CBSE Class 10 2025 Science Compartment Question Paper with Solutions

Time Allowed :3 hours	**Maximum Marks :**80	**Total questions :**38

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper is divided into five Sections – A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) andques-tions number 19 and 20 are Assertion-Reason based questions of 1 markeach.
4. In Section B, Questions no. 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are short answer (SA) type questions,carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are long answer (LA) type questions carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are case study based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and 2 questions in Section E.
9. Use of calculators is not allowed.

SECTION-A

1. In which of the following reactions is a combination reaction taking place?

- **I.** $CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$
- **II.** $ZnO + C \rightarrow Zn + CO$
- **III.** $4Na + O_2 \rightarrow 2Na_2O$
- **IV.** $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

(A) Only III

(B) Only IV

(C) II and III

(D) I, III and IV

Correct Answer: (A) Only III

Solution:

We are asked to identify which of the given reactions is a **combination reaction**. A combination reaction is one in which two or more reactants combine to form a single product.

Let us analyze each reaction:

I. $CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$

This is a **reduction reaction**, where CuO is reduced to Cu and hydrogen is oxidized to H_2O. Since it produces more than one product, it is **not** a combination reaction.

II. $ZnO + C \rightarrow Zn + CO$

This is also a **reduction reaction**. Zinc oxide is reduced to zinc. Carbon is oxidized to carbon monoxide. It is not a combination reaction.

III. $4Na + O_2 \rightarrow 2Na_2O$

This is a classic example of a **combination reaction**, as sodium and oxygen combine to form a single compound: sodium oxide.

IV. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

This is a **combustion reaction**. It produces more than one product and hence is not a combination reaction.

Thus, only reaction III is a combination reaction.

Correct Answer: (A) Only III

Quick Tip

In a combination reaction, two or more reactants combine to form a single product. Always look for reactions with a single compound formed on the right-hand side.

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2. A few drops of turmeric solution are added to a colorless liquid. If the liquid turns red in color, the liquid could be:

(A) Hydrochloric acid

(B) Distilled water

(C) Ammonium hydroxide

(D) Lemon juice

Correct Answer: (C) Ammonium hydroxide

Solution:

Turmeric is a natural acid-base indicator. It turns red in basic solutions. Among the given options, only ammonium hydroxide is basic in nature. Hence, it changes turmeric's yellow color to red. All other options are either acidic or neutral.

Quick Tip

Turmeric changes to red in basic medium and remains yellow in acidic or neutral medium.

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3. The acid present in nettle leaves is:

(A) Acetic acid

(B) Methanoic acid

(C) Tartaric acid

(D) Citric acid

Correct Answer: (B) Methanoic acid

Solution:

Nettle leaves contain **methanoic acid** (also called formic acid), which causes a stinging sensation when touched. It is the same acid found in ant stings.

Quick Tip

Methanoic acid (HCOOH) is a simple carboxylic acid responsible for the burning effect in nettle and ant stings.

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4. Select the hydrocarbon from the following which contains one C≡C triple bond and one C–C single bond:

(A) Ethyne

(B) Propyne

(C) Butyne

(D) Benzene

Correct Answer: (B) Propyne

Solution:

Propyne has the structure CH_3–C≡CH. It contains one triple bond between two carbon atoms and one single bond between CH_3 and the adjacent carbon.

Quick Tip

To identify bonds in hydrocarbons, analyze the molecular structure for the presence of C–C and C≡C bonds.

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5. When barium chloride and sodium sulphate react together in aqueous solution, an insoluble substance is formed with sodium chloride in the aqueous solution. This reaction is an example of:

(A) Combination reaction

(B) Decomposition reaction

(C) Displacement reaction

(D) Double displacement reaction

Correct Answer: (D) Double displacement reaction

Solution:

When $BaCl_2$ (barium chloride) and Na_2SO_4 (sodium sulphate) are mixed in aqueous solution, a white precipitate of barium sulphate ($BaSO_4$) forms, and sodium chloride (NaCl) remains in solution.

$$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 \downarrow + 2NaCl$$

This is a classic **double displacement reaction**, where ions are exchanged between two compounds and one of the products is insoluble (precipitate).

Quick Tip

In a double displacement reaction, parts of two compounds exchange to form two new compounds — often forming a precipitate, gas, or water.

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6. In the following reaction, what is the name of compound 'A'?

$$NaCl + NH_3 + H_2O + CO_2 \rightarrow A + NH_4Cl$$

(A) Sodium carbonate

(B) Ammonium carbonate

(C) Sodium hydrogen carbonate

(D) Ammonium hydrogen carbonate

Correct Answer: (C) Sodium hydrogen carbonate

Solution:

This is a reaction used in the **Solvay process** for producing sodium hydrogen carbonate (baking soda). The combination of sodium chloride, ammonia, water, and carbon dioxide produces sodium hydrogen carbonate and ammonium chloride:

$$NaCl + NH_3 + H_2O + CO_2 \rightarrow NaHCO_3 + NH_4Cl$$

Hence, compound 'A' is sodium hydrogen carbonate.

Quick Tip

The Solvay process is an industrial method to prepare $NaHCO_3$ using NaCl, NH_3, CO_2, and H_2O. The product is commonly known as baking soda.

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7. Choose the correct statement regarding the given reaction:

$$CuO + H_2 \rightarrow Cu + H_2O$$

(A) CuO is getting reduced and H_2 is getting oxidized.

(B) H_2 is getting reduced and CuO is getting oxidized.

(C) CuO is the reducing agent.

(D) H_2 is the reducing agent.

Correct Answer: (D) H_2 is the reducing agent.

Solution:

In the reaction: $CuO + H_2 \rightarrow Cu + H_2O$

- CuO is reduced to Cu (gain of electrons) - H_2 is oxidized to H_2O (loss of electrons)

Since H_2 donates electrons, it reduces CuO and is therefore the **reducing agent**.

Quick Tip

The substance that causes reduction (loses electrons) is called the reducing agent.

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8. In the human respiratory system, the correct pathway of air during inhalation is:

(A) Nasal cavity $\rightarrow$ Pharynx $\rightarrow$ Larynx $\rightarrow$ Trachea $\rightarrow$ Bronchi $\rightarrow$ Alveoli

(B) Nasal cavity $\rightarrow$ Trachea $\rightarrow$ Larynx $\rightarrow$ Bronchi $\rightarrow$ Alveoli

(C) Nasal cavity $\rightarrow$ Bronchi $\rightarrow$ Pharynx $\rightarrow$ Trachea $\rightarrow$ Alveoli

(D) Nasal cavity $\rightarrow$ Larynx $\rightarrow$ Bronchi $\rightarrow$ Trachea $\rightarrow$ Alveoli

Correct Answer: (A) Nasal cavity $\rightarrow$ Pharynx $\rightarrow$ Larynx $\rightarrow$ Trachea $\rightarrow$ Bronchi $\rightarrow$ Alveoli

Solution:

Air enters through the nasal cavity, then passes through the pharynx, larynx, trachea, and bronchi, finally reaching the alveoli where gas exchange occurs.

Quick Tip

Remember the air passage sequence: Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Alveoli.

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9. A doctor advised a patient to take an insulin injection. What could be the reason?

(A) His heart rate was slow.

(B) He had low hemoglobin.

(C) He appeared to be very thin.

(D) His pancreas was not producing enough insulin.

Correct Answer: (D) His pancreas was not producing enough insulin.

Solution:

Insulin is a hormone produced by the pancreas that regulates blood sugar levels. A person with diabetes may need insulin injections if the pancreas fails to produce sufficient insulin.

Quick Tip

Insulin is essential for glucose regulation; its deficiency is treated using insulin injections in diabetes.

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10. The movement of the sunflower plant is a response to which type of stimulus?

(A) Gravity

(B) Chemical

(C) Day or Night

(D) Water

Correct Answer: (C) Day or Night

Solution:

The sunflower exhibits movement based on the presence or absence of light (diurnal movement), i.e., it faces the sun during the day. This type of movement is called photonasty, triggered by light availability.

Quick Tip

Sunflowers respond to light stimulus (day/night), not to gravity or chemicals.

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11. In the bread mould (Rhizopus), the structures labeled A and B are respectively:

(A) Mycelium and spores

(B) Root and sporangium

(C) Mycelium and sporangium

(D) Root and spores

Correct Answer: (C) Mycelium and sporangium

Solution:

In Rhizopus (bread mould):

- A is the mycelium (fungal hyphae network),

- B is the sporangium (sac-like structure that produces spores).

Quick Tip

In fungi like Rhizopus, A = mycelium and B = sporangium (spore-producing structure).

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12. In plants, waste products like resin and gum are stored in:

(A) The falling leaves

(B) Old xylem

(C) Phloem

(D) Cellular vacuoles

Correct Answer: (B) Old xylem

Solution:

In plants, waste materials such as resins and gums are stored in dead tissues like old xylem vessels. These tissues do not participate in transport anymore and act as storage for metabolic waste.

Quick Tip

Plants store waste like resins and gums in old/dead xylem vessels, which are no longer functional in transport.

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13. A real image of a body is formed by a concave mirror of 50 cm focal length at a distance of –1 focal length. What is the distance between the image and the object?

(A) 50 cm

(B) 100 cm

(C) 200 cm

(D) Zero

Correct Answer: (B) 100 cm

Solution:

If the object is placed at a distance equal to 2F (i.e., 100 cm from the mirror), a real image is formed at the same distance (100 cm) on the other side of the mirror. So, distance between object and image:

$$= 100\,\text{cm} + 100\,\text{cm} = \boxed{200\,\text{cm}}$$

But according to the question, image forms at 1 focal length (i.e., 50 cm), so object must be at 100 cm. Thus:

$$\text{Distance between object and image} = 100 - 0 = \boxed{100\,\text{cm}}$$

Quick Tip

A concave mirror forms a real, inverted image at the same distance as the object when placed at 2F. Use mirror formula to calculate.

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14. When we connect multiple electrical appliances to a circuit with fixed current rating using the same socket:

(A) Total resistance of circuit increases

(B) Current taken from the source decreases

(C) Current exceeds the permitted value

(D) Every appliance starts drawing more than required current

Correct Answer: (C) Current exceeds the permitted value

Solution:

Using too many appliances from a single socket increases the total current beyond safe levels. This may cause overheating, damage, or even short circuits.

Quick Tip

Avoid overloading sockets; excess current can exceed fuse limits and become a fire hazard.

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15. Consider the following statements:

1. Every step in a food chain is called a trophic level.
2. Decomposers convert complex organic matter into simple substances that mix with the soil.
3. In a food chain, energy increases from lower to higher trophic level.
4. Interlinking of multiple food chains forms a food web.

Which of the above statements are correct?

(A) Only I

(B) I and IV

(C) I, II and IV

(D) II and IV

Correct Answer: (C) I, II and IV

Solution:

- Statement I is correct: Each level is called a trophic level.
- Statement II is correct: Decomposers break down complex organic matter.
- Statement III is incorrect: Energy decreases as we move up the food chain.
- Statement IV is correct: Multiple food chains form a food web.

Quick Tip

Energy decreases at higher trophic levels due to energy loss; decomposers play a key role in nutrient recycling.

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16. What is meant by biomagnification?

(A) Increase in body weight of an organism

(B) Increase in growth of plant tissues

(C) Increase in harmful chemicals at each trophic level

(D) Increase in number of plants and animals in a region

Correct Answer: (C) Increase in harmful chemicals at each trophic level

Solution:

Biomagnification refers to the progressive increase in the concentration of harmful substances (like DDT or mercury) at higher levels of the food chain.

Quick Tip

Toxic substances magnify up the food chain, affecting top predators most — this is biomagnification.

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17. Assertion (A): Soap does not form lather with hard water.

Reason (R): Hard water contains salts of calcium and magnesium which react with soap to form insoluble substances (scum).

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

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Correct Answer: (A) Both A and R are true and R is the correct explanation of A.

Solution:

Soap does not lather in hard water due to the presence of calcium and magnesium ions, which form insoluble scum with soap. Hence both assertion and reason are correct, and

reason explains the assertion.

Quick Tip

Hard water forms scum with soap due to calcium/magnesium ions, preventing lathering.

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18. Assertion (A): Both plants and animals exhibit chemical coordination.

Reason (R): Plant hormones regulate directional growth while in animals, hormones do not control directional growth.

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

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Correct Answer: (B) Both A and R are true but R is not the correct explanation of A.

Solution:

Chemical coordination occurs in both plants (via hormones like auxin, gibberellin) and animals (via endocrine glands). Though the reason is true, it doesn't explain the assertion directly, as coordination involves more than just directional growth.

Quick Tip

Plants and animals both use hormones for regulation, but in different ways and not limited to direction control.

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19. Assertion (A): Kilowatt-hour (kWh) is the commercial unit of electrical energy.

Reason (R): $1\,\text{kWh} = 10^6\,\text{Joules}$

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

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Correct Answer: (A) Both A and R are true and R is the correct explanation of A.

Solution:

Electrical energy used in households is measured in kilowatt-hours. One kilowatt-hour equals $1000 \times 3600 = 3.6 \times 10^6$ J, but commonly rounded to 10^6 in estimation.

Quick Tip

kWh is the practical unit for billing electrical energy, and 1 kWh = 3.6×10^6 J.

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20. Assertion (A): An ozone molecule (O_3) is formed from three atoms of oxygen.

Reason (R): Ozone protects life on Earth from harmful ultraviolet (UV) radiation.

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

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Correct Answer: (B) Both A and R are true but R is not the correct explanation of A.

Solution:

Ozone (O_3) is composed of three oxygen atoms. It protects Earth from UV rays, but that is not the reason why it is made up of three atoms. So both statements are correct but not causally linked.

Quick Tip

Ozone absorbs harmful UV radiation, but its molecular structure (O_3) is not due to this protective function.

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21. "Sex of a newborn baby in humans depends on the father, not the mother." Confirm this statement with the help of a flow chart.

Solution:

In humans, sex is determined by sex chromosomes. Males have XY chromosomes and females have XX chromosomes. During reproduction:

$$\text{Mother (XX)} \Rightarrow \text{Provides X chromosome only}$$

$$\text{Father (XY)} \Rightarrow \text{Can provide either X or Y chromosome}$$

Flow chart:

$$\text{Mother (X)}$$

$$\downarrow$$

$$\text{Father (X or Y)} \Rightarrow \begin{cases} \text{X from father} \Rightarrow \text{XX (Girl)} \\ \text{Y from father} \Rightarrow \text{XY (Boy)} \end{cases}$$

So, the child's sex depends on whether the sperm carries an X or Y chromosome — determined by the father.

Quick Tip

Only the father contributes the sex-determining chromosome (X or Y), so the baby's sex is decided by the father.

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22. Identify one organ in (i) male and (ii) female reproductive system of humans which produces gametes and also acts as an endocrine gland. Also name the hormone secreted by each.

Solution:

(i) Male Reproductive System: Organ: Testes

Function: Produces sperm (gametes) and also secretes hormone **testosterone**.

(ii) Female Reproductive System: Organ: Ovaries

Function: Produces ova (gametes) and secretes hormones **estrogen** and **progesterone**.

Quick Tip

Testes and ovaries are both gonads and also endocrine glands — they produce gametes and hormones.

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23. (a) Write one advantage of using cloth bags instead of plastic bags.

(b) Mention any two methods for safe disposal of solid waste in urban areas.

Solution:

(a) Cloth bags are biodegradable and reusable, hence they do not pollute the environment like plastic bags. They are environmentally friendly and economical in the long run.

(b) Two methods for safe disposal of solid waste:

- **Segregation and Recycling:** Separate biodegradable and non-biodegradable waste and recycle reusable items.
- **Composting:** Convert organic waste into manure using aerobic bacteria or vermicompost techniques.

Quick Tip

Avoid plastic, adopt reusable cloth bags. Solid waste can be managed using recycling and composting.

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24. (a) A metal 'A' reacts violently with cold water and the released gas catches fire. Another metal 'B' floats on water and moves rapidly on the surface. Metal 'C' does not react with cold or hot water but reacts with steam. Metal 'D' does not react with water in any form. Identify metals 'A', 'B', 'C', and 'D'.

Solution:

Based on chemical reactivity with water:

- **Metal A: Sodium (Na)** — Reacts violently with cold water and the released hydrogen gas catches fire.
- **Metal B: Potassium (K)** — Reacts with water, floats and moves on the surface.
- **Metal C: Iron (Fe)** — Reacts only with steam, not with cold or hot water.
- **Metal D: Gold (Au) or Silver (Ag)** — Does not react with water at all.

Quick Tip

The reactivity of metals with water decreases down the reactivity series. Sodium and potassium react vigorously, iron reacts with steam, and noble metals like gold and silver do not react.

OR

(b) When two compounds — sodium chloride and calcium chloride — are burned in a flame one by one, the flame turns into different colours.
(i) Write the name of the flame colours produced by:

- Sodium chloride
- Calcium chloride

(ii) Are these compounds soluble in non-polar solvents like kerosene or petrol? Justify your answer.

Solution:

(i) **Flame Test Colours:**

- Sodium chloride (NaCl) $\rightarrow$ **Golden yellow flame**
- Calcium chloride ($CaCl_2$) $\rightarrow$ **Brick red flame**

(ii) **Solubility:** No, sodium chloride and calcium chloride are ionic compounds. They are soluble in polar solvents like water but not in non-polar solvents like kerosene or petrol.

Quick Tip

"Ionic compounds dissolve in polar solvents." Flame colours help identify metal ions: Na (yellow), Ca (brick red).

25.

(a) State Fleming's Left-Hand Rule.

Solution:

Fleming's Left-Hand Rule: If the forefinger, middle finger, and thumb of the left hand are stretched mutually perpendicular to each other, then:

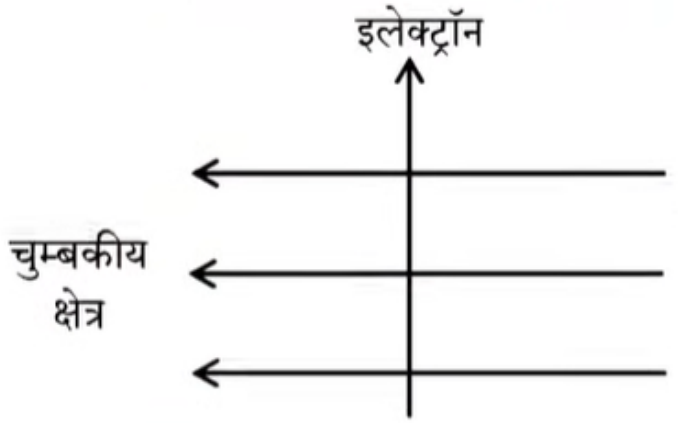
- Forefinger indicates the direction of the magnetic field (B),
- Middle finger shows the direction of current (I),
- Thumb gives the direction of the force (motion) on the conductor.

Quick Tip

Use left-hand rule for motors: Thumb = Force, First finger = Magnetic field, Middle finger = Current.

OR

(b) As shown in the diagram, an electron enters perpendicularly into a magnetic field. Using Fleming's Left-Hand Rule, determine the direction of the force experienced by the electron.



Solution:

Given:

- Electron is moving **upward**.
- Magnetic field is **into the page (leftward in diagram)**.
- Electron is negatively charged, so the direction of current is opposite to the motion of the electron, i.e., **downward**.

Now, applying Fleming's Left-Hand Rule:

- First finger $\rightarrow$ magnetic field (left)
- Middle finger $\rightarrow$ current (downward)
- Thumb $\rightarrow$ force on the conductor $\rightarrow$ **out of the plane of the paper (towards observer)**

Thus, the electron experiences a force in the **inward direction (into the page)** because the actual force direction is opposite for negatively charged particles.

Quick Tip

For electrons, reverse the current direction while applying Fleming's Left-Hand Rule.

26.

(a) Based on the given data, determine the image position formed by a spherical mirror:

$$u = -20\,\text{cm}, \quad f = -15\,\text{cm}$$

Solution:

Using the mirror formula:

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

Substituting values:

$$\frac{1}{-15} = \frac{1}{v} - \frac{1}{-20} \Rightarrow \frac{1}{v} = \frac{1}{-15} + \frac{1}{20}$$

$$\frac{1}{v} = \frac{-4+3}{60} = \frac{-1}{60} \Rightarrow v = -60\,\text{cm}$$

Thus, the image is formed 60 cm in front of the mirror.

Since v is negative:

- The image is real and inverted.
- It lies beyond the center of curvature.

Quick Tip

Use sign convention carefully in mirror formula: Real images have negative v, virtual images have positive v for concave mirrors.

OR

(b) Draw a ray diagram to show image formation by a concave mirror when the object is placed between focus and center of curvature.

Solution:

Position of Object: Between the focus (F) and the center of curvature (C) in front of a concave mirror.

Ray Diagram Description:

- Draw a ray parallel to the principal axis → reflects through the focus.
- Draw a ray through the center of curvature → reflects back along the same path.
- The image forms beyond the center of curvature.

Nature of Image:

- Real and inverted
- Enlarged
- Formed beyond the center of curvature

Quick Tip

When the object is between F and C in a concave mirror, the image is real, inverted, and magnified — formed beyond C.

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27. Mention any two ways by which plants absorb carbon dioxide. Also explain the reason for opening and closing of stomata.

Solution:

Ways plants absorb carbon dioxide:

1. **Stomata:** Tiny pores present mainly on the underside of leaves. They open during the day to allow CO_2 to diffuse into leaf cells for photosynthesis.
2. **Lenticels:** Small openings in woody stems through which gases like carbon dioxide and oxygen can exchange.

Reason for opening and closing of stomata:

- Guard cells control the stomatal opening. When guard cells absorb water, they swell and the pore opens (turgid condition).
- When guard cells lose water, they become flaccid and the pore closes.

This process helps balance gas exchange and water loss.

Quick Tip

Stomata open during the day for photosynthesis and close at night to prevent water loss. Turgor pressure in guard cells controls this movement.

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28. (a)

(i) Why do the members of a homologous series show similar chemical properties?

(ii) What is the difference in number of carbon and hydrogen atoms between two consecutive members of a homologous series? Give one example each of (i) Alkanes, (ii) Alcohols, (iii) Aldehydes.

Solution:

(i) Reason for similar chemical properties:

Members of a homologous series have:

- The same functional group (e.g., –OH in alcohols, –CHO in aldehydes).
- A common general molecular formula.
- Similar structural framework.

Because of the same functional group, their chemical reactivity remains similar, even though physical properties (melting/boiling point, mass) vary.

(ii) Difference in atomic composition:

Each successive member of a homologous series differs by:

$$\boxed{-CH_2 \text{ group} \Rightarrow 1 \text{ carbon and } 2 \text{ hydrogen atoms}}$$

Examples:

- **Alkanes:** CH_4 (methane), C_2H_6 (ethane)
- **Alcohols:** CH_3OH (methanol), C_2H_5OH (ethanol)
- **Aldehydes:** HCHO (formaldehyde), CH_3CHO (acetaldehyde)

Each next compound has one additional carbon and two hydrogen atoms.

Quick Tip

Homologous series members differ by a constant $–CH_2$ group and show similar chemical behavior due to the same functional group.

OR

28. (b) (i) Explain why carbon forms strong bonds with other elements.

(ii) Why do covalent compounds have low melting and boiling points?

(iii) Draw electron dot structure of chlorine (atomic number 17).

Solution:

(i) Carbon bonding explanation:

- Carbon has a small atomic radius and 4 valence electrons.
- It can form strong covalent bonds with many elements like hydrogen, oxygen, nitrogen, chlorine, etc.
- The covalent bonds are very stable due to high bond energy and ability to form single, double, and triple bonds.

(ii) Low melting and boiling points of covalent compounds:

- Covalent compounds do not form ions.
- Molecules are held by weak Van der Waals forces or London dispersion forces.
- Less energy is required to break these weak intermolecular attractions.

(iii) Electron dot structure of Cl_2:

Each chlorine atom has 7 valence electrons: Cl · · · · · ··

They share 1 pair of electrons to form a covalent bond: Cl : Cl

Quick Tip

Carbon's tetravalency makes it bond-rich and stable. Covalent compounds melt easily due to weak molecular forces, not ionic bonds.

29.

(a) Write the names of glands located in the stomach and list the digestive enzymes secreted by them.

Solution:

Glands in the stomach:

- **Gastric glands** are located in the walls of the stomach.

Digestive secretions:

- **Hydrochloric acid (HCl):** Kills bacteria and provides acidic medium.
- **Pepsinogen:** Converts to pepsin in acidic medium and digests proteins.
- **Mucus:** Protects the stomach lining from acid.

Quick Tip

Pepsin is activated only in acidic conditions, provided by HCl from gastric glands.

(b) Even though the liver has no digestive enzymes, it plays an important role in digestion. Explain.

Solution:

Although the liver does not secrete any enzyme, it secretes **bile juice**, which:

- **Emulsifies fats:** Breaks large fat globules into smaller ones for enzyme action.
- **Neutralizes acidic food:** Makes chyme from the stomach alkaline for enzyme action in the small intestine.

Quick Tip

Liver's bile is essential for fat digestion even without enzymes—it breaks down fats mechanically.

30.

(a)(i) Differentiate between a solenoid and a circular coil.

Solution:

Solenoid:

- Long coil with many turns of wire closely packed in a cylindrical shape.
- Magnetic field inside is uniform and similar to a bar magnet.

Circular Coil:

- Single or few turns of wire in a circular loop.
- Magnetic field is concentrated at the center, not uniform throughout.

Quick Tip

Solenoid acts like a bar magnet due to uniform internal field; a circular coil does not.

(a)(ii) Explain how a solenoid can be made in a school lab.

Solution:

Making a solenoid:

- Take an insulated copper wire.
- Wind it uniformly around a cylindrical cardboard or PVC tube.
- Connect the two ends to a battery.

This setup behaves like a solenoid producing a magnetic field when current passes.

Quick Tip

Use multiple closely spaced turns on a non-metallic tube to make a safe lab solenoid.

(a)(iii) Write one use of a strong magnetic field produced inside a solenoid.

Solution:

Use: The strong magnetic field inside a solenoid is used to make an **electromagnet**, which is further used in:

- Electric bells
- Relays and switches
- Magnetic lifting cranes

Quick Tip

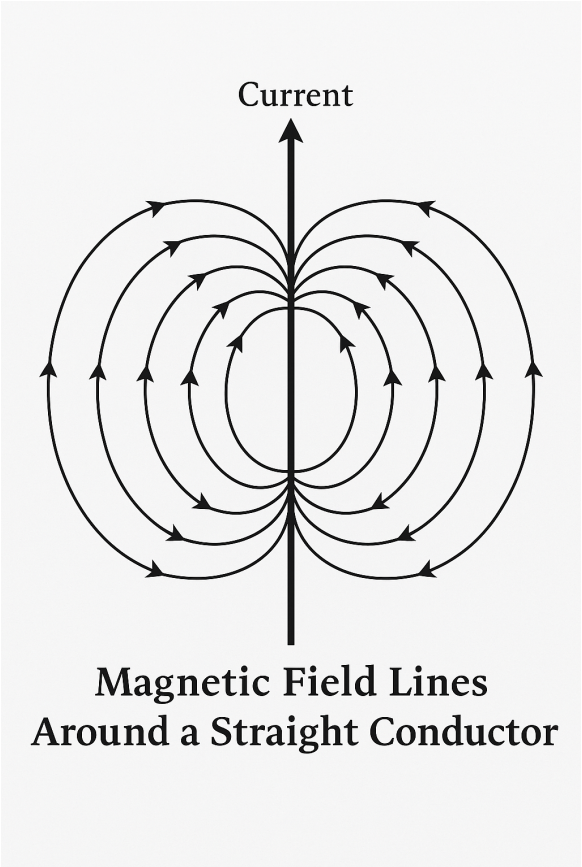
Solenoids create strong magnetic fields useful in making temporary, controllable electromagnets.

OR

(b) With the help of a labeled diagram, show the pattern of magnetic field lines around a current-carrying straight conductor. Explain how we can use the right-hand thumb rule to find the direction of magnetic field due to current.

Solution:

Diagram: Magnetic Field Lines Around a Straight Conductor



Right-Hand Thumb Rule: If you hold the current-carrying conductor in your right hand such that the thumb points in the direction of the current, then the curled fingers show the direction of the magnetic field around the conductor.

Quick Tip

The magnetic field around a straight conductor forms concentric circles. Use the right-hand thumb rule to trace the field direction.

31.

A person must hold reading material at a distance greater than 25 cm for clear vision.

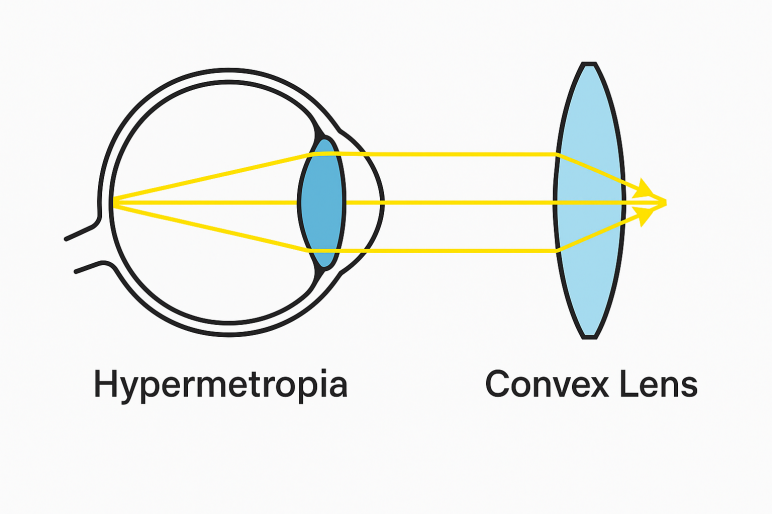
(i) What is the name of this visual defect?

(ii) Draw a ray diagram to show its correction.

Solution:

(i) This defect is called **Hypermetropia (farsightedness)**. It is the inability to see nearby objects clearly.

(ii) **Correction:** This defect is corrected using a **convex lens** which converges the light rays before they enter the eye so that they focus correctly on the retina.



Explanation: In hypermetropia, the image is formed behind the retina due to a short eyeball or insufficient curvature of the eye lens.

Quick Tip

Hypermetropia is corrected by convex lenses that shift the focal point onto the retina.

32.

What is photosynthesis? Name the organs and organelles (cell structures) where photosynthesis occurs.

Where is oxygen released during this process? What happens to the carbohydrates that are not immediately used by plants?

Solution:

Definition: Photosynthesis is the process by which green plants synthesize food (glucose) using carbon dioxide, water, and sunlight in the presence of chlorophyll.

$$6CO_2 + 6H_2O \xrightarrow{\text{light, chlorophyll}} C_6H_{12}O_6 + 6O_2$$

Organs involved: - Leaves (main site of photosynthesis)

Organelles: - **Chloroplasts** (contain chlorophyll)

Oxygen release: - Oxygen is released from the **stomata** on the leaves.

Fate of unused carbohydrates: - Excess glucose is converted into starch and stored in roots, stems, and leaves.

Quick Tip

Photosynthesis occurs in leaves, specifically in chloroplasts. Oxygen exits through stomata, and excess sugars are stored as starch.

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33. (a)

Give one example each of (i) a natural ecosystem and (ii) an artificial (man-made) ecosystem.

Solution:

- **Natural Ecosystem:** Forest, Pond, Lake
- **Artificial Ecosystem:** Crop field, Aquarium, Garden

Quick Tip

Natural ecosystems function without human intervention; artificial ecosystems are managed by humans.

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33. (b)

Write a four-step aquatic food chain. Among them, which group of organisms is most important and why?

Solution:

Example of a Four-Level Aquatic Food Chain:

$$\text{Phytoplankton} \rightarrow \text{Zooplankton} \rightarrow \text{Small Fish} \rightarrow \text{Large Fish}$$

Most Important Group: Phytoplankton (Producers) They are the base of the food chain and synthesize food via photosynthesis. All higher trophic levels depend on them for energy.

Quick Tip

Producers form the foundation of all food chains by converting solar energy into chemical energy.

34.

(a)(i) A certain aqueous solution turns blue litmus red. On adding an excess of which of the following solutions will this change be reversed?

1. Lemon juice
2. Magnesium hydroxide
3. Vinegar
4. Calcium sulphate

Solution:

The given solution is acidic because it turns blue litmus red. To reverse this, a basic solution is needed.

Correct option: (2) Magnesium hydroxide — It is a strong base and will neutralize the acid.

Quick Tip

Acids turn blue litmus red, and bases (alkalies) like magnesium hydroxide reverse this.

(ii) Which of the following will turn phenolphthalein pink?

1. CH_3COOH
2. $Ca(OH)_2$
3. HCl
4. NaOH

Solution:

Phenolphthalein turns pink in basic solutions. Both $Ca(OH)_2$ and NaOH are bases.

Correct options: (2) and (4) — Calcium hydroxide and Sodium hydroxide.

Quick Tip

Phenolphthalein is colorless in acid but turns pink in base.

(iii) Write the name and formula of a gas whose solution is basic.

Solution:

Name: Ammonia

Formula: NH_3

Aqueous solution: Ammonium hydroxide (NH_4OH), which is basic in nature.

Quick Tip

Ammonia dissolves in water to form a weak base — ammonium hydroxide.

(iv) Why is a basic solution used to treat a bee sting?

Solution:

A bee sting injects **formic acid**, which causes pain and irritation. To neutralize the acid, a base like baking soda (sodium bicarbonate) is used.

Base used: $NaHCO_3$ (baking soda)

Quick Tip

Bee stings are acidic — treat with a mild base like baking soda to neutralize.

(v) Name the acids present in:

- Tomato
- Tamarind (imli)

Solution:

- Tomato — **Oxalic acid**
- Tamarind — **Tartaric acid**

Quick Tip

Naturally occurring acids include oxalic (in tomato), citric (in lemon), and tartaric (in tamarind).

OR

OR (b)

(i) Define crystalline water.

Solution:

Crystalline water refers to the fixed number of water molecules chemically bound within a crystal structure of a salt.

Also called: Water of crystallization.

Quick Tip

Water of crystallization gives hydrated salts their shape and often their color.

(ii) Give one compound's name and formula that contains water of crystallization and appears blue.

Solution:

Name: Copper(II) sulphate pentahydrate

Formula: $CuSO_4 \cdot 5H_2O$

Quick Tip

$CuSO_4 \cdot 5H_2O$ appears blue due to water of crystallization.

(iii) Write the chemical formula of bleaching powder. Write the balanced chemical equation for its preparation. List three uses.

Solution:

Formula: $CaOCl_2$ (Calcium oxychloride)

Balanced Chemical Equation:

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

Uses:

- Disinfecting drinking water

- Used as bleaching agent in textile industry
- Used in paper industry for bleaching wood pulp

Quick Tip

Bleaching powder is a disinfectant and is produced by reaction of chlorine with slaked lime.

35.

(a)(i) Write the name of the part of the human female reproductive system where the following functions take place:

1. Maturation of ovum
2. Fertilization of ovum with sperm
3. Zygote formation

Solution:

The name of the part is: **Fallopian tube (oviduct)**

- The ovum matures in the ovary but is released into the fallopian tube.
- Fertilization occurs in the fallopian tube.
- The zygote is formed here before moving to the uterus for implantation.

Quick Tip

The fallopian tube is the site of fertilization and early zygote development in humans.

(ii) What happens when:

1. The ovum is fertilized?
2. The ovum is not fertilized?

Solution:

(1) When fertilization occurs:

- The fertilized egg (zygote) undergoes cell division and forms an embryo.
- The embryo implants into the uterine wall and develops into a fetus.

(2) When fertilization does not occur:

- The uterine lining sheds through the vagina in a process called menstruation.
- This happens approximately every 28 days.

Quick Tip

Fertilization leads to embryo formation, while failure of fertilization causes menstruation.

OR

35. (b)

(i) Explain each with an example:

- (1) Unisexual flower
- (2) Bisexual flower

Solution:

Unisexual flower:

- Has either stamens or carpels, not both.
- Example: Papaya, corn

Bisexual flower:

- Has both stamens and carpels.
- Example: Hibiscus, mustard

Quick Tip

Unisexual flowers are either male or female; bisexual flowers have both reproductive parts.

(ii) Identify the labeled parts A, B, C, and D in the given diagram of a flower.

Solution:

A – Stigma

B – Style

C – Ovary

D – Ovule

These are parts of the pistil (female reproductive part of a flower).

Quick Tip

The ovule becomes the seed after fertilization, and the ovary becomes the fruit.

(iii) "Pollination can occur without fertilization, but fertilization cannot occur without pollination." Justify this statement.

Solution:

Justification:

- **Pollination** is the transfer of pollen from anther to stigma. It may or may not be followed by fertilization.
- **Fertilization** is the fusion of male and female gametes, which can only happen if pollination has already taken place.

Thus, pollination is a necessary condition for fertilization, but pollination alone does not guarantee fertilization.

Quick Tip

Pollination is the gateway to fertilization in flowering plants — one can happen without the other, but not vice versa.
