 5.5?

OR

(*iii*) If someone is suffering from the problem of acidity after overeating; which of the following would you suggest as a remedy? Give reason.

Lemon juice, Baking soda solution or Vinegar.

38. A receptor is a specialised cell or a group of cells in a sense organ that perceive a particular type of stimulus in the environment like light, heat, pressure, etc. Different sense organs have different receptors for detecting different stimuli.

Name of Receptors	Stimulus	Location in our body
Photoreceptors	Light	Eyes
Phonoreceptors	Sound	Inner Ears
Olfactory receptors	Smell	Nose
Gustory receptors	Taste	Tongue
Thermoreceptors	Heat/Cold	Skin
Tangoreceptors	Touch	Skin

Receptors are either neuron endings or specialised cells that are in close contact with neuron endings to perceive information about their external or internal environments. The receptor cells receive stimuli from the environment and transform these excitations into electro-chemical impulse. Therefore, all the receptors in various sense organs receive stimuli from the surrounding environment and send messages to the spinal cord and brain through sensory nerves. Another type of nerve cells called motor nerves transmit the response from the sensory organs to central nervous system towards effectors, in the form of electrical impulse.

(*i*) What is a nerve impulse?

(*ii*) What will be the path followed by a nerve impulse on hearing a sound?

(*iii*) What is an axon?

OR

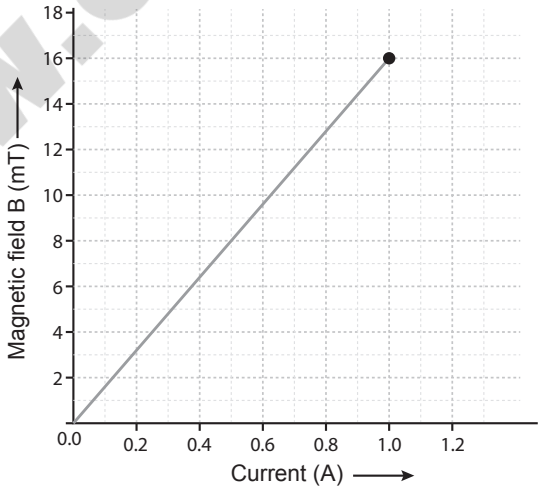
(*iii*) Name one gustatory receptor and one olfactory receptor present in human beings.

39. A solenoid is a long helical coil of wire through which a current is run in order to create a magnetic field. The magnetic field of the solenoid is the superposition of the fields due to the current through each coil. It is nearly uniform inside the solenoid and close to zero outside and is similar to the field of a bar magnet having a north pole at one end and a south pole at the other depending upon the direction of current flow.

The magnetic field produced in the solenoid is dependent on a few factors such as, the current in the coil, number of turns per unit length etc.

The following graph is obtained by a researcher while doing an experiment to see the variation of the magnetic field with respect to the current in the solenoid.

The unit of magnetic field as given in the graph attached is in milli-tesla (mT) and the current is given in ampere.



(*i*) What type of energy conversion is observed in a linear solenoid? After analysing the graph, what can be concluded?

(*ii*) What will happen if a soft iron bar is placed inside the solenoid?

OR

(*ii*) What kind of magnetic field is produced by a current carrying solenoid?

Answers

1. (*c*) **2.** (*d*) **3.** (*b*) **4.** (*b*) **5.** (*c*) **6.** (*d*) **7.** (*b*)
8. (*b*) **9.** (*d*) **10.** (*b*) **11.** (*a*) **12.** (*c*) **13.** (*b*) **14.** (*c*)
15. (*b*) **16.** (*d*) **17.** (*a*) **18.** (*c*) **19.** (*d*) **20.** (*b*)
30. (*ii*) 2.14 **33.** 30 ohm **36.** (*i*) –15 cm **OR** $v = +1.15$ m, $m = +0.23$

9 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following is (are) true about slaking of lime and the solution formed?

(*i*) It is an endothermic reaction

(*ii*) It is an exothermic reaction

(*iii*) The pH of the resulting solution will be more than seven

(*iv*) The pH of the resulting solution will be less than seven

(*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iii*)

(*c*) (*i*) and (*iv*) (*d*) (*iii*) and (*iv*)

2. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?

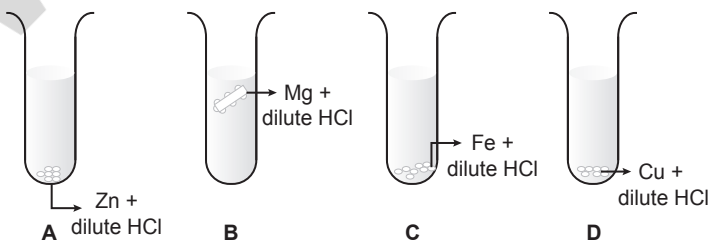
(*a*) Wash the hand with saline solution.

(*b*) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogencarbonate.

(*c*) After washing with plenty of water, apply solution of sodium hydroxide on the hand.

(*d*) Neutralise the acid with a strong alkali.

3. The diagram shows the reaction between metal and dilute acid.



What is the reason for different behaviour of Mg in test tube B?

(*a*) Mg is lighter element than dil. HCl

(*b*) Mg reacts with dil. HCl to produce H_2 gas which helps in floating

(*c*) Mg reacts with dil. HCl to produce N_2 gas which helps in floating

(*d*) Mg reacts with dil. HCl to produce CO_2 gas which helps in floating

4. Which one of the following structures correctly depicts the compound $CaCl_2$?

(*a*) $Ca^{2+}\left[\cdot\underset{\times}{\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}}\cdot\right]^{2-}$

(*b*) $\left[\times\underset{\times\times}{\overset{\times\times}{Ca}}\times\right]^{2+}\left[\cdot\underset{\times}{\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}}\cdot\right]_2$

(*c*) $Ca^{2+}\left[\cdot\underset{\times}{\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}}\cdot\right]_2^{-}$

(*d*) $\left[\times\underset{\times\times}{\overset{\times\times}{Ca}}\times\right]^{+}\left[\cdot\underset{\times}{\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}}\cdot\right]_2^{-}$

5. Generally, non-metals are not conductors of electricity. Which of the following is a good conductor of electricity?

(*a*) Diamond (*b*) Graphite (*c*) Sulphur (*d*) Fullerene

6. The hetero atoms present in $CH_3—CH_2—O—CH_2—CH_2—Cl$ are

(*i*) Oxygen (*ii*) Carbon (*iii*) Hydrogen (*iv*) Chlorine

(*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iii*) (*c*) (*iii*) and (*iv*) (*d*) (*i*) and (*iv*)

7. $CH_3 — CH_2 — OH \xrightarrow[\text{Heat}]{\text{Alkaline } KMnO_4} CH_3 — COOH$

In the above given reaction, alkaline $KMnO_4$ acts as

(*a*) reducing agent (*b*) oxidising agent

(*c*) catalyst (*d*) dehydrating agent

8. Which of the following is most appropriate for aerobic respiration?

(*a*) Glucose $\xrightarrow{\text{Mitochondria}}$ Pyruvate $\xrightarrow{\text{Cytoplasm}}$ $CO_2 + H_2O$ + Energy

(*b*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate $\xrightarrow{\text{Mitochondria}}$ $CO_2 + H_2O$ + Energy

(*c*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate + Energy $\xrightarrow{\text{Mitochondria}}$ $CO_2 + H_2O$

(*d*) Glucose $\xrightarrow{\text{Cytoplasm}}$ Pyruvate + Energy $\xrightarrow{\text{Mitochondria}}$ $CO_2 + H_2O$ + Energy

9. Spinal cord originates from

(*a*) cerebrum (*b*) medulla (*c*) pons (*d*) cerebellum

10. Match the terms of Column (A) with these of Column (B):

Column A	Column B
A.Olfactory receptors	(*i*) Tongue
B.Thermoreceptors	(*ii*) Eye
C.Gustatory receptors	(*iii*) Nose
D.Photoreceptors	(*iv*) Skin

(*a*) A–(*iii*), B–(*iv*), C–(*i*), D–(*ii*) (*b*) A–(*ii*), B–(*iii*), C–(*iv*), D–(*i*)

(*c*) A–(*iv*), B–(*iii*), C–(*ii*), D–(*i*) (*d*) A–(*i*), B–(*ii*), C–(*iii*), D–(*iv*)

11. In the list of organisms given below, those that reproduce by the asexual method are

(*i*) banana **(*ii*) dog** **(*iii*) yeast** **(*iv*) *Amoeba***

(*a*) (*ii*) and (*iv*) (*b*) (*i*), (*iii*) and (*iv*) (*c*) (*i*) and (*iv*) (*d*) (*ii*), (*iii*) and (*iv*)

12. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F_2 is

(*a*) 1 : 3 (*b*) 3 : 1 (*c*) 1 : 1 (*d*) 2 : 1

13. Consider these indices of refraction: glass: 1.52; air: 1.0003; water: 1.333. Based on the refractive indices of three materials, arrange the speed of light through them in decreasing order.

(*a*) The speed of light in water > the speed of light in air > the speed of light in glass.

(*b*) The speed of light in glass > the speed of light in water > the speed of light in air.

(*c*) The speed of light in air > the speed of light in water > the speed of light in glass.

(*d*) The speed of light in glass > the speed of light in air > the speed of light in water.

14. At the time of short circuit, the electric current in the circuit

(*a*) very continuously (*b*) does not change

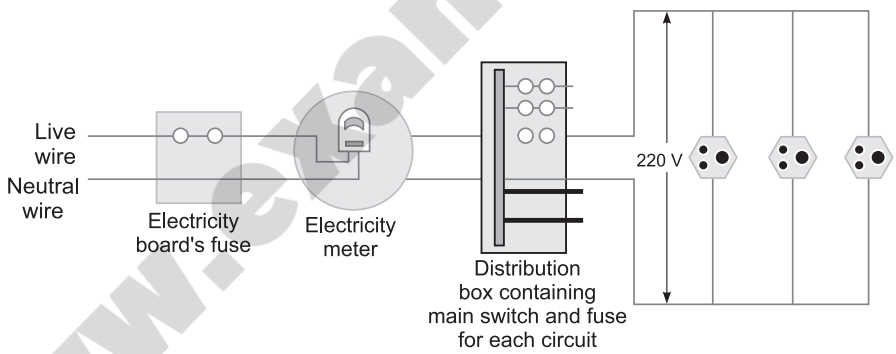
(*c*) reduces substantially (*d*) increases heavily

15. The magnetic field lines due to a straight wire carrying a current are

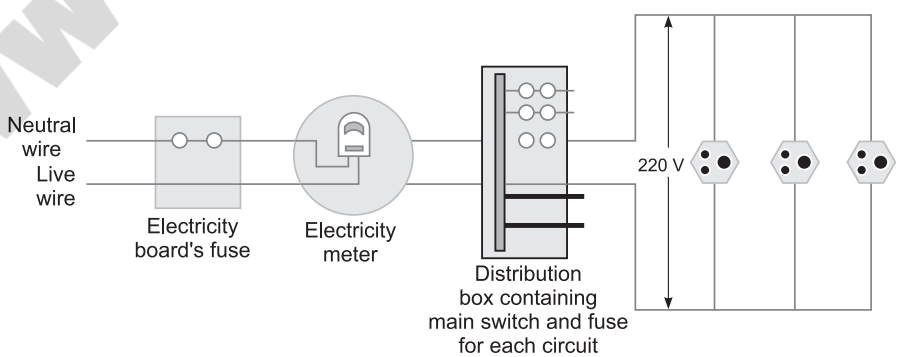
(*a*) straight (*b*) circular (*c*) parabolic (*d*) elliptical

16. Which diagram shows the domestic electric circuit?

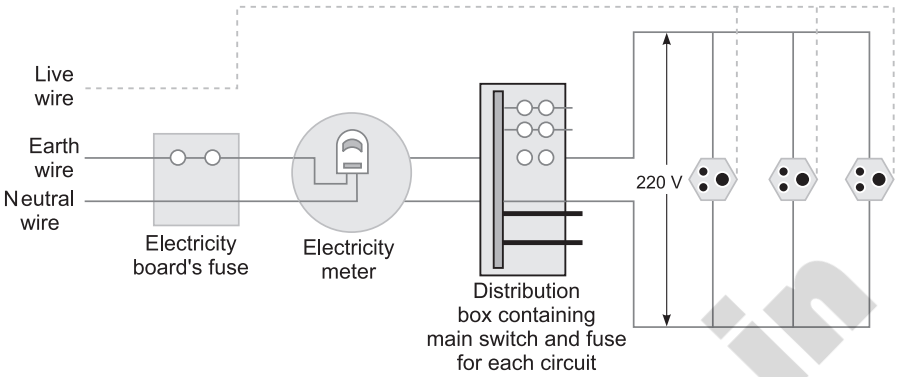
(*a*)



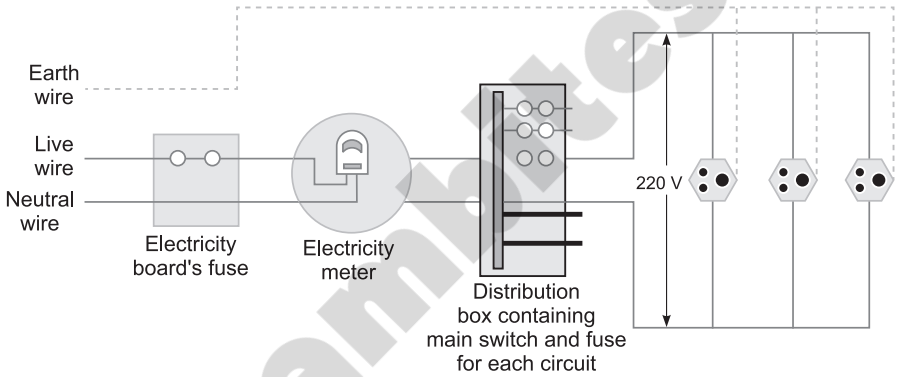
(*b*)



(*c*)



(*d*)



Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Copper sulphate crystals are wet because it contains water of crystallisation.

Reason (*R*) : Water of crystallisation is the fixed number of molecules of water present in one formula unit of salt.

18. Assertion (*A*) : Insulin regulates blood sugar level.

Reason (*R*) : Insufficient secretion of insulin will cause diabetes.

19. Assertion (*A*) : Colonies of yeast multiply in sugar solution.

Reason (*R*) : Sugar is made of sucrose which provides energy for sustaining all life activities.

20. Assertion (*A*) : If a graph is plotted between the potential difference and the current flowing, the graph is a straight line passing through the origin.

Reason (*R*) : The current is directly proportional to the potential difference.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. What happens when:

(*i*) $ZnCO_3$ is heated in the absence of oxygen?

(*ii*) a mixture of Cu_2O and Cu_2S is heated?

22. Why do veins have thin walls as compared to arteries?

23. What changes are observed in the uterus subsequent to implantation of young embryo?

OR

In a germinating seed, which parts are known as future shoot and future root? Mention the function of cotyledon.

24. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.

25. (*i*) What is meant by garbage? List two classes into which garbage is classified.

(*ii*) What do we actually mean when we say that the "enzymes are specific in their action"?

26. What is electrical resistivity? In a series electrical circuit comprising of a resistor having a metallic wire, the ammeter reads 5 A. The reading of the ammeter decreases to half when the length of the wire is doubled. Why?

OR

Why does an electric bulb become dim when an electric heater in parallel circuit is switched on? Why does dimness decrease after sometime?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. A compound 'A' is used in the manufacture of cement. When dissolved in water, it evolves a large amount of heat and forms compound 'B'.

(*i*) Identify A and B.

(*ii*) Write chemical equation for the reaction of A with water.

(*iii*) List two types of reaction in which this reaction may be classified.

OR

Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(*i*) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.

(*ii*) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.

(*iii*) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.

(*iv*) Ethanol is burnt in air to form carbon dioxide, water and releases heat.

28. What is meant by functional group in carbon compounds? Write in tabular form the structural formula and the functional group present in the following compounds:

(*i*) Ethanol

(*ii*) Ethanoic acid

29. (*i*) Plants do not have any nervous system but yet, if we touch a sensitive plant, some observable changes take place in its leaves. Explain how could this plant respond to the external stimuli and how it is communicated.

(*ii*) Name the hormone that needs to be administered to

(*a*) increase the height of a dwarf plant.

(*b*) cause rapid cell division in fruits and seeds.

OR

Write in tabular form the location and function of the hormones secreted by each of the following glands present in the human body:

(*i*) Pituitary gland

(*ii*) Thyroid gland

(*iii*) Pancreas

30. An object is placed at a distance of 10 cm from a convex mirror of focal length 5 cm.

(*i*) Draw a ray diagram showing the formation of image.

(*ii*) State two characteristics of the image formed.

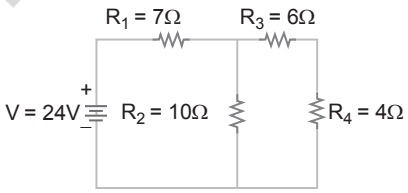
(*iii*) Calculate the distance of the image from mirror.

31. When do we consider a student sitting in the class to be myopic? List two causes of this defect.

32. (*i*) We do not clean ponds or lakes, but an aquarium needs to be cleaned regularly. Why?

(*ii*) Why is ozone layer getting depleted at the higher levels of the atmosphere? Mention one harmful effect caused by its depletion.

33.



Calculate the total resistance of the circuit and find the total current in the circuit.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. A non-metal A, is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming.

(*i*) Identify A, B and C

(*ii*) To which group of Periodic Table does A belong?

35. Design an activity to show that chlorophyll is essential for photosynthesis.

OR

(*i*) Describe aerobic respiration.

(*ii*) Describe the process of anaerobic respiration.

36. (*i*) To construct a ray diagram we use two rays which are so chosen that it is easy to know their directions after reflection from the mirror. List two such rays and state the path of these rays after reflection in case of concave mirrors. Use these two rays and draw ray diagram to locate the image of an object placed between pole and focus of a concave mirror.

(*ii*) A concave mirror produces three times magnified image on a screen. If the object is placed 20 cm in front of the mirror, how far is the screen from the object?

OR

Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.

(*i*) State the nature of the lens and reason for its use.

(*ii*) Where should the palmist place/hold the lens so as to have a real and magnified image of an object?

(*iii*) If the focal length of this lens is 10 cm and the lens is held at a distance of 5 cm from the palm, use lens formula to find the position and size of the image.

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The primary reason behind the formation of the toxic foam is high phosphate content in the wastewater because of detergents used in dyeing industries, *dhobi ghat* and households. Yamuna's pollution level is so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.

Study the passage and answer the questions that follow:

(*i*) Give an idea about the pH value of the water of river Yamuna if the reason of froth is high content of detergents dissolved in it. What does it tell us about the concentration of hydroxide ion and hydronium ion?

(*ii*) The table provides the pH value of four solutions P, Q, R and S

Solution	pH value
P	2
Q	9
R	5
S	11

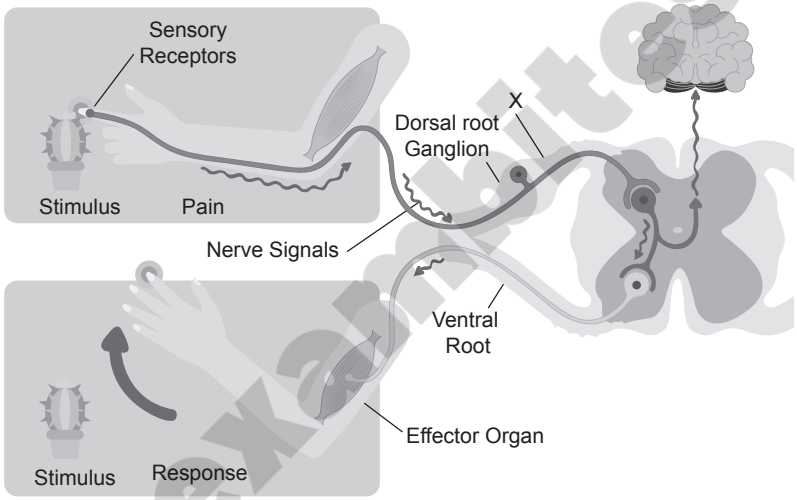
Arrange the solutions in increasing order of their hydronium ion concentration.

OR

(*ii*) What is the effect of high content of phosphate ion in river Yamuna?

38. Reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain. Thus, a reflex action is the one which we perform automatically. It is a comparatively simple form of behaviour in which the same stimulus produces the same response every time. If we unknowingly touch a hot plate, we immediately move our hand away from it. Moving our hand away on touching a hot plate is an example of reflex action. In a reflex action, we are unaware of what is going to happen to us and are done without thinking. How do we respond to it? We respond to it by the process of detecting the signal or the input and responding to it by an output action. Such a connection is commonly called a reflex arc. Nerves from all over the body meet in a bundle in the spinal cord on their way to the brain. Reflex arcs are formed in this spinal cord itself, although the information input also goes on to reach the brain.

The given figure represents the path of message from the receptor to the effector.



(*i*) In the given figure, identify "X" and its function.

(*ii*) Define reflex arc.

(*iii*) Explain four stages in a reflex action using the above figure.

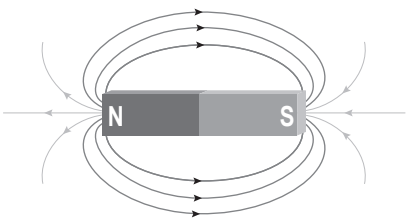
OR

(*iii*) Sweating and breathing are not reflex actions. Justify this statement.

39. When magnet is brought into the field of another magnet, the field interacts with each pole of the magnet and each of these poles experience magnetic force.

The space surrounding a magnet where a magnetic force is experienced is called magnetic field.

A magnetic field line is a continuous curve in a magnetic field such that the tangent at any point on it gives the direction of magnetic field at that point.



(*i*) Magnetic field is produced by the flow of current in a straight wire. Who discovered this phenomenon and what is the SI unit of magnetic field?

(*ii*) Where is the magnetism minimum in a bar magnet?

(*iii*) Meena draws magnetic field lines of field close to the axis of a current-carrying circular loop. As she moves away from the centre of the circular loop she observes that the lines keep on diverging. How will you explain her observation?

OR

(*iii*) How can it be proved that a magnetic field exists around a current carrying metallic wire?

Answers

1. (*b*)	**2.** (*b*)	**3.** (*b*)	**4.** (*c*)	**5.** (*b*)	**6.** (*d*)	**7.** (*b*)
8. (*d*)	**9.** (*b*)	**10.** (*a*)	**11.** (*b*)	**12.** (*c*)	**13.** (*c*)	**14.** (*d*)
15. (*b*)	**16.** (*d*)	**17.** (*d*)	**18.** (*a*)	**19.** (*a*)	**20.** (*a*)	

30. (*iii*) 3.3 cm

33. 12 ohm, 2 A

36. (*ii*) 40 cm **OR** (*iii*) –10 cm

SAMPLE PAPER [UNSOLVED] 10

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

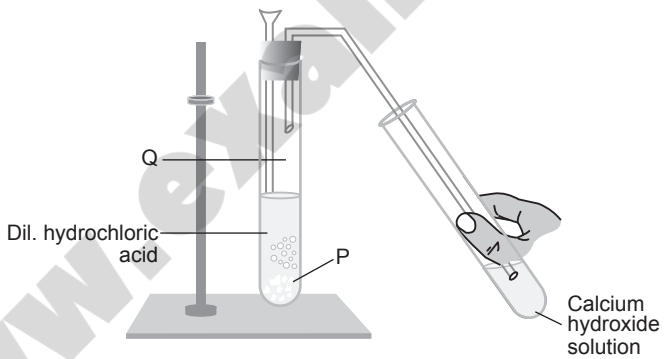
***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Which one of the following reactions is categorised as thermal decomposition reaction?

(*a*) $2H_2O(l) \longrightarrow 2H_2(g) + O_2(g)$ (*b*) $2AgBr(s) \longrightarrow 2Ag(s) + Br_2(g)$

(*c*) $2AgCl(s) \longrightarrow 2Ag(s) + Cl_2(g)$ (*d*) $CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$

2. Study the experimental set up shown in given figure and choose the correct option from the following:



	P	Q	Change observed in calcium hydroxide solution
(*a*)	K_2CO_3	Cl_2 gas	No change
(*b*)	$KHCO_3$	CO_2 gas	No change
(*c*)	$KHCO_3$	H_2 gas	Turns milky
(*d*)	K_2CO_3	CO_2 gas	Turns milky

3. What happens when calcium is treated with water?

(*i*) It does not react with water.

(*ii*) It reacts violently with water.

(*iii*) It reacts less violently with water.

(*iv*) Bubble of hydrogen gas formed stick to the surface of calcium.

(*a*) (*i*) and (*iv*) (*b*) (*ii*) and (*iii*)

(*c*) (*i*) and (*ii*) (*d*) (*iii*) and (*iv*)

4. A student adds an equal amount of copper sulphate solution in two beakers. He adds zinc in beaker P and silver in beaker Q. The student observes that the color of the solution in beaker P changes while no change is observed in beaker Q. Which option arranges the metals in increasing order of reactivity?

(*a*) Copper-silver-zinc (*b*) Zinc-copper-silver

(*c*) Silver-copper-zinc (*d*) Silver-zinc-copper

5. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, *e.g.*, hydrogen. After the formation of four bonds, carbon attains the electronic configuration of

(*a*) helium (*b*) neon (*c*) argon (*d*) krypton

6. Which is the correct sequence of parts in human alimentary canal?

(*a*) Mouth → stomach → small intestine → oesophagus → large intestine

(*b*) Mouth → oesophagus → stomach → large intestine → small intestine

(*c*) Mouth → stomach → oesophagus → small intestine → large intestine

(*d*) Mouth → oesophagus → stomach → small intestine → large intestine

7. A few drops of iodine solution were added to rice water. The solution turned blue-black in colour. This indicates that rice water contains

(*a*) complex proteins (*b*) simple proteins

(*c*) fats (*d*) starch

8. Which of the following statements is correct about receptors?

(*a*) Gustatory receptors detect taste while olfactory receptors detect smell.

(*b*) Both gustatory and olfactory receptors detect smell.

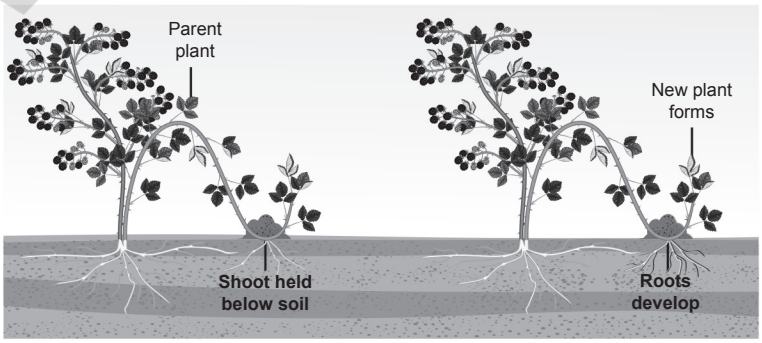
(*c*) Auditory receptors detect smell and olfactory receptors detect test.

(*d*) Olfactory receptors detect taste and gustatory receptors smell.

9. In *Rhizopus*, tubular, thread-like structures bearing sporangia at their tips are called

(*a*) filaments (*b*) hyphae (*c*) rhizoids (*d*) roots

10. The image shows the process of vegetative propagation in a plant.



The shoot of the parent plant is pushed below the soil that results in growth of a new plant.

What is the advantage of this process?

(*a*) this results in plant of different flowers

(*b*) this helps grow plants without adding extra manure

(*c*) this eliminates the need of producing plant using seeds

(*d*) this allows growth of plants with new genetic composition

11. The table lists some components of an ecosystem.

❍ **Rain**	❍ **Water**
❍ **Butterfly**	❍ **Air**
❍ **Grass**	❍ **Bacteria**
❍ **Fungi**	❍ **Sunlight**

A student wants to classify these into abiotic components from biotic components separately. Which option correctly shows the classification done by the student?

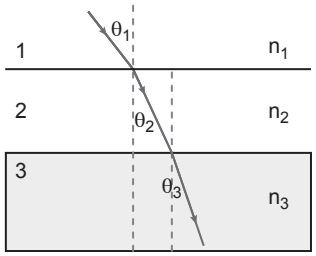
(*a*)	**Biotic Component**	**Abiotic Component**
	Rain, grass, bacteria, fungi	Water, fungi, sunlight, air

(*b*)	**Biotic Component**	**Abiotic Component**
	Air, grass, butterfly, fungi	Water, fungi, sunlight, rain

(*c*)	**Biotic Component**	**Abiotic Component**
	Grass, bacteria. fungi, butterfly	Water, rain, sunlight, air

(*d*)	**Biotic Component**	**Abiotic Component**
	Rain, grass, bacteria, fungi	Water, butterfly, sunlight, air

12.

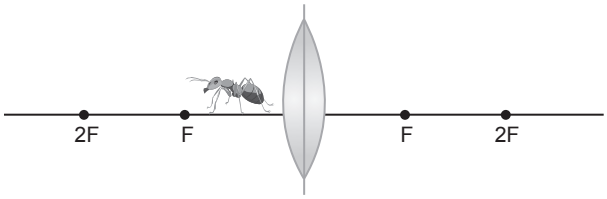


In the diagram shown above n_1, n_2 and n_3 are refractive indices of the media 1, 2 and 3 respectively. Which one of the following is true in this case?

(*a*) $n_1 = n_2$ (*b*) $n_1 > n_2$

(*c*) $n_2 > n_3$ (*d*) $n_3 > n_1$

13. An ant was in front of a convex lens as shown below.



Which of the following image is correct?

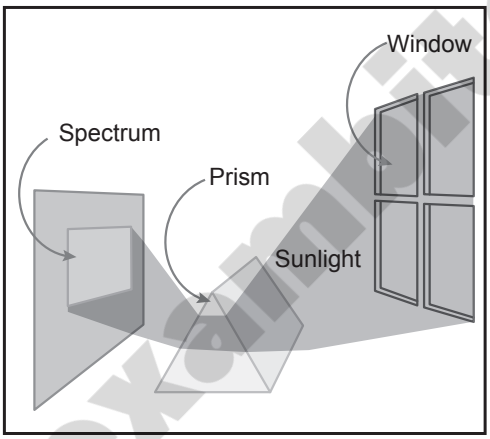
(*a*) 

(*b*) 

(*c*) 

(*d*) 

14. The image below depicts light being split by a prism into different colours.



This was first observed by Isaac Newton. What would this observation help us to understand?

(*a*) the cause for sunspots

(*b*) how X-rays are formed

(*c*) the cause for rainbows

(*d*) how the Sun produces light

15. The sky appears dark to passengers flying at very high altitudes mainly because:

(*a*) Scattering of light is not enough at such heights.

(*b*) There is no atmosphere at great heights.

(*c*) The size of molecules is smaller than the wavelength of visible light.

(*d*) The light gets scattered towards the earth.

16. If a person has five resistors each of value $\frac{1}{5}\Omega$, then the maximum resistance he can obtain by connecting them is

(*a*) 1 Ω (*b*) 5 Ω (*c*) 10 Ω (*d*) 25 Ω

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Ethanoic acid is also known as glacial acetic acid.

Reason (*R*) : The melting point of pure ethanoic acid is 290 K and hence it often freezes during winters in cold climates.

18. Assertion (*A*) : Animals can react to stimuli in different ways.

Reason (*R*) : All animals have a nervous system and an endocrine system involving hormones.

19. Assertion (*A*) : Decomposers act as cleaning agents of the environment.

Reason (*R*) : The decomposers recycle waste material in the hydrosphere.

20. Assertion (*A*) : When the object moves with a velocity 2 m/s, its image in the plane mirror moves with a velocity of 4 m/s.

Reason (*R*) : The image formed by a plane mirror is as far behind the mirror as the object is in front of it.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Give reasons for the following:

(*i*) Only one half of water molecule is shown in the formula of Plaster of Paris.

(*ii*) On strong heating, blue coloured copper sulphate crystals turn white.

22. (*i*) A knife, which is used to cut a fruit, was immediately dipped into water containing drops of blue litmus solution. The colour of the solution changes to red, what is the nature of the fruit?

(*ii*) Which one of these has a higher concentration of H^+ ions?

1M HCl or 1M CH_3COOH

23. (*i*) Testes are located outside the abdominal cavity. Why?

(*ii*) Fertilisation is possible if copulation has taken place during middle of menstrual cycle. Give reason.

OR

Write the function of following parts in human female reproductive system:

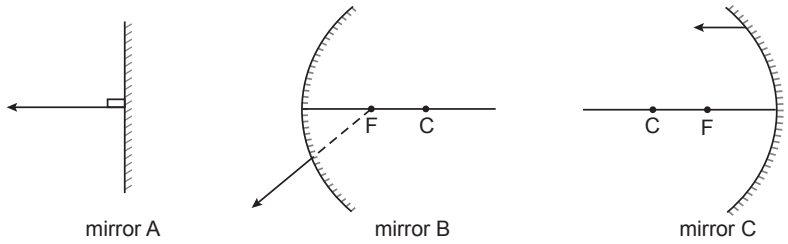
(*i*) Ovary (*ii*) Oviduct

24. A study found that children with light-coloured eyes are likely to have parents with light-coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

25. With the help of ray diagram, illustrate the position, nature and size of the image formed if an object is placed at the curvature in front of a concave lens.

OR

Study the diagram given below and answer the questions that follow:

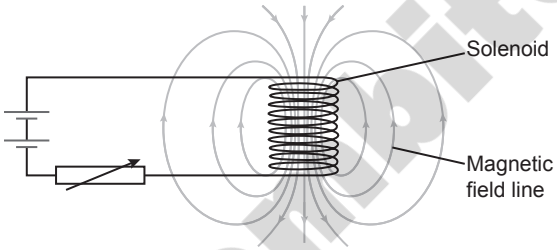


(*i*) Which of the three mirrors is a convex mirror?

(*ii*) For the reflected rays shown in the above diagrams draw the corresponding incident ray.

(*iii*) Identify the mirror which reflects a parallel beam of light as a converging beam.

26. A circuit contains a battery, a variable resistor and a solenoid. The figure below shows the magnetic field pattern produced by the current in the solenoid.



(*i*) State how the magnetic field pattern indicates regions where the magnetic field is stronger.

(*ii*) What happens to the magnetic field when the current in the circuit is reversed?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. (*i*) Write the electron dot structures of sodium, oxygen and magnesium.

(*ii*) Show the formation of Na_2O and MgO by the transfer of electrons.

(*iii*) What are the ions present in these compounds?

28. What is a homologous series of carbon compounds? Give an example and three characteristics.

OR

A compound X is formed by the reaction of a carboxylic acid $C_2H_4O_2$ and an alcohol in presence of a few drops of H_2SO_4. The alcohol on oxidation with alkaline $KMnO_4$ followed by acidification gives the same carboxylic acid as used in this reaction. Give the names and structures of (*i*) carboxylic acid, (*ii*) alcohol and (*iii*) the compound X. Also write the reaction.

29. (*i*) What are sexually transmitted diseases (STD)? List two viral and two bacterial STDs.

(*ii*) Give two reasons for avoiding frequent pregnancies by women.

30. Mendel, in one of his experiments with pea plants, crossed a variety of pea plant having round seeds with one having wrinkled seeds. State Mendel's observations giving reasons of F_1 and F_2 progeny of this cross. Also, list any two contrasting characters, other than round seeds of pea plants that Mendel used in his experiments.

31. Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem.

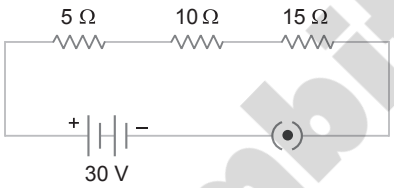
OR

(*i*) With the help of an example explain how indiscriminate use of pesticides may result in the degradation of the environment.

(*ii*) What are the by-products of fertiliser industries? How do they affect the environment?

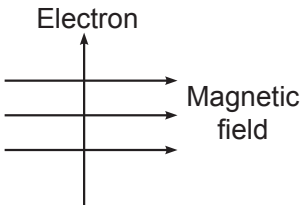
32. (*i*) Three resistors R_1, R_2 and R_3 are connected in series and the combination is connected to a battery, ammeter, voltmeter and key. Draw suitable circuit diagram and obtain an expression for the equivalent resistance of the combination of the resistors.

(*ii*) Consider the given circuit and find the current flowing in the circuit and potential difference across the 15 Ω resistor when the circuit is closed.



33. (*i*) State the rule which gives the direction of force acting on the conductor.

(*ii*) An electron moves perpendicular to a magnetic field as shown in the figure.



What would be the direction of force experienced by the electron?

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. (*i*) What is a double displacement reaction? Explain with an example.

(*ii*) A small amount of quick lime is added to water in a beaker.

(*a*) Name and define the type of reaction that has taken place.

(*b*) Write balanced chemical equation for the above reaction and the chemical name of the product formed.

(*c*) List two main observations of this reaction.

OR

Give the characteristic tests for the following gases:

(*i*) CO_2 (*ii*) SO_2 (*iii*) O_2 (*iv*) H_2

35. (*i*) What are cranial and spinal nerves? Describe a spinal nerve.

(*ii*) Draw a diagram of the human brain and label the following parts:

(*a*) Cerebrum (*b*) Meninges (*c*) Medulla oblongata (*d*) Cerebellum

36. A person is unable to see objects distinctly placed within 50 cm from his eyes.

(*i*) Name the defect of vision the person is suffering from and list its two possible causes.

(*ii*) Draw a ray diagram to show the defect in the above case.

(*iii*) Mention the type of lens used by him for the correction of the defect and calculate its power. Assume that the near point for the normal eye is 25 cm.

(*iv*) Draw labelled diagram for the correction of the defect in the above case.

OR

What is the cause of dispersion of white light through a glass prism? Draw a ray diagram to show the path of light when two identical glass prisms are arranged together in inverted position with respect to each other and a narrow beam of white light is allowed to fall obliquely on one of the faces of the prisms.

SECTION - E

Q. No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The following observations were made by a student on treating four metals P, Q, R and S with the given salt solutions:

Sample	$MgSO_4(aq)$	$Zn(NO_3)_2(aq)$	$CaSO_4(aq)$	$Na_2SO_4(aq)$
P	No reaction	Reaction occurs	Reaction occurs	No reaction
Q	Reaction occurs	Reaction occurs	Reaction occurs	Reaction occurs
R	No reaction	Reaction occurs	No reaction	No reaction
S	No reaction	No reaction	No reaction	No reaction

Based on the above observations:

(*i*) Arrange the given samples in the increasing order of reactivity.

(*ii*) Write the chemical formulae of products formed when Q reacts with $CuSO_4$ solution.

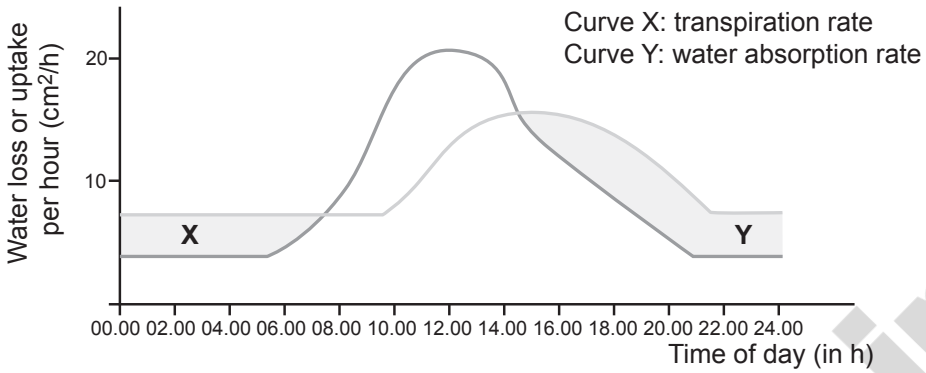
(*iii*) There are 3 unknown metals—A, B and C. C displaces B from its oxide while with oxide of A, there is no reaction. Give the reactivity order of A, B and C.

OR

(*iii*) Carbon can reduce copper oxide to copper but not CaO to Ca. Why?

38. Plants have low energy needs, and can use relatively slow transport systems. The distances over which transport systems have to operate, however, can be very large in plants such as very tall trees. Plant transport systems move energy stores from leaves and raw materials from roots. These two pathways are constructed as independently organised conducting tubes.

Given graph shows the rates of absorption and transpiration of a plant during a 24 hour period.

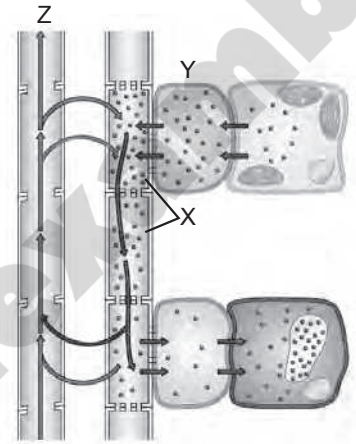


(*i*) Define (*a*) transpiration (*b*) force of cohesion

(*ii*) Why there is a difference between the rates of transpiration and water absorption between 00:00 and 06:00 hours?

OR

(*ii*) The given figure represents the movement of water and minerals in xylem and movement of food in phloem. Name the parts X, Y and Z. What will happen to a plant if its xylem is removed?



39. In an electrical circuit, the resistance R is defined by the equation $R = \frac{V}{I}$, where the electrical current I is in amperes (A), and the potential difference V is in volts (V). R is measured in ohms (Ω).

Ohm's law states that for certain conductors the resistance R is constant. Any resistance device or conductor for which R is constant is said to obey Ohm's law while those for which the value of R is not constant does not obey this law.

A student performed two experiments. In Experiment 1, she investigated the resistance of a small resistor device. In Experiment 2, she investigated the resistance of a small light bulb. In first experiment, she measured current through the resistor at various voltage values between

0 and 20 V whereas in second experiment she measured current through the lightbulb at about 10 voltage values between 0 and 20 V. Figures show the symbolic circuit diagrams for Experiment 1 and 2, respectively. The lines connecting the various devices represent wires whose resistance is negligible.

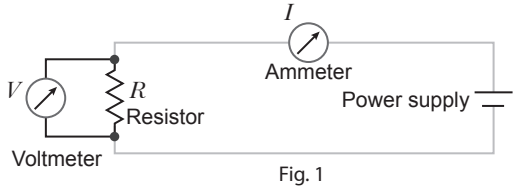


Fig. 1

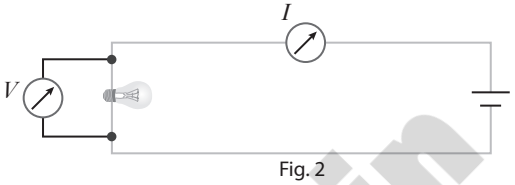


Fig. 2

Fig. 3 shows the results of Experiment 1 when current I in milliamperes (mA) was plotted against potential V in volts (V).

Fig. 4 shows the results of Experiment 2 when current I in amperes (A) was plotted against potential V in volts (V).

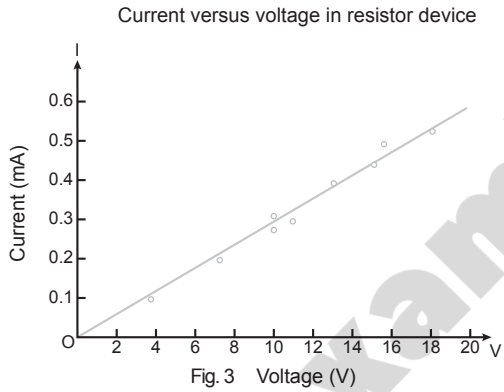


Fig. 3 Voltage (V)

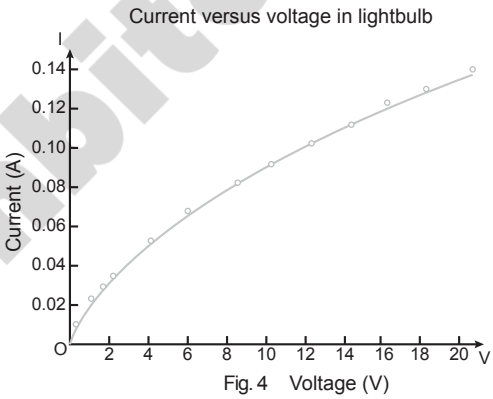
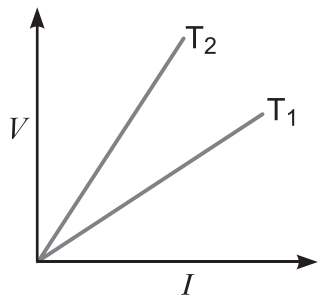


Fig. 4 Voltage (V)

(*i*) Based on the graphs in figures, what could the student reasonably conclude?

(*ii*) The voltage-current (V-I) graph of a metallic conductor at two different temperatures T_1 and T_2 is shown in figure. At which temperature is the resistance higher?



(*iii*) What are ohmic and non-ohmic conductors? What is the resistance of the resistor device approximately?

OR

(*iii*) The power rating of a lightbulb is the rate at which energy is used, mainly converted to heat and light energy. Power in a resistor is given by P = IV, where P is in watts (W), I is current in ampere (A), and V is electrical potential in volts (V). Suppose that household lightbulbs are designed to operate at a constant voltage of 100 V. If you were to compare a 60 W lightbulb with a 75 W lightbulb, what could you conclude about their resistances?

Answers

1. (*d*)	**2.** (*d*)	**3.** (*d*)	**4.** (*c*)	**5.** (*b*)	**6.** (*d*)	**7.** (*d*)
8. (*a*)	**9.** (*b*)	**10.** (*c*)	**11.** (*c*)	**12.** (*d*)	**13.** (*c*)	**14.** (*c*)
15. (*a*)	**16.** (*c*)	**17.** (*a*)	**18.** (*a*)	**19.** (*c*)	**20.** (*a*)	

32. (*ii*) 1 A, 15 V

36. (*iii*) + 2D

11 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum Marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Some reactions require conditions like specific temperature, pressure, etc. While writing chemical equations for such reactions, where are these conditions usually mentioned

(*a*) Above the arrow (*b*) Along with products

(*c*) Below the plus signs (*d*) Before the reactants

2. When a small amount of acid is added to water, the phenomena which occur are:

(A) Dilution **(B) Neutralisation**

(C) Formation of H_3O^+ ions **(D) Salt formation**

The correct statements are:

(*a*) (A) and (C) (*b*) (B) and (D) (*c*) (A) and (B) (*d*) (C) and (D)

3. A piece of zinc (Zn) - a reactive metal - was dropped into a test tube containing a substance. A zinc salt was formed and hydrogen gas was liberated. This is shown in the equation below.

Zn + _____ $\longrightarrow$ zinc salt + H_2 gas

Which of the following can be the substance that zinc was dropped into?

P. water **Q. hydrochloric acid** **R. a solution of a zinc salt**

(*a*) only P (*b*) only Q (*c*) only R (*d*) either P or R

4. Metals are refined by using different methods. Which of the following metals are refined by electrolytic refining?

***(i)* Au** ***(ii)* Cu** ***(iii)* Na** ***(iv)* K**

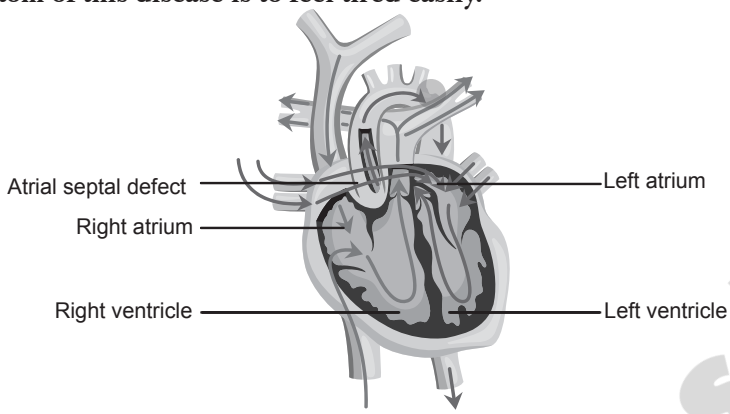
(*a*) (*i*) and (*ii*) (*b*) (*i*) and (*iii*) (*c*) (*ii*) and (*iii*) (*d*) (*iii*) and (*iv*)

5. The name of the compound $CH_3—CH_2—CHO$ is

(*a*) Propanal (*b*) Propanone (*c*) Ethanol (*d*) Ethanal

6. Some adults have a defective heart since birth. They are born with a hole between the left atrium and right atrium (shown below), this defect is called the Atrial Septal Defect (ASD).

Due to the hole between the atria, oxygenated blood gets mixed with deoxygenated blood. A symptom of this disease is to feel tired easily.



Which of the following is likely to happen in people with ASD in a single cycle of blood flow?

(*a*) The kidneys will filter out more carbon dioxide.

(*b*) The blood will take up more oxygen from the lungs.

(*c*) The muscles will receive blood containing less oxygen.

(*d*) The lungs will receive blood containing more carbon dioxide.

7. Single circulation, *i.e.*, blood flows through the heart only once during one cycle of passage through the body, is exhibited by

(*a*) *Labeo*, Chameleon, Salamander (*b*) Hippocampus, Exocoetus, *Anabas*

(*c*) *Hyla, Rana, Draco* (*d*) Whale, Dolphin, Turtle

8. In a synapse, chemical signal is transmitted from

(*a*) dendritic end of one neuron to axonal end of another neuron

(*b*) axon to cell body of the same neuron

(*c*) cell body to axonal end of the same neuron

(*d*) axonal end of one neuron to dendritic end of another neuron

9. The given box consists of various diseases. Identify the sexually transmitted diseases and choose the correct combination of information provided in the following table.

Measles	**AIDS**	**Tetanus**	**Syphilis**
Gonorrhoea	**Scabies**	**Mumps**	**Cholera**
	Typhoid	**Filaria**	

	STD-1	**STD-2**	**STD-3**
(*a*)	AIDS	Scabies	Filaria
(*b*)	Syphilis	Gonorrhoea	Mumps
(*c*)	Gonorrhoea	AIDS	Syphilis
(*d*)	Cholera	Tetanus	Typhoid

10. Which of the following statements is not true about a 'bud' in '*Hydra*'?

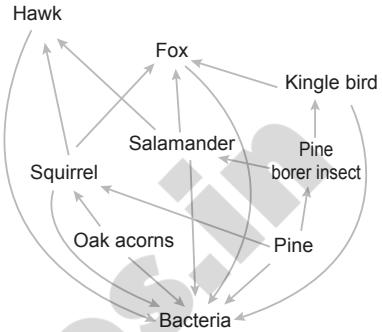
(*a*) It is an outgrowth.

(*b*) It forms due to repeated cell division at one specific site.

(*c*) It detaches from the parent body as soon as it is produced.

(*d*) It becomes a new independent individual.

11. The image shows a food web.



Which one is the correct statement?

(*a*) Fox feeds on hawk obtain energy.

(*b*) Hawk feeds on oak acorn to obtain energy.

(*c*) Squirrel feeds on pine borer to obtain energy.

(*d*) Salamander feeds on pine borer to obtain energy.

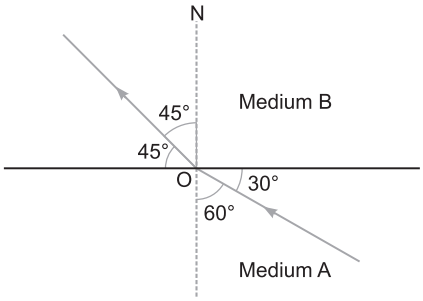
12. Shown below is a photograph of a convex lens.

A small, bright spot is seen on the paper when the lens is kept out facing the sun. Which diagram below explains the formation of the bright spot?

(*a*) only P (*b*) only Q

(*c*) only R (*d*) both P and Q

13. Figure shows a ray of light as it travels from medium A to medium B. The refractive index of medium B relative to medium A is



(*a*) $\sqrt{3}/\sqrt{2}$ (*b*) $\sqrt{2}/\sqrt{3}$

(*c*) $1/\sqrt{2}$ (*d*) $\sqrt{2}/1$

14. A student sitting on the last bench can read the letters written on the blackboard but is not able to read the letters written in his textbook. Which of the following statements is correct?

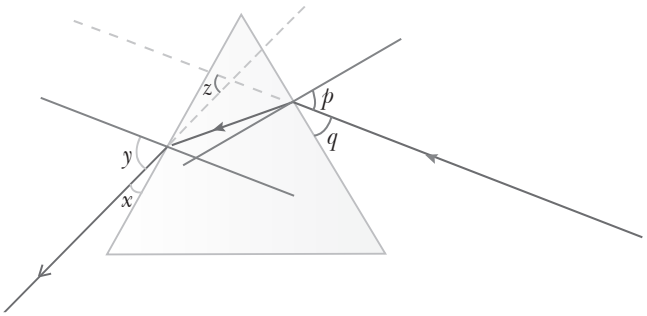
(*a*) The near point of his eyes has receded away

(*b*) The near point of his eyes has come closer to him

(*c*) The far point of his eyes has come closer to him

(*d*) The far point of his eyes has receded away

15. Study the following ray diagram:



In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by

(*a*) *y*, *p*, *z* (*b*) *x*, *q*, *z* (*c*) *p*, *y*, *z* (*d*) *p*, *z*, *y*

16. A metallic wire of resistance 12 Ω is bent to form a square. The resistance between the two diagonal points would be

(*a*) 12 Ω (*b*) 24 Ω (*c*) 6 Ω (*d*) 3 Ω

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : In a homologous series of alcohols, the formula for the second member is C_2H_5OH and the third member is C_3H_7OH.

Reason (*R*) : The difference between the molecular masses of the two consecutive members of a homologous series is 144.

18. Assertion (*A*) : The brain is also known as the central nervous system.

Reason (*R*) : Central nervous system controls and regulates the voluntary actions.

19. Assertion (*A*) : Greater number of individuals are present in lower trophic levels.

Reason (*R*) : The flow of energy is unidirectional.

20. Assertion (*A*) : Mirror formula can be applied to a plane mirror.

Reason (*R*) : A plane mirror is a spherical mirror of infinite focal length.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. What is brine? What happens when an electric current is passed through it? Write chemical equation for it.

22. "Sodium hydrogen carbonate is a basic salt." Justify this statement. How is it converted into washing soda?

23. Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained.

OR

Why does bread mould grow profusely on a moist slice of bread rather than on a dry slice of bread?

24. A pea plant with blue colour flower denoted by BB is cross-bred with a pea plant with white flower denoted by ww.

(*i*) What is the expected colour of the flowers in their F_1 progeny?

(*ii*) What will be the percentage of plants bearing white flower in F_2 generation, when the flowers F_1 plants were selfed?

25. Where should an object be placed in case of a convex lens to form an image of same size as of the object? Show with the help of ray diagram the position and the nature of the image formed.

OR

How far should one hold an object from a concave mirror of focal length 40 cm so as to get a virtual image twice the size of the object?

26. Meena draws magnetic field lines of field close to the axis of a current-carrying circular loop. As she moves away from the centre of the circular loop she observes that the lines keep on diverging. How will you explain her observation?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Iqbal treated a lustrous, divalent element M with sodium hydroxide. He observed the formation of bubbles in reaction mixture. He made the same observations when this element was treated with hydrochloric acid. Suggest how can he identify the produced gas. Write chemical equations for both the reactions.

28. Explain esterification reaction with the help of a chemical equation. Describe an activity to show esterification.

OR

Write the structural formulae of all the isomers of hexane.

29. What is placenta? Mention its role during pregnancy.

30. 'Different species use different strategies to determine sex of a newborn individual. It can be environmental cues or genetically determined'. Explain the statement by giving example for each strategy.

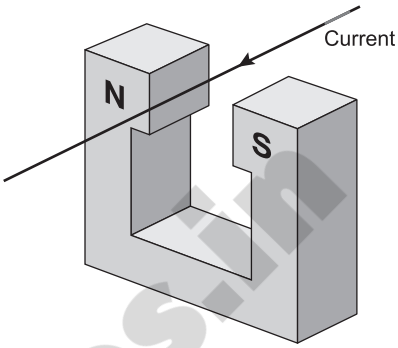
31. Mention three harmful effects of using polythene bags on the environment. Suggest an effective alternative to these bags.

OR

Define a food chain. Design a terrestrial food chain of four trophic levels. If a pollutant enters at the producers level, the organisms of which trophic level will have the maximum concentration of the pollutant in their bodies? What is this phenomenon called?

32. Draw a circuit diagram of an electric circuit containing a cell, a key, an ammeter, a resistor of 2 Ω in series with a combination of two resistors (4 Ω each) in parallel and a voltmeter across the parallel combination. Will the potential difference across the 2 Ω resistor be the same as that across the parallel combination of 4 Ω resistors? Give reason.

33. Figure shows a wire, held between the poles of a magnet, carrying a current in the direction of the arrow.



(*i*) What is the direction of the force acting on the wire?

(*ii*) Explain why the force acts on the wire.

(*iii*) The directions of the current and the magnetic field are both reversed. State the effect on the force.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. What happens when a piece of

(*i*) zinc metal is added to copper sulphate solution?

(*ii*) aluminium metal is added to dilute hydrochloric acid?

(*iii*) silver metal is added to copper sulphate solution?

Also, write the balanced chemical equation if the reaction occurs.

OR

(*i*) Crystals of copper sulphate are heated in a test tube for some time.

(*a*) What is the colour of copper sulphate crystals before heating, and after heating?

(*b*) What is the source of liquid droplets seen on the inner upper side of the test tube during the heating process?

(*ii*) A metal 'X' when dipped in aqueous solution of aluminium sulphate, no reaction is observed whereas when it is dipped in an aqueous solution of ferrous sulphate, the pale green solution turns colourless. Identify metal 'X' with reason.

35. Differentiate between tropic and nastic movements in plants.

36. State the function of each of the following parts of the human eye:

(*i*) Cornea (*ii*) Iris (*iii*) Pupil (*iv*) Retina

Millions of people of the developing countries are suffering from corneal blindness. This disease can be cured by replacing the defective cornea with the cornea of a donated eye. Your school has organised a campaign in the school and its neighbourhood in order to create awareness about this fact and motivate people to donate their eyes after death. How can you along with your classmates contribute in this noble cause? State the objectives of organising such campaigns in schools.

OR

(*i*) What is meant by scattering of light? Use this phenomenon to explain why the clear sky appears blue.

(*ii*) Is the position of a star as seen by us in its true position? Justify your answer.

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. A student, took four metals P, Q, R and S and carried out different experiments to study the properties of metals. Some of the observations were:

- All metals could not be cut with knife except metal R.
- Metal P combined with oxygen to form an oxide M_2O_3 which reacted with both acids and bases.
- Reaction with water.

P – Did not react either with cold or hot water but reacted with steam.

Q – Reacted with hot water and the metal started floating.

R – Reacted violently with cold water.

S – Did not react with water at all

(*i*) Out of the given metals, name the following:

(*a*) metal which needs to be stored under kerosene.

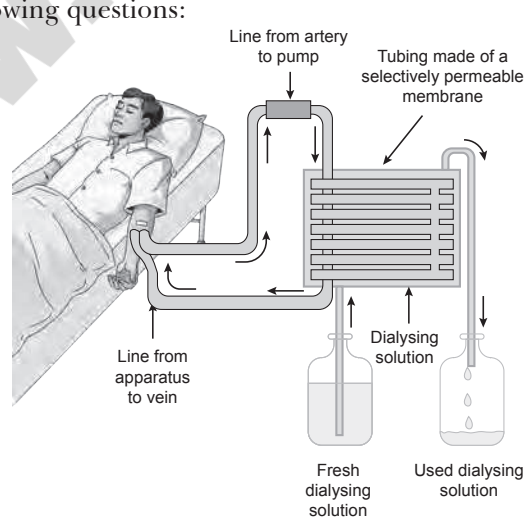
(*b*) metal which forms amphoteric oxides.

(*ii*) Write the increasing order of the reactivity of the four given metals. Give reason.

OR

(*ii*) When a metal X is treated with cold water, it gives a basic salt Y with molecular formula XOH (Molecular mass = 40) and liberates a gas Z which easily catches fire. Identify X, Y and Z and also write the reaction involved.

38. The figure shown below represents a common type of dialysis called as Haemodialysis. It removes waste products from the blood. Such as excess salts and urea which are insufficiently removed by the kidney in patients with kidney failure. During the procedure, the patient's blood is cleaned by filtration through a series of semi-permeable membranes before being returned to the blood of the patient. On the basis of this, answer the following questions:



(*i*) What does used dialysing solution contains?

(*ii*) What type of blood vessel brings in the blood with wastes?

(*iii*) What is the use of semi-permeable lining of tubes in haemodialyzer?

OR

(*iii*) What is the difference between the dialysing fluid and the blood?

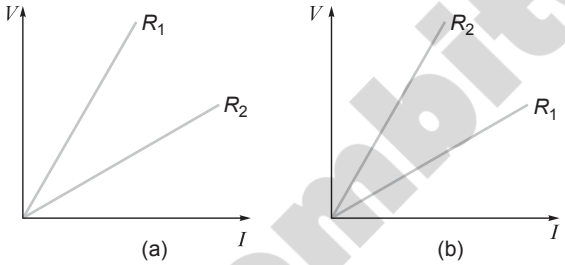
39. In an investigation, the current in a circuit and the potential difference across a resistor in the circuit were measured. The results are shown in Table.

I(A)	0.5	1	2	3	4
V(V)	1.6	3.4	6.8	10.2	13.2

(*i*) Calculate the resistance of the resistor at 13.2 V.

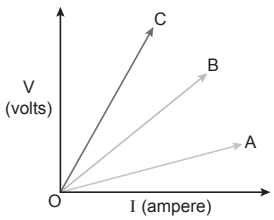
(*ii*) Plot a graph of V on the y-axis against I on the x-axis.

(*iii*) Two students perform experiments on two given resistors R_1 and R_2 and plot the following V-I graphs. If $R_1 > R_2$ which of the two diagrams correctly represent the situation on the plotted curves? Justify your answer.



OR

(*iii*) Three *V-I* graphs are drawn individually for two resistors and their series combination. Out of *A*, *B*, *C* which one represents the graph for series combination of the other two? Give reason.



Answers

1. (*a*) **2.** (*a*) **3.** (*b*) **4.** (*a*) **5.** (*a*) **6.** (*c*) **7.** (*b*)

8. (*d*) **9.** (*c*) **10.** (*c*) **11.** (*d*) **12.** (*a*) **13.** (*a*) **14.** (*a*)

15. (*c*) **16.** (*d*) **17.** (*c*) **18.** (*d*) **19.** (*b*) **20.** (*a*)

25. OR u = -20 cm **39.** (*i*) 3.6 ohm

12 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. In the double displacement reaction between aqueous potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate?

(*a*) Lead sulphate (insoluble) (*b*) Lead acetate

(*c*) Ammonium nitrate (*d*) Potassium sulphate

2. A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?

(*a*) Lemon juice (*b*) Vinegar (*c*) Common salt (*d*) An antacid

3. A student adds some metallic ash in water taken in a test tube. The ash gets completely dissolved in water and the solution changes colour. What should the student do next to test the chemical properties of the product formed?

(*a*) Test the acidity using a blue litmus paper.

(*b*) Test the basicity using a red litmus paper.

(*c*) Measure the temperature change using a thermometer.

(*d*) Evaporate the solution to get crystals.

4. Galvanisation is a method of protecting iron from rusting by coating with a thin layer of

(*a*) Gallium (*b*) Aluminium (*c*) Zinc (*d*) Silver

5. Which of these series can be classified as homologous series?

(*a*) $CHCl_3$, C_2H_5OH, C_3H_7OH (*b*) CH_3OH, C_2H_5OH, C_3H_7OH

(*c*) $CHCl_3$, C_4H_9OH, CH_3COOH (*d*) CH_3COOH, C_4H_9OH, C_2H_5OH

6. Organisms break down large food molecules to small molecules. How does this breakdown help the organisms?

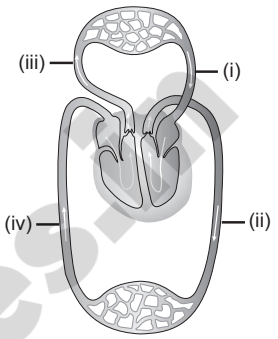
(*a*) It releases a lot of energy in the digestive tract that can be used up by the cells.

(*b*) It ensures that there are enough raw materials to produce and supply oxygen to the cells.

(*c*) It converts the large molecules to small molecules that can pass through the cell membrane.

(*d*) It makes sure that the liberation of heat by the breakdown of large molecules does not occur inside the cell.

7. The figure given alongside shows a schematic plan of blood circulation in humans with labels (*i*) to (*iv*). Identify the correct label with its functions.



(*a*) (*i*) Pulmonary vein - takes impure blood from body part.

(*b*) (*ii*) Pulmonary artery - takes blood from lung to heart.

(*c*) (*iii*) Aorta - takes blood from heart to body parts.

(*d*) (*iv*) Vena cava - takes blood from body parts to right auricle.

8. Study the table below and select the row that has the incorrect information.

	Reflex action	Walking
(*a*)	Involuntary action	Voluntary action
(*b*)	Conducted by spinal cord	Controlled by hind brain
(*c*)	Occurs in fraction of seconds	Takes longer time
(*d*)	Intentional and non-mechanical response	Spontaneous, automatic and mechanical response

9. In a flower, the parts that produce male and female gametes (germ cells) are

(*a*) stamen and anther (*b*) filament and stigma

(*c*) anther and ovary (*d*) stamen and style

10. The correct sequence of organs in the male reproductive system for transport of sperms is

(*a*) testis → vas deferens → urethra (*b*) testis → ureter → urethra

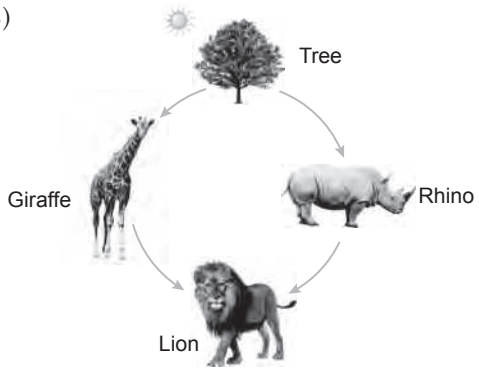
(*c*) testis → urethra → ureter (*d*) testis → vas deferens → ureter

11. The table shows some organisms including plants, animals and how they get energy.

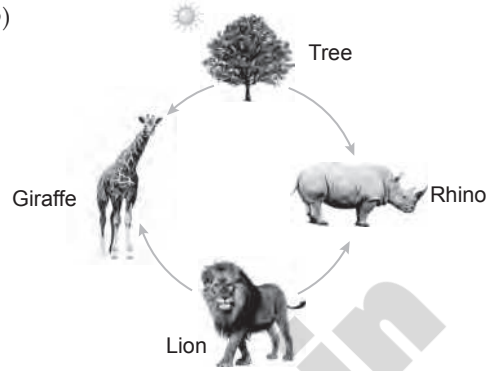
Organism	How the organism gets energy
Tree	Sunlight
Lion	Giraffe, Rhino
Rhino	Tree
Giraffe	Tree

Which option shows the correct model made based on the table?

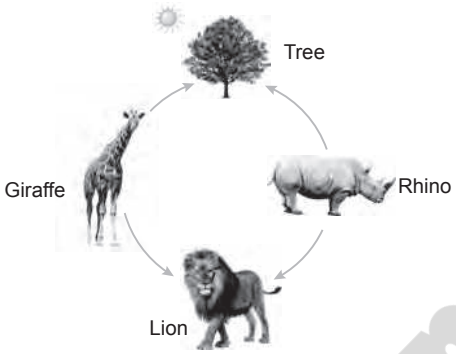
(*a*)



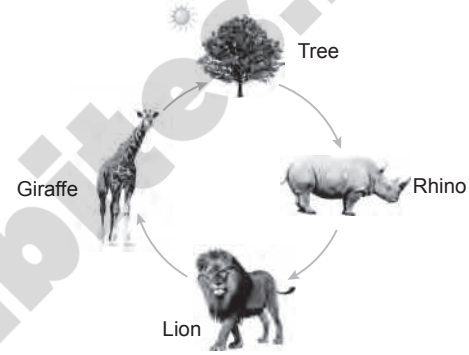
(*b*)



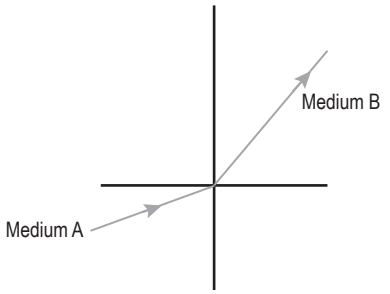
(*c*)



(*d*)



12. A light ray enters from medium A to medium B as shown in figure. The refractive index of medium B relative to A will be



(*a*) greater than unity
(*b*) less than unity
(*c*) equal to unity
(*d*) zero

13. The full length image of a distant tall building can definitely be seen by using

(*a*) a concave mirror
(*b*) a convex mirror
(*c*) a plane mirror
(*d*) both concave as well as plane mirrors

14. A person cannot see objects distinctly kept beyond 2 m. This defect can be corrected by using a lens of power

(*a*) +0.5 D
(*b*) –0.5 D
(*c*) +0.2 D
(*d*) –0.2 D

15. Electric signals from retina to brain is conveyed via

(*a*) ciliary muscles
(*b*) blind spot
(*c*) optic nerves
(*d*) pupil

16. When a 4V battery is connected across an unknown resistor there is a current of 100 mA in the circuit. The value of the resistance of the resistor is

(*a*) 4 Ω
(*b*) 40 Ω
(*c*) 400 Ω
(*d*) 0.4 Ω

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

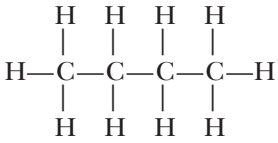
(*a*) *Both A and R are true and R is the correct explanation of A.*

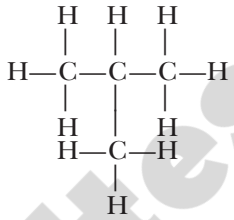
(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Following are the structural isomers of butane.





Reason (*R*) : Structural isomers have the same molecular formula but they differ in their structures.

18. Assertion (*A*) : Cyton region of nerve fibre collects information for the brain.

Reason (*R*) : Nerve fibres can either have or lack myelin sheath.

19. Assertion (*A*) : Biotic components of ecosystem continuously require energy to carry on life processes.

Reason (*R*) : Abiotic components are the non-living factors of the ecosystem.

20. Assertion (*A*) : Light does not travel in the same direction in all the media.

Reason (*R*) : The speed of light does not change as it enters from one transparent medium to another.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Write the chemical formula of washing soda. How can it be obtained from baking soda?

22. A stain of curry on a white cloth becomes reddish-brown when soap is scrubbed on it.

(*i*) Which indicator can be used here? What type of indicator is it?

(*ii*) Why did the stain become reddish-brown when soap is scrubbed on it?

23. In the context of reproduction of species state the main difference between fission and fragmentation. Also give one example of each.

OR

(*i*) Explain with diagram the method by which an Amoeba reproduces.

(*ii*) Describe the structure of a pollen grain.

24. Trace the F_1 generation formed by crossing two plants with separate traits for shape and seed colour—round green (RRyy) and wrinkled yellow (rrYY). Mention the characteristic exhibited by it.

25. A divergent lens has a focal length of 30 cm. At what distance should an object of height 5 cm from the optical centre of the lens be placed so that its image is formed 15 cm away from the lens? Find the size of the image also.

OR

The image of an object formed by a mirror is real, inverted and is of magnification –1. If the image is at a distance of 40 cm from the mirror, where is the object placed? Where would the image be if the object is moved 20 cm towards the mirror?

26. An electron and a proton, moving parallel to each other, enter a uniform magnetic field with same velocity. The direction of magnetic field and their motion coincides (is same). How will the direction of their paths be affected when they are travelling in

(*i*) same direction (*ii*) opposite direction.

Justify your answer.

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. An ore on treatment with dilute hydrochloric acid produces brisk effervescence. Name the type of ore with one example. What steps will be required to obtain metal from the enriched ore? Also write the chemical equations for the reactions involved in the process.

28. Draw the electron dot structures for:

(*i*) Ethanoic acid (*ii*) H_2S (*iii*) F_2

OR

What is meant by homologous series of carbon compounds? Classify the following carbon compounds into two homologous series and name them.

C_3H_4, C_3H_6, C_4H_6, C_4H_8, C_5H_8, C_5H_{10}

29. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.

30. In human beings, the statistical probability of getting either a male or female child is 50 : 50. Give a suitable explanation.

31. (*i*) Natural water bodies are not regularly cleaned whereas an aquarium needs regular cleaning. Why?

(*ii*) What are decomposers? What will be the consequence if the decomposers are completely eradicated from an ecosystem? Give justification in support of your answer.

OR

How is ozone formed in the upper atmosphere? State its importance. What is responsible for its depletion? Write one harmful effect of ozone depletion.

32. Three 250 watt heaters are connected in parallel to a 100 volt supply. Calculate:

(*i*) the total current taken from the supply
(*ii*) the resistance of each heater
(*iii*) the energy supplied in kWh to the three heaters in 5 hours.

33. What are magnetic field lines? How is the direction of a magnetic field at a point determined?

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. What happens when zinc granules are treated with dilute solution of H_2SO_4, HCl, HNO_3, NaCl and NaOH? Also write the chemical equations if reaction occurs.

OR

Give the characteristic tests for the following gases:

(*i*) CO_2 (*ii*) SO_2 (*iii*) O_2 (*iv*) H_2

35. Name various plant hormones. Also give their physiological effects on plant growth and development.

36. (*i*) What is meant by dispersion of white light? Name the various colours of spectrum of white light in proper sequence.

(*ii*) Why are 'danger' signal lights red in colour?

OR

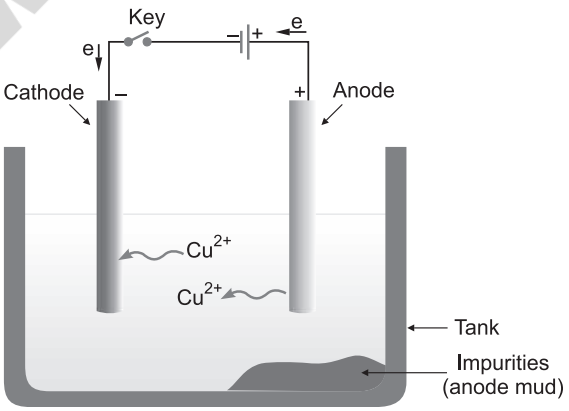
What is "dispersion of white light"? Draw a labelled diagram to illustrate the recombination of the spectrum of white light. Why is it essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other?

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. Refining is the process of purification of metals. One of the important method of refining is electrolysis. In electrolysis, electrical energy is used to bring about a non-spontaneous redox reaction. This is done by passing an electric current through a liquid containing ions, known as an **electrolyte**. In contrast to metals, the current in electrolytes is carried by the movement of ions rather than the movement of electrons. The solid conductors inserted into the liquid are called electrodes, the one with a positive charge is called the **anode** (because it attracts anions) and the one with the negative charge is called the **cathode**.

A diagrammatic representation of electrolysis of copper is shown in figure.



(*i*) (*a*) Name the electrolyte used in refining of copper.

(*b*) I. $Cu \rightarrow Cu^{2+} + 2e^-$ II. $Cu^{2+} + 2e^- \rightarrow Cu$

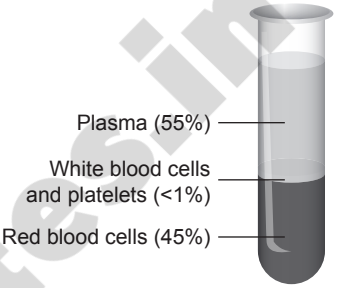
Which of these two reactions occur at cathode and anode?

(*ii*) Name two metals which can be refined by electrolytic method. What is anode mud?

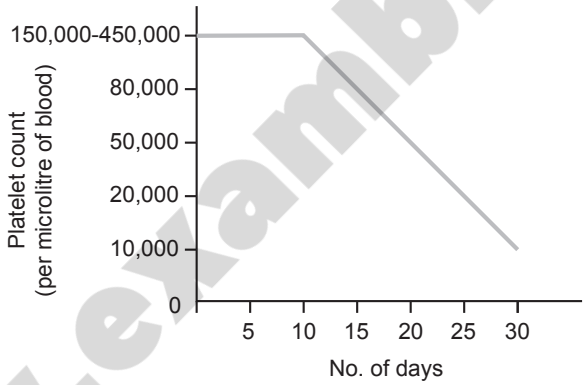
OR

(*ii*) Which material will be used as anode and cathode for refining of silver metal by this process? Suggest a suitable electrolyte also.

38. Blood is a fluid connective tissue that circulates throughout our body and delivers essential substances like oxygen to the body cells. It also transports metabolic waste products away from the cells. Figure alongside depicts the percentage composition of different components of blood.



Blood cannot be made or manufactured outside the body. Blood donation is the only source of blood for patients that need blood transfusion.



(*i*) Which component is deficient in your blood if you lose too much of blood from a cut?

(*ii*) Name the pigment present in red blood cells that carries oxygen from the lungs to all the body tissues.

(*iii*) Based on the information shown by the bar graph, what could be the possible cause for reduced platelet count?

OR

(*iii*) Why do you think donating blood isn't harmful even though red blood cells carry oxygen to the body cells?

39. The table shows four different materials and their resistivity.

Material	Resistivity
P	1.62×10^{-8}
Q	100×10^{-6}
R	6.84×10^{-8}
S	44×10^{-6}

(*i*) Which material is the best conductor of electricity?

(*ii*) Why is nichrome wire used in many electrical heating devices?

(*iii*) Define the term electrical resistivity of a material. What is the SI unit of resistivity?

OR

(*iii*) Why does the cord of an electric heater not glow while the heating element does?

Answers

1. (*b*) **2.** (*d*) **3.** (*b*) **4.** (*c*) **5.** (*b*) **6.** (*c*) **7.** (*d*)

8. (*d*) **9.** (*c*) **10.** (*a*) **11.** (*a*) **12.** (*a*) **13.** (*b*) **14.** (*b*)

15. (*c*) **16.** (*b*) **17.** (*a*) **18.** (*d*) **19.** (*b*) **20.** (*c*)

25. $u = -30$ cm, $h_2 = 2.5$ cm OR $u = -40$ cm, $v = \infty$

32. (*i*) 7.5 A, (*ii*) 40 Ω, (*iii*) 3.75 kWh

13 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Which one of the following processes involve chemical reactions?

(*a*) Storing of oxygen gas under pressure in a gas cylinder

(*b*) Liquefaction of air

(*c*) Keeping petrol in a china dish in the open

(*d*) Heating copper wire in presence of air at high temperature

2. When dilute sulphuric acid is added to a solid X, a gas Y is formed along with the formation of the salt of the solid. What could be X and Y?

(*a*) X: carbon; Y: hydrogen (*b*) X: zinc; Y: hydrogen

(*c*) X: zinc; Y: oxygen (*d*) X: copper; Y: oxygen

3. The compound obtained on reaction of iron with steam is/are:

(*a*) Fe_2O_3 (*b*) Fe_3O_4

(*c*) FeO (*d*) Fe_2O_3 and Fe_3O_4

4. If copper is kept open in air, it slowly loses its shining brown surface and gains a green coating. It is due to the formation of:

(*a*) $CuSO_4$ (*b*) $CuCO_3$

(*c*) $Cu(NO_3)_2$ (*d*) CuO

5. Carbon exists in the atmosphere in the form of

(*a*) carbon monoxide only.

(*b*) carbon monoxide in traces and carbon dioxide.

(*c*) carbon dioxide only.

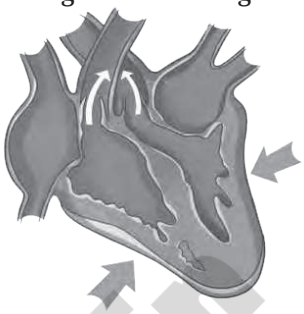
(*d*) coal.

6. Which of the following plays the important role of creating a suction force which pulls water upwards from the roots of a tree to its leaves?

(*a*) Gravitation (*b*) Respiration

(*c*) Transpiration (*d*) Photosynthesis

7. Identify the phase of circulation which is represented in the diagram of heart given below. Arrows indicate contraction of the chambers shown.



(*a*) Blood transferred to the right ventricle and left ventricle simultaneously.

(*b*) Blood is transferred to lungs for oxygenation and is pumped into various organs simultaneously.

(*c*) Blood transferred to the right auricle and left auricle simultaneously.

(*d*) Blood is received from lungs after oxygenation and is received from various organs of the body.

8. The substance that triggers the fall of mature leaves and fruits from plants is due to

(*a*) auxin (*b*) gibberellin

(*c*) abscisic acid (*d*) cytokinin

9. Vegetative propagation refers to the formation of new plants from

(*a*) stem, roots and flowers (*b*) stem, roots and leaves

(*c*) stem, flowers and fruits (*d*) stem, leaves and flowers

10. Factors responsible for the rapid spread of bread mould on slices of bread are

(*i*) large number of spores

(*ii*) availability of moisture and nutrients in bread

(*iii*) presence of tubular branched hyphae

(*iv*) formation of round shaped sporangia

(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*ii*) (*d*) (*iii*) and (*iv*)

11. Excessive exposure of humans to UV-rays results in

(*i*) damage to immune system **(*ii*) damage to lungs**

(*iii*) skin cancer **(*iv*) peptic ulcers**

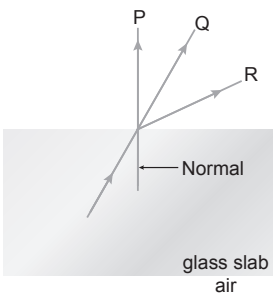
(*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*iii*) (*d*) (*iii*) and (*iv*)

12. You are given water, mustard oil, glycerine and kerosene. In which of these media a ray of light incident obliquely at same angle would bend the most?

(*a*) Kerosene (*b*) Water

(*c*) Mustard oil (*d*) Glycerine

13. In the diagram shown below, a beam of light is travelling from inside a glass slab to air. Which of the marked paths will the ray of light take as it emerges from the glass slab?



(*a*) P

(*b*) Q

(*c*) R

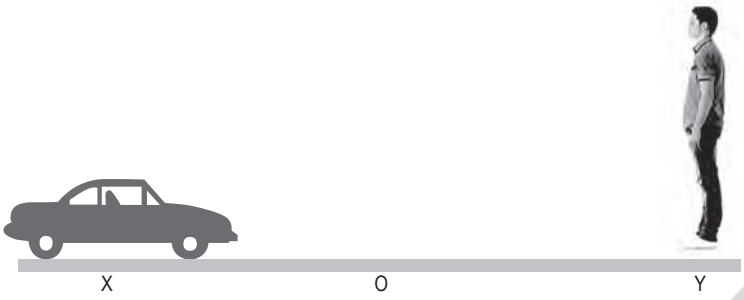
(*d*) None of them as light splits into its many colours.

14. Person suffering from cataract has

(*a*) elongated eyeball (*b*) excessive curvature of eye lens

(*c*) weakened ciliary muscles (*d*) opaque eye lens

15. A person standing at point Y is watching a car coming from a point X to O as shown.



The table shows the variation in the parts of eye while seeing the car at X and O.

1. At X the focal length is higher than at O

2. At O the focal length is higher than at X

3. At X the ciliary muscle is thicker than at O

4. At O the ciliary muscle is thicker than at X

Which change in the person's eye would likely to occur while watching the car?

(*a*) 2 and 4 (*b*) 1 and 4 (*c*) 1 and 3 (*d*) 2 and 3

16. Study the table below and select the row that has the incorrect information.

	Reflex action	Walking
(*a*)	Involuntary action	Voluntary action
(*b*)	Conducted by spinal cord	Controlled by hind brain
(*c*)	Occurs in fraction of seconds	Takes longer time
(*d*)	Intentional and non-mechanical response	Spontaneous, automatic and mechanical response

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Longer wires have greater resistance and the smaller wires have lesser resistance.

Reason (*R*) : Resistance is inversely proportional to the length of the wire.

18. Assertion (*A*) : A receptor is a specialized group of cells in a sense organ that perceive a particular type of stimulus.

Reason (*R*) : Different sense organs have different receptors for detecting stimuli.

19. **Assertion(*A*) :** Green plants of the ecosystem are the transducers..

Reason (*R*) : Producers trap the radiant energy of the Sun and change it into chemical energy.

20. **Assertion(*A*) :** For observing traffic at back, the driver mirror is convex mirror.

Reason (*R*) : A convex mirror has much larger field of view than a plane mirror.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Two samples A and B were given to test their nature. A student found the change in pH paper as follows: A → green colour, B → orange colour. Find the nature of given samples.

22. A compound 'X' of sodium is used as an antacid and it decomposes on strong heating.

(*i*) Name the compound 'X' and give its chemical formula.

(*ii*) Write a balanced chemical equation to represent the decomposition of 'X'.

23. In the experiment "To prepare a temporary mount of a leaf peel to show stomata", glycerine and safranin are used. When and why are these two liquids used? Explain.

OR

Trace the path of sperm during ejaculation and mention the gland and their functions associated with the male reproductive system.

24. In one of his experiments with pea plants Mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant, in the first generation (F_1), only tall plants appear.

(*i*) What happens to the traits of the dwarf plants in this case?

(*ii*) When the plants of F_1 generation were self-fertilised, he observed that in the plants of second generation (F_2), both tall plants and dwarf plants were present. Why it happened? Explain briefly.

25. An object is placed at a distance of 30 cm in front of a convex mirror of focal length 15 cm. Write four characteristics of the image formed by the mirror.

OR

State two positions in which a concave mirror produces a magnified image of a given object. List two differences between the two images.

26. Write SI unit of magnetic field. Under what condition does a moving charge experience

(*i*) maximum force (*ii*) minimum force?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Out of three metals P, Q and R, P is less reactive than Q and R is more reactive than P and Q both. Suggest an activity to arrange P, Q and R in order of their decreasing reactivity.

28. Explain the given reactions with examples:

(*i*) Combustion reaction

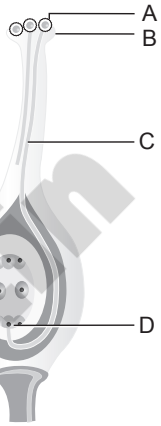
(*ii*) Oxidation reaction

(*iii*) Substitution reaction

OR

Distinguish between esterification and saponification reactions with the help of the chemical equations for each. State one use of each (***i***) esters, and (***ii***) saponification process.

29. (*i*) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.



(*ii*) (*a*) Name the part marked 'A' in the diagram given.

(*b*) How does 'A' reaches part 'B' ?

(*c*) State the importance of the part 'C'.

(*d*) What happens to the part marked 'D' after fertilisation is over?

30. A change in DNA that is useful for one property to start with, can become useful later for a different function. Explain.

31. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose nonbiodegradable waste, for saving the environment.

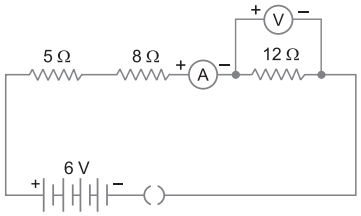
OR

(*i*) State one important function of ozone layer at the higher level in the atmosphere.

(*ii*) How is ozone formed?

(*iii*) It has been observed that ozone layer is getting depleted. Name the compound responsible for ozone depletion.

32. Consider the following circuit:



What would be the readings of the ammeter and the voltmeter when key is closed? Give reason to justify your answers.

33. (*i*) State Fleming's Left-hand rule.

(*ii*) List three characteristic features of the electric current used in our homes.

(*iii*) What is a fuse? Why is it called a safety device?

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. What is 'rusting'? Describe with a labelled diagram an activity to investigate the conditions under which iron rusts.

OR

(*i*) What is a double displacement reaction? Explain with an example.

(*ii*) A small amount of quick lime is added to water in a beaker.

(*a*) Name and define the type of reaction that has taken place.

(*b*) Write balanced chemical equation for the above reaction and the chemical name of the product formed.

(*c*) List two main observations of this reaction.

35. What are reflex actions? Give two examples. Explain a reflex arc.

36. What is a rainbow? Draw a labelled diagram to show the formation of a rainbow.

OR

What happens to a beam of white light when it gets refracted through a glass prism? Which colour deviates the most and the least after refraction through a prism? What is likely to happen if a second identical prism is placed in an inverted position with respect to the first prism? Justify your answer.

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The reactivity series is a list of metals arranged in the order of their decreasing activities. The metal at the top of the reactivity series is the most reactive and metal at the bottom is the least reactive. The more reactive metal displaces less reactive metal from its salt solution.

K	Potassium	Most reactive
Na	Sodium	
Ca	Calcium	
Mg	Magnesium	
Al	Aluminium	
Zn	Zinc	Reactivity decreases
Fe	Iron	
Pb	Lead	
[H]	[Hydrogen]	
Cu	Copper	
Hg	Mercury	
Ag	Silver	
Au	Gold	Least reactive

(*i*) Name the metals which react with steam but not with hot water.

(*ii*) What happen when calcium reacts with nitric acid?

(*iii*) Which method is used to extract metal present at the top of the reactivity series? What is the nature of non-metal oxide?

OR

(*iii*) A metal that exists as a liquid at room temperature is obtained by heating its sulphide in the presence of air. Identify the metal and its ore .

38. Bacteria that live in our mouths cause dental caries (tooth decay). Caries has been a problem since the 1700s when sugar became available from the expanding sugarcane industry.

Today, we know a lot about caries. For example:

- Bacteria that cause caries feed on sugar.
- The sugar is transformed to acid.
- Acid damages the surface of teeth.
- Brushing teeth helps to prevent caries.

(*i*) What is the role of bacteria in dental caries?

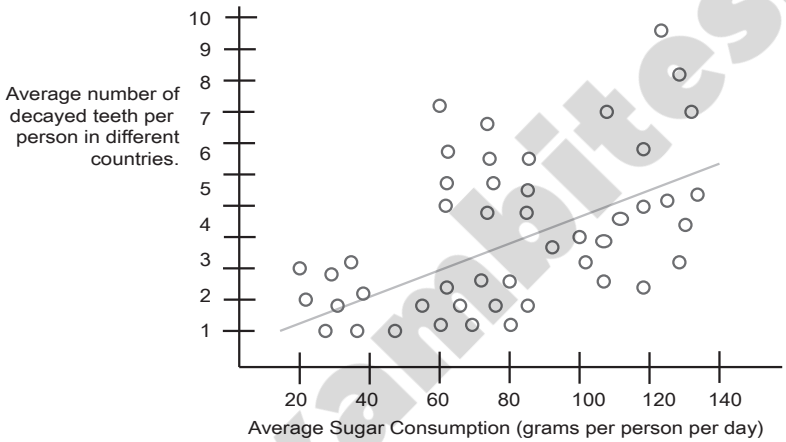
(*ii*) How can tooth decay be prevented?

(*iii*) What role does mouth play in digestion of food?

OR

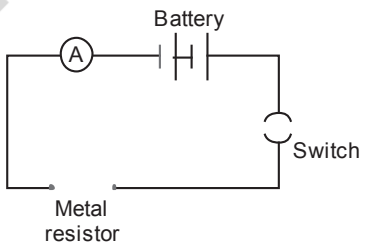
(*iii*) The given graph shows the consumption of sugar and the amount of caries in different countries. Each country is represented by a dot in the graph.

What do you conclude?

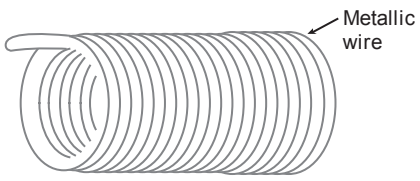


39. Metals differ in their relative abilities to conduct electricity. Resistance is a measurement in ohms (Ω) of how much a metal opposes electric current at a particular voltage.

A scientist performed 3 experiments using the circuit shown in Figure.



The metal resistor consists of a coil of metallic wire with a known cross-sectional area and length.



A 9-volt battery was used, and when the switch was closed, electrons (negatively charged) flowed away from the negative battery terminal, through the circuit, and back to the positive battery terminal. The magnitude of current (charge per unit time) from this electron flow was measured by an ammeter, and was 1.0×10^{-3} coulombs/second for the first trial of each experiment. Resistor was calculated in ohms (R) from the resulting values for voltage (V) and current (I).

Experiment 1

Table 1

Resistor length (m)	I (coulombs/second)	R (Ω)	
100	1.0×10^{-3}	9,000	Three nickel resistor coils, each with a cross-sectional area of 7.61×10^{-10} m^2 but with different lengths, were attached separately to the circuit. Results were recorded in Table 1.
50	2.0×10^{-3}	4,500	
25	4.0×10^{-3}	2,250	

Experiment 2

Table 2

Resistor cross-sectional area (m^2)	I (coulombs/second)	R (Ω)	
2.7×10^{-10}	1.0×10^{-3}	9,000	Three gold resistor coils of varying cross-sectional area were tested. Each resistor coil had a measured length of 100 m. The results were recorded in Table 2.
8.0×10^{-10}	3.0×10^{-3}	3,000	
2.4×10^{-9}	9.0×10^{-3}	1,000	

Experiment 3

Table 3

Metal	ρ (Ω m)	I (coulombs/second)	R (Ω)	
Gold	2.4×10^{-8}	1.0×10^{-3}	9,000	Three coils made of different metals were tested. Each resistor had a cross-sectional area of 2.67×10^{-10} m^2 and a length 100 m. The value is related to each metal's inherent resistor to current flow. Results were recorded in Table 3.
Nickel	6.9×10^{-8}	4.4×10^{-4}	25,690	
Tin	1.1×10^{-7}	3.4×10^{-4}	41,250	

(*i*) From the above experiments, write the relation between R (resistance), ρ (resistivity), A (area of cross section) and l (length) of a conductor.

(*ii*) Assume that as increases, a metal's ability to conduct current decreases. Based on the results of Experiment 3, Arrange correctly gold, nickel and tin in order of increasing ability to conduct electrons when shaped as a wire coil.

OR

(*ii*) In the first trial of Experiments 1–3, once the resistor was attached and the switch closed, what charge returned to the positive battery terminal each second?

Answers

1. (*d*)	**2.** (*b*)	**3.** (*b*)	**4.** (*b*)	**5.** (*b*)	**6.** (*c*)	**7.** (*b*)
8. (*c*)	**9.** (*b*)	**10.** (*c*)	**11.** (*c*)	**12.** (*d*)	**13.** (*c*)	**14.** (*d*)
15. (*b*)	**16.** (*d*)	**17.** (*c*)	**18.** (*b*)	**19.** (*a*)	**20.** (*a*)	

25. $v = 10$ cm

32. 0.24 A, 2.88 V

SAMPLE PAPER [UNSOLVED] 14

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Which of the following gives the correct increasing order of acidic strength?

(*a*) Water < Acetic acid < Hydrochloric acid

(*b*) Water < Hydrochloric acid < Acetic acid

(*c*) Acetic acid < Water < Hydrochloric acid

(*d*) Hydrochloric acid < Water < Acetic acid

2. Which of the following reactions is a neutralisation reaction?

(*a*) $4Na + O_2 \longrightarrow 2Na_2O$

(*b*) $Fe + 2HCl \longrightarrow FeCl_2 + H_2$

(*c*) $MgO + H_2O \longrightarrow Mg(OH)_2$

(*d*) $HNO_3 + NaOH \longrightarrow NaNO_3 + H_2O$

3. Which of the following property is generally not shown by metals?

(*a*) Electrical conduction (*b*) Sonorous in nature

(*c*) Dullness (*d*) Ductility

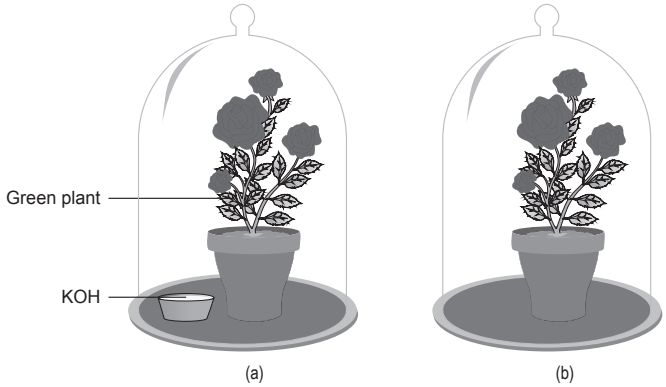
4. Generally metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg)?

(*a*) H_2SO_4 (*b*) HCl (*c*) HNO_3 (*d*) All of these

5. The electronic configuration of an element is found to be 2, 4. How many bonds can one carbon atom form in a compound?

(*a*) 1 (*b*) 2 (*c*) 4 (*d*) 6

6. A student was asked to write a stepwise procedure to demonstrate that carbon dioxide is necessary for photosynthesis. He wrote the following steps. The wrongly worded step is:



(*a*) Both potted plants are kept in dark room for at least three days.

(*b*) Bottom of the bell jars is sealed to make them air tight.

(*c*) Both potted plants are kept in sunlight after the starch test.

(*d*) A leaf from both the plants is taken to test the presence of starch.

7. In the excretory system of human beings, some substances in the initial filtrate such as glucose, amino acids, salts and water are selectively reabsorbed in

(*a*) urethra (*b*) nephron

(*c*) ureter (*d*) urinary bladder

8. Which of the following statement is incorrect?

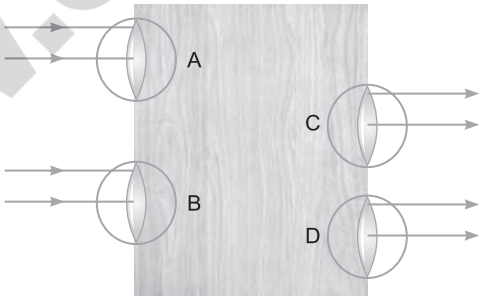
(*a*) For every hormone there is a gene.

(*b*) For every protein there is a gene.

(*c*) For production of every enzyme there is a gene.

(*d*) For every molecule of fat there is a gene.

9. Beams of light are incident through the holes A and B and emerge out of box through the holes C and D respectively as shown in figure.



Which of the following could be inside the box?

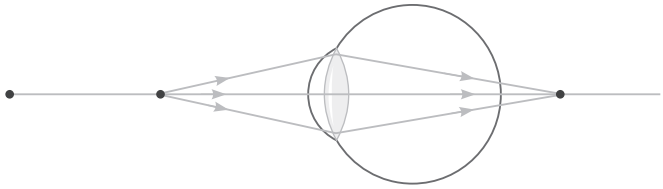
(*a*) A rectangular glass slab (*b*) A convex lens

(*c*) A concave lens (*d*) A prism

10. Two lenses of power +2.50 D and –3.75 D are combined to form a compound lens. Its focal length in cm will be

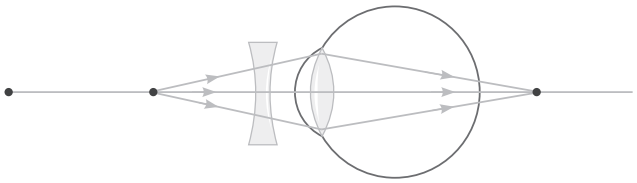
(*a*) 40 (*b*) –40 (*c*) 80 (*d*) –80

11. The image shows the ray diagram of a defected eye.

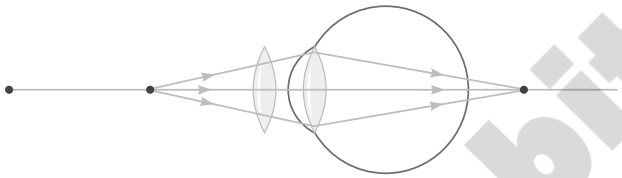


Which option shows the correction of the defect of the eye?

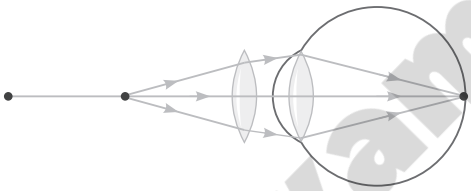
(*a*)



(*b*)



(*c*)



(*d*) None of these

12. Four cells each of emf 1.5V and the internal resistance 0.5 Ω are connected in series but one cell is wrongly connected as shown in figure.

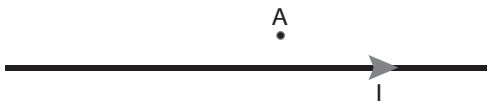
The net voltage and net internal resistance between A and B is

(*a*) 6 V, 2 Ω (*b*) 4.5 V, 1.5 Ω (*c*) 3V, 1 Ω (*d*) 3V, 2 Ω

13. When a 4V battery is connected across an unknown resistor there is a current of 100 mA in the circuit. The value of the resistance of the resistor is:

(*a*) 4 Ω (*b*) 40 Ω (*c*) 400 Ω (*d*) 0.4 Ω

14. What is the direction of magnetic field at a point A above the wire carrying current I as shown in figure?



(*a*) Out of the page (*b*) Into the page

(*c*) Up the page (*d*) Down the page

15. If a grasshopper is eaten by a frog, then the energy transfer will be from

(*a*) producer to decomposer

(*b*) producer to primary consumer

(*c*) primary consumer to secondary consumer

(*d*) secondary consumer to primary consumer

16. How much of the net primary productivity of a terrestrial ecosystem is eaten and digested by herbivores?

(*a*) 100% (*b*) 10% (*c*) 1% (*d*) 0.1%

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Hydrogen gas is not evolved when a metal reacts with nitric acid.
Reason (*R*) : Nitric acid is a strong oxidising agent.

18. Assertion (*A*) : Plants lack excretory organs.
Reason (*R*) : Plants usually absorb essential nutrients.

19. Assertion (*A*) : The mirrors used in search lights are concave spherical.
Reason (*R*) : In concave spherical mirror the image formed is always virtual.

20. Assertion (*A*) : Myopia is the defect of the eye in which only nearer objects are seen by the eye.
Reason (*R*) : The eye ball is elongated.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. Identify the substances oxidised and the substances reduced in the following reactions.

(*i*) $ZnO(s) + C(s) \longrightarrow Zn + CO(g)$

(*ii*) $4Na(s) + O_2(g) \longrightarrow 2Na_2O(s)$

22. (*i*) Write the number of covalent bonds in the molecule of propane, C_3H_8.

(*ii*) Which element exhibits the property of catenation to maximum extent and why?

OR

Catenation is the ability of an atom to form bonds with other atoms of the same element. It is exhibited by both carbon and silicon. Compare the ability of catenation of the two elements. Give reasons.

23. What will happen if mucus is not secreted by the gastric glands?

24. Answer the following:

(*i*) Which hormone is responsible for the changes noticed in females at puberty?

(*ii*) Dwarfism results due to deficiency of which hormone?

(*iii*) Blood sugar level rises due to deficiency of which hormone?

(*iv*) Iodine is necessary for the synthesis of which hormone?

25. Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive.

(*i*) yellow seed (*ii*) round seed

26. An electric oven of 2 kW power rating is operated in a domestic electrical circuit of 220 V that has a current rating of 5 A. What result do you expect? Explain.

OR

Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V.

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed?

28. An element A burns with golden flame in air. It reacts with another element B, atomic number 17 to give a product C. An aqueous solution of product C on electrolysis gives a compound D and liberates hydrogen. Identify A, B, C and D. Also write down the equations for the reactions involved.

OR

A metal A, which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B with HCl and NaOH.

29. Why is the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron but not the reverse?

30. (*i*) Why are budding, fragmentation and regeneration all considered as asexual types of reproduction?

(*ii*) With neat diagrams explain the process of regeneration in ***Planaria***.

OR

Reproduction is one of the most important characteristics of living beings. Give three reasons in support of the statement.

31. An object 6 cm in size is placed at 50 cm in front of a convex lens of focal length 30 cm. At what distance from the lens should a screen be placed in order to obtain a sharp image of the object ? Find the nature and size of the image. Also draw labelled ray diagram to show the image formation in this case.

32. Read the following information:

I. Resistivity of copper is lower than that of aluminium which in turn is lower than that of constantan.

II. Six wires labelled as A, B, C, D, E, F have been designed as per the following parameters:

Wire	Length	Diameter	Material	Resistance
A	l	$2d$	Aluminium	R_1
B	$2l$	$d/2$	Constantan	R_2
C	$3l$	$d/2$	Constantan	R_3
D	$l/2$	$3d$	Copper	R_4
E	$2l$	$2d$	Aluminium	R_5
F	$l/2$	$4d$	Copper	R_6

Answer the following questions using the above data:

(*i*) Which of the wires has maximum resistance and why?

(*ii*) Which of the wires has minimum resistance and why?

(*iii*) Arrange R_1, R_3 and R_5 in ascending order of their values. Justify your answer.

33. Give two examples of decomposers. State their important role in nature.

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. A metal carbonate X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at anode during electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identify X, Y, G and Z.

35. Explain Mendel's experiment with peas on inheritance of characters considering only one visible contrasting character.

OR

In the following crosses write the characteristics of the progeny.

Cross	Progeny
(*i*) RR YY × RR YY Round, yellow and round, yellow	_____
(*ii*) Rr Yy × Rr Yy Round, yellow and round, yellow	_____
(*iii*) rr yy × rr yy Wrinkled, green and wrinkled, green	_____
(*iv*) RR YY × rr yy Round, yellow and wrinkled, green	_____

36. (*i*) What is an electromagnet? List any two uses.

(*ii*) Draw a labelled diagram to show how an electromagnet is made.

(*iii*) State the purpose of soft iron core used in making an electromagnet.

(*iv*) List two ways of increasing the strength of an electromagnet if the material of the electromagnet is fixed.

OR

(*i*) With the help of a labelled diagram, explain the distribution of magnetic field due to a current through a circular loop. Why is it that if a current carrying coil has *n* turns the field produced at any point is *n* times as large as that produced by a single turn?

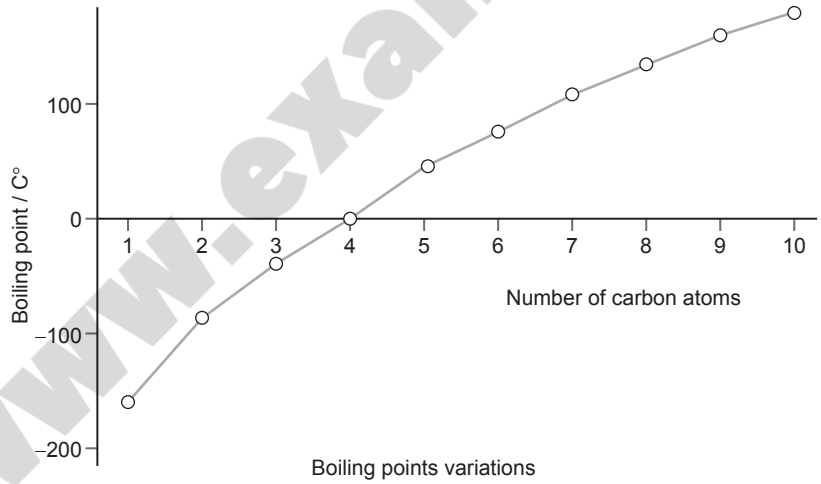
(*ii*) Draw a pattern of magnetic field formed around a current carrying solenoid. What happens to the magnetic field when the current through the solenoid is reversed?

SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. The ability of carbon atoms to form chains leads to the existence of a series of compounds that have same functional group (and hence similar chemical properties) and only differ from each other by the presence of an additional carbon atom and its two associated hydrogen atoms in the molecule (which causes the physical properties to change in a regular manner). A series of compounds related in this way is said to form an **homologous series**.

The point about chemical properties is best illustrated by the sections that follow, on different homologous series. The changes in physical properties are a result of the changes that occur in the strength of van der Waals' forces with increasing molar mass and in some cases a change in molecular polarity. The simplest illustration of the effect of chain length on physical properties is the, variation of the boiling point of the alkanes with the number of carbon atoms in the chain, as illustrated in figure.



Boiling points variations

***Source*:** *Organic Chemistry Chapter 10, P-256 from 'Chemistry by John Green and Sadru Damji'*

(*i*) All the members of a homologous series have similar chemical properties. Why?

(*ii*) In the graph shown, which has the higher boiling point and why?
Hydrocarbon with 3 carbon atoms or hydrocarbon with 6 carbon atoms

(*iii*) (*a*) What is the boiling point of heptane as shown in the graph?
(*b*) Why the curve is initially steep and flattens at the end?

OR

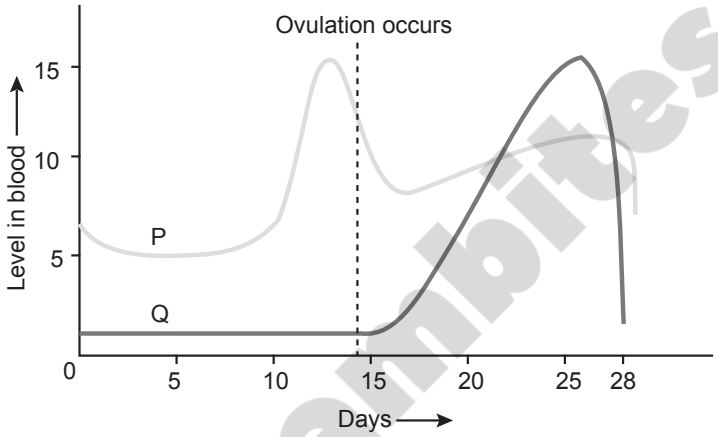
(*iii*) (*a*) Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane.

(*b*) Write the next homologue of each of the following:

I. C_2H_4 II. C_4H_6

38. Humans use sexual mode of reproduction. But the actual transfer of germ cells between two people needs special organs for the sexual act. In mammals such as humans, the baby is carried in the mother's body for a long period and is breastfed later on. The female reproductive organs and breasts will need to mature to accommodate these possibilities. Hence some specialised systems are involved in the process of sexual reproduction.

The given graph shows the hormonal changes during a normal menstrual cycle.



(*i*) What would be a likely consequence if the hormone represented by graph Q is lacking in an adult female?

(*ii*) What is funeral of unfertilised egg?

(*iii*) After the beginning of menstrual cycle, at which day progesterone reaches its peak? Give reason.

OR

(*iii*) (*a*) Name two simple organisms having the ability of regeneration.

(*b*) What is the role of the seminal vesicles and the prostate gland?

39. Light spectrum is the many different wavelengths of energy produced by light source. Light is measured in nanometers (nm). Each nanometer represents a wavelength of light or band of light energy. Visible light is the part of spectrum from 380 nm to 780 nm.

Isaac Newton was the first to use a glass prism to obtain the spectrum of sunlight. He tried to split the colours of the spectrum of white light further by using another similar prism. He then placed a second identical prism in an inverted position with respect to the first prism. This allowed all the colours of the spectrum to pass through second prism. He found a beam of white light emerging from the other side of the second prism. This observation gave Newton the idea that the sunlight is made up of seven colours.

(*i*) (*a*) What is the range of wavelength of visible light spectrum?

(*b*) What do you understand by light spectrum?

(*ii*) Explain the process of refraction when critical angle between an equilateral prism and air is 45 degree, if the incident ray is perpendicular to the refracting surface?

OR

(*ii*) (*a*) Why do different rays deviate differently in the prism?

(*b*) How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light?

Answers

1. (*a*)	**2.** (*d*)	**3.** (*c*)	**4.** (*c*)	**5.** (*c*)	**6.** (*c*)	**7.** (*b*)
8. (*d*)	**9.** (*a*)	**10.** (*d*)	**11.** (*c*)	**12.** (*d*)	**13.** (*b*)	**14.** (*a*)
15. (*c*)	**16.** (*b*)	**17.** (*a*)	**18.** (*a*)	**19.** (*c*)	**20.** (*a*)	

26. OR 0.45 A, 0.27 A

31. $v = +75$ cm, $h_1 = -9$ cm

15 SAMPLE PAPER [UNSOLVED]

Time allowed: 3 hours **Maximum marks: 80**

***General Instructions*:** *Same as CBSE Sample Question Paper–2023 (Solved).*

SECTION–A

***Select and write one most appropriate option out of the four options given for each of the questions* 1- 20.**

1. Which of the following statements is true for acids?

(*a*) Bitter and change red litmus to blue (*b*) Sour and change red litmus to blue

(*c*) Sour and change blue litmus to red (*d*) Bitter and change blue litmus to red

2. The pH of the gastric juices released during digestion is:

(*a*) less than 7 (*b*) more than 7

(*c*) equal to 7 (*d*) equal to 0

3. Which among the following statements is incorrect for magnesium metal?

(*a*) It burns in oxygen with a dazzling white flame.

(*b*) It reacts with cold water to form magnesium oxide and evolves hydrogen gas.

(*c*) It reacts with hot water to form magnesium hydroxide and evolves hydrogen gas.

(*d*) It reacts with steam to form magnesium hydroxide and evolves hydrogen gas.

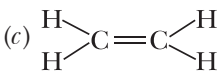
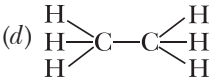
4. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z?

(*a*) Has high melting point (*b*) Has low melting point

(*c*) Conducts electricity in molten state (*d*) Occurs as solid

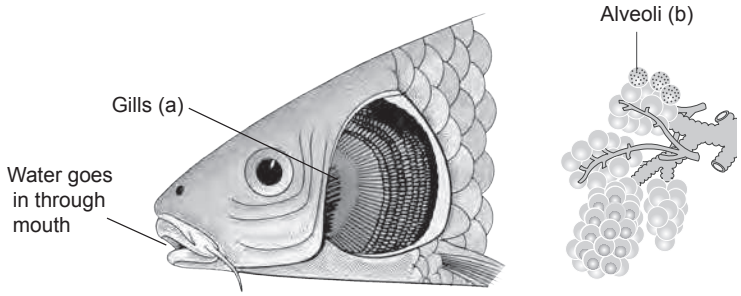
5. Structural formula of ethyne is

(*a*) H—C ≡ C—H (*b*) H_3—C ≡ C—H

(*c*)  (*d*) 

6. Respiratory structures of two different animals—a fish and a human being are as shown.

Observe (*a*) and (*b*) and select one characteristic that holds true for both of them.



(*a*) Both are placed internally in the body of animal.

(*b*) Both have thin and moist surface for gaseous exchange.

(*c*) Both are poorly supplied with blood vessels to conserve energy.

(*d*) In both the blood returns to the heart after being oxygenated.

7. Which is the first enzyme to mix with food in the digestive tract?

(*a*) Pepsin (*b*) Cellulase

(*c*) Amylase (*d*) Trypsin

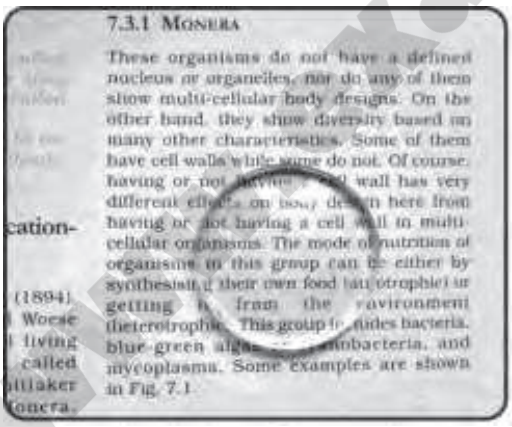
8. Exchange of genetic material takes place in

(*a*) vegetative reproduction (*b*) asexual reproduction

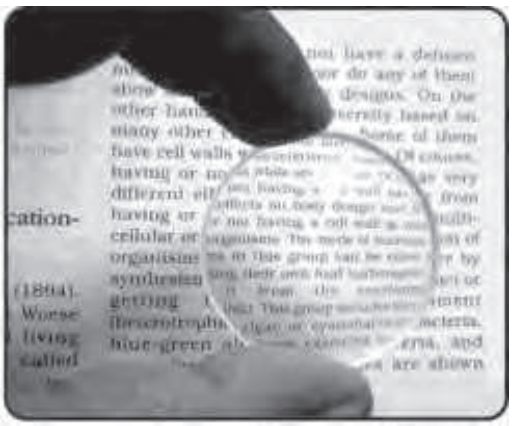
(*c*) sexual reproduction (*d*) budding

9. Rajan takes the following two photographs of the text in a book, first while keeping a circular piece of glass on the book, and then while holding it at some distance above the book.

Which of the following statements is true about the piece of glass?



Photograph 1: A piece of glass on the book



Photograph 2: A piece of glass held at some distance above the book

(*a*) It is a convex lens as the text is not inverted.

(*b*) It is a concave lens as the text is diminished in size.

(*c*) It is a plain glass disc as there is no difference in the text.

(*d*) It cannot be predicted based on the given information.

10. The magnification produced by a rear view mirror fitted in vehicles is

(*a*) less than 1

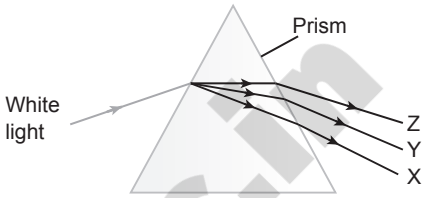
(*b*) more than 1

(*c*) equal to 1

(*d*) less than 1 or more than 1 depending on the position of the object in front of it.

11. The image shows the dispersion of the white light in the prism.

What will be the colours of the X, Y and Z?



(*a*) X: green; Y: violet; Z: red

(*b*) X: violet; Y: green; Z: red

(*c*) X: red; Y: violet; Z: green

(*d*) X: red; Y: green; Z: violet

12. In an electrical circuit three incandescent bulbs A, B and C of rating 40W, 60W and 100W respectively are connected in parallel to an electric source. Which one of the following is likely to happen regarding their brightness?

(*a*) Brightness of all the bulbs is same

(*b*) Brightness of bulb A will be maximum

(*c*) Brightness of bulb B will be more than that of A

(*d*) Brightness of bulb C will be less than that of B

13. An electric kettle consumes 1 kW of electric power when operated at 220V. A fuse wire of what rating must be used for?

(*a*) 1A (*b*) 2A (*c*) 4A (*d*) 5A

14. The strength of magnetic field inside a long current carrying straight solenoids is

(*a*) more at the ends than at the centre

(*b*) minimum in the middle

(*c*) same at all points

(*d*) found to increase from one end to the other

15. The manufacturing of Chlorofluorocarbon-free refrigerators is mandatory throughout the world. How this help prevent ozone depletion?

(*a*) This will help convert oxygen molecules into ozone.

(*b*) This will help convert the CFCs into ozone molecules.

(*c*) This will reduce the production of CFCs from oxygen molecules.

(*d*) This will reduce the release of CFCs that reacts with ozone molecules.

16. The table lists some waste products

- **grass cutting**
- **plastic toys**
- **paper straw**
- **polythene bags**
- **used tea bags**
- **old clothes**

Which group of waste materials can be classified as non-biodegradable?

(*a*) plant waste, used tea bags (*b*) polyethene bags, plastic toys

(*c*) used tea bags, paper straw (*d*) old clothes, broken footwear

Q. No 17 to 20 are Assertion-Reasoning based questions.

These consist of two statements– Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(*a*) *Both A and R are true and R is the correct explanation of A.*

(*b*) *Both A and R are true and R is not the correct explanation of A.*

(*c*) *A is true but R is false.*

(*d*) *A is false but R is true.*

17. Assertion (*A*) : Highly reactive metals are obtained by electrolytic reduction.
Reason (*R*) : In the electrolytic reduction, metal is deposited at the cathode.

18. Assertion (*A*) : Energy is required to carry out different life processes.
Reason (*R*) : Energy is obtained in the form of ATP in the mitochondria.

19. Assertion (*A*) : Refractive index has no units.
Reason (*R*) : The refractive index is a ratio of two similar quantities.

20. Assertion (*A*) : Danger signals are made of red colour.
Reason (*R*) : Velocity of red light in air is maximum, so signals are visible even in dark.

SECTION–B

Q. No 21 to 26 are very short answer questions.

21. What is the difference between the displacement and double displacement reactions? Write equations for these reactions.

22. Why are most carbon compounds poor conductors of electricity?

OR

(*i*) In an organic compound, which parts largely determine its physical and chemical properties?

(*ii*) Which of the following formulae represents a saturated hydrocarbon?
C_nH_{2n+2}, C_nH_{2n+1}, C_nH_{2n}, C_nH_{2n-2}

23. What would happen if green plants disappear from the Earth?

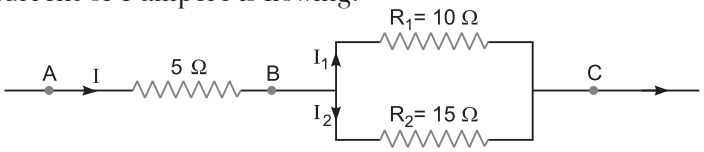
24. What will happen if intake of iodine in our diet is low?

25. List the two types of reproduction. Which one of the two is responsible for bringing in more variations in its progeny and how?

26. Two wires made of copper and nichrome have equal lengths and equal resistance. Which is thicker? (The resistivity of nichrome is greater than resistivity of copper.)

OR

Three resistors are connected as shown in the figure. Through the resistor of 5 ohms a constant current of 1 ampere is flowing.



(*i*) What is the current through the other two resistors?

(*ii*) What is the potential difference across AB and across AC?

SECTION–C

Q.No. 27 to 33 are short answer questions.

27. In an industrial process used for the manufacture of sodium hydroxide, a gas 'A' is formed as a by-product. The gas 'A' reacts with lime water to give a compound 'B' which is used as a bleaching agent in the chemical industry. Identify 'A' and 'B'. Also give the chemical equations of the reactions involved.

28. 'M' is an element which is out of Cu, Fe, Al, Na. It shows the following properties:

(*i*) One of its ore is rich in M_2O_3.

(*ii*) M_2O_3 is not affected by water.

(*iii*) It corrodes easily.

(*iv*) It forms two chlorides MCl_2 and MCl_3. Identify 'M'.

OR

A metal 'X' when added to a solution containing $ZnSO_4$ shows no change in the colour of the solution. The metal 'X' is also used to join railway tracks.

(*i*) Identify the metal 'X'.

(*ii*) What is the other reactant used in the reaction with 'X' to join railway tracks?

(*iii*) Name the method to extract the metal 'X'.

29. Why is chemical communication better than electrical impulses as a means of communication betwen cells in a multi-cellular organism?

30. Name the reproductive parts of an angiosperm. Where are these parts located? Explain in brief the structure of its female reproductive parts.

OR

(*i*) Name the following:

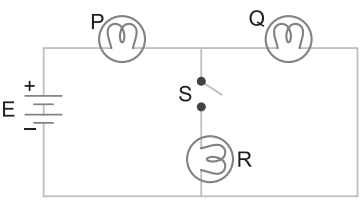
(*a*) Thread like non-reproductive structures present in Rhizopus.

(*b*) 'Blobs' that develop at the tips of the non-reproductive threads in Rhizopus.

(*ii*) Explain how these structures protect themselves and what is the function of the structures released from the 'blobs' in Rhizopus.

31. A 6 cm tall object is placed perpendicular to the principal axis of a concave mirror of focal length 30 cm. The distance of the object from the mirror is 45 cm. Use mirror formula to determine the position, nature and size of the image formed. Also draw labelled ray diagram to show the image formation in this case.

32. A battery E is connected to three identical lamps P, Q and R as shown in figure:



Initially the switch S is kept open and the lamp P and Q are observed to glow with some brightness.

Then switch S is closed.

How will the brightness of glow of bulbs P and Q will change? Justify your answer.

33. (*i*) Explain the role of UV radiation in producing ozone layer.

(*ii*) Mention the reaction involved.

(*iii*) Why is excessive use of CFCs a cause of concern?

SECTION - D

Q.No. 34 to 36 are Long answer questions.

34. A cloth strip dipped in onion juice is used for testing a liquid 'X'. The liquid 'X' changes its odour. Which type of an indicator is onion juice? The liquid 'X' turns blue litmus red. List the observations the liquid 'X' will show on reacting with the following :

(*a*) Zinc granules (*b*) Solid sodium carbonate

Write the chemical equations for the reactions involved.

35. "It is possible that a trait is inherited but may not be expressed." Give a suitable example to justify this statement.

OR

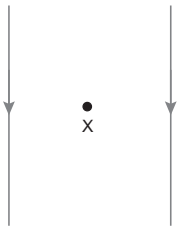
Give the basic features of the mechanism of inheritance.

36. Briefly explain an activity to plot the magnetic field lines around a bar magnet. Sketch the field pattern for the same specifying field directions.

A region A has magnetic field lines relatively closer than another region B. Which region has stronger magnetic field. Give reason to support your answer.

OR

The following diagram shows two parallel straight conductors carrying, same current. Copy the diagram and draw the pattern of the magnetic field lines around them showing their directions. What is the magnitude of magnetic field at a point 'A' which is equidistant from the conductors? Give justification for your answer.



SECTION - E

Q.No. 37 to 39 are case - based/data -based questions with 2 to 3 short sub - parts. Internal choice is provided in one of these sub-parts.

37. In an investigation, Saanvi dissolves salts in distilled water.

Experiment	Salt
1	NaCl
2	$CaCl_2$
3	$MgCl_2$
4	KCl

In each experiment she adds a soap solution, containing Na^+ ions, to each salt solution. She shakes each mixture vigorously.

(*i*) In which experiment/s will Saanvi not observe the formation of lather (foam)? Explain your answer

(*ii*) (*a*) Why are detergents better cleansing agents than soaps?

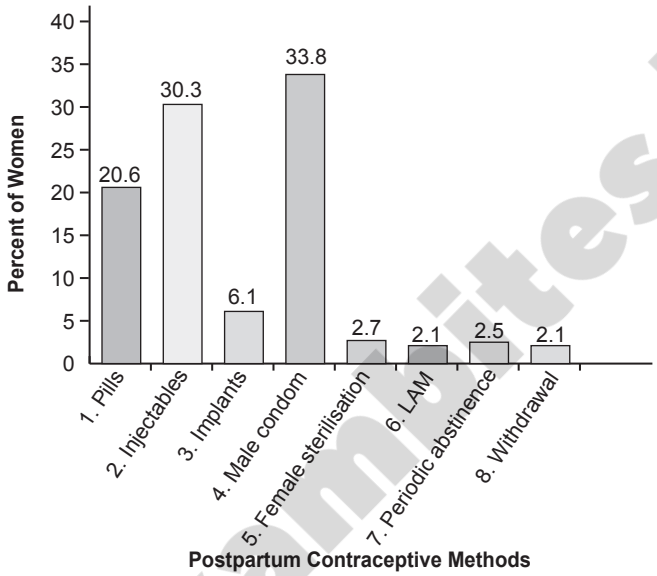
(*b*) Detergents are non-biodegradable. Explain two negative environmental impacts of detergents in a lake ecosystem.

OR

(*ii*) Design an activity to show that a detergent works well with all types of water while a soap does not.

38. The sexual act is a very intimate connection of bodies so that may lead to transmission of many diseases. Is it possible to prevent the transmission of such disease? The sexual act always has the potential to lead to pregnancy. Is there any way to avoid pregnancy? It is possible via surgery but this method may be misused by people who do not want a particular child. As reproduction leads to increase in population size, the size of the human population is a cause of concern for many people.

The given graph indicates the percentage of widely used postpartum contraceptive methods among women of a country.



(*i*) List two bacterial diseases which are transmitted sexually.

(*ii*) Name the mineral that is responsible for synthesis of hormone secreted by thyroid gland.

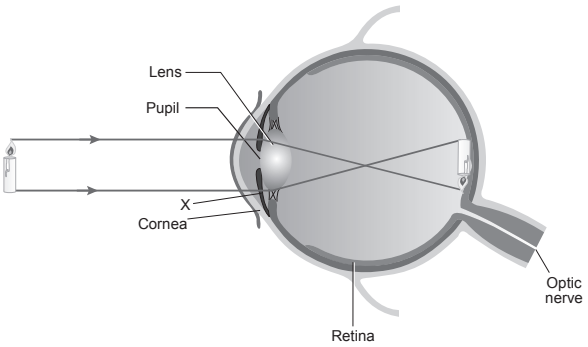
(*iii*) How copper- T prevents pregnancy? Name the natural family planning methods using the above graph.

OR

(*iii*) Study the table below and select the row that has the incorrect information. Justify your answer.

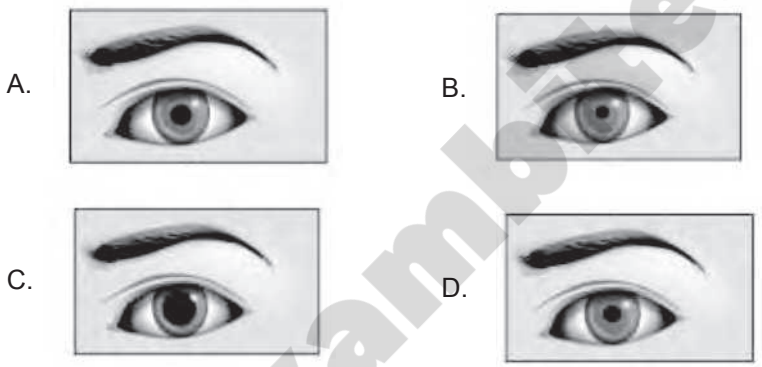
	Method	Mode of action
(*a*)	Pill	Prevents ovulation
(*b*)	Tubectomy	Prevents the egg from reaching the uterus
(*c*)	Condom	Prevents eggs reaching cervix
(*d*)	IUDs	Disrupts the process of conception

39. The diagram shows how a human eye sees a candle.



(*i*) What is X? Which part of the eye produces maximum refraction of light rays?

(*ii*) Which eye likely to be in the brightest light? Give reason.



OR

(*ii*) Due to gradual weakening of ciliary muscles and diminishing flexibility of the eye lens a certain defect of vision arises. Write the name of this defect. Name the type of lens required by such persons to improve the vision. Explain the structure and function of such a lens.

Answers

1. (*c*)	**2.** (*a*)	**3.** (*b*)	**4.** (*b*)	**5.** (*a*)	**6.** (*b*)	**7.** (*c*)
8. (*c*)	**9.** (*b*)	**10.** (*a*)	**11.** (*b*)	**12.** (*c*)	**13.** (*d*)	**14.** (*c*)
15. (*d*)	**16.** (*b*)	**17.** (*b*)	**18.** (*a*)	**19.** (*a*)	**20.** (*c*)	

26. OR (*i*) 0.6 A, 0.4 A (*ii*) 5 V and 11V

31. $v = -90$ cm, $m = -2$, $h' = -12$ cm