UP Board Class 10 Science 2024 code : 824 (IN) Question Paper with solutions

Time Allowed :3 hours	**Maximum Marks :**100	**Total questions :**65

General Instructions

Read the following instructions very carefully and strictly follow them:

1. (i). First **15 minutes** are allotted for the candidates to read the question paper.
2. (ii). The question paper is divided into **two parts – Part A** and **Part B**.
3. (iii). **Part A** and **Part B** are further divided into **three sub-sections**: 1, 2, and 3.
4. (iv). In **Part A** of the question paper, there are **Multiple Choice Type Questions**. Candidates must select the correct alternative and mark it on the **OMR Answer Sheet** using a **blue or black ballpoint pen**. Completely fill the respective circle. **Do not erase, cut, or use a whitener** on the OMR Answer Sheet after marking your answer.
5. (v). Each question in **Part A** carries **1 mark**.
6. (vi). **Part B** contains **descriptive questions**.
7. (vii). The marks allotted for each question are clearly mentioned.
8. (viii). All the questions in **Sub-Sections of Part B** must be attempted **at a time**. Start each Sub-Section from a new page.
9. (ix). **All questions are compulsory.**

PART - A
(Multiple Choice Type Questions)
Sub-Section - (1)

1. A convex lens of focal length 10 cm forms a real image of the same size as the object. The distance between the object and its image will be:

(A) 10 cm

(B) 20 cm

(C) 30 cm

(D) 40 cm

Correct Answer: (B) 20 cm

Solutions: For a convex lens that forms a real image of the same size as the object, both the object and image must be positioned at equal distances from the focal point. Consequently, the object distance (u) and image distance (v) will have equal magnitudes but opposite directions. The total distance between the object and the image will be twice the focal length. Therefore, the distance between the object and its image is 20 cm.

Quick Tip

For a convex lens forming a real image of the same size as the object, the distance between the object and the image is twice the focal length.

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2. The magnification produced by a convex mirror is always

(A) more than 1

(B) less than 1

(C) equal to 1

(D) more or less than 1

Correct Answer: (B) less than 1

Solutions: A convex mirror consistently produces a virtual, upright, and reduced image, resulting in a magnification that is always less than 1. Since the image is always smaller than the object, the ratio of the image height to the object height is always less than 1.

Quick Tip

A convex mirror always produces a virtual, erect, and diminished image, making its magnification less than 1.

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3. The focal length of a converging lens is 20 cm. The power of this lens will be

(A) +0.2 D

(B) -0.2 D

(C) +5.0 D

(D) -5.0 D

Correct Answer: (C) +5.0 D

Solutions: The power of a lens is calculated using the formula:

$$P = \frac{100}{f}$$

where f is the focal length in centimeters. Given that $f = 20\,\text{cm}$, we have:

$$P = \frac{100}{20} = 5D$$

Since this is a converging (convex) lens, the power is positive.

Quick Tip

The power of a lens is calculated using $P = \frac{100}{f}$, where f is in cm. A convex lens has a positive power.

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4. When a beam of white light falls on the surface of a triangular glass prism it splits, after emerging out from the prism into various colours with different deviations. The colour which has minimum deviation is

(A) Yellow

(B) Green

(C) Violet

(D) Red

Correct Answer: (D) Red

Solutions: When white light passes through a prism, it undergoes dispersion, separating into its individual colors. The extent of deviation depends on the wavelength of the light, with longer wavelengths deviating less. Among the visible colors, red, having the longest wavelength, experiences the least deviation.

Quick Tip

The deviation of light in a prism depends on its wavelength. Red light, having the longest wavelength, experiences the least deviation.

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5. The resistance of a wire of any substance of length l and area of cross-section A is 4 Ω. Another wire of the same substance has length $2l$ and area of cross-section $\frac{A}{2}$. Then its resistance will be

(A) 4 Ω

(B) 8 Ω

(C) 16 Ω

(D) 32 Ω

Correct Answer: (C) 16 Ω

Solutions: The resistance of a wire is given by the formula:

$$R = \rho \frac{l}{A}$$

For the original wire, the resistance is:

$$R_1 = \rho \frac{l}{A} = 4\,\Omega$$

For the second wire with length $2l$ and cross-sectional area $\frac{A}{2}$, the resistance is:

$$R_2 = \rho \frac{2l}{A/2} = \rho \frac{4l}{A} = 4 \times 4 = 16\,\Omega$$

Quick Tip

Resistance of a wire is directly proportional to length and inversely proportional to the cross-sectional area.

6. Which of the following does not represent electrical power in a circuit?

(A) I^2R

(B) VI

(C) IR^2

(D) $\frac{V^2}{R}$

Correct Answer: (C) IR^2

Solutions: Electrical power is given by the following formulas:

$$P = VI = I^2R = \frac{V^2}{R}$$

The expression IR^2 is incorrect, as power cannot be represented in this form.

Quick Tip

Electrical power formulas include $P = VI$, $P = I^2R$, and $P = \frac{V^2}{R}$.

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7. The magnetic field produced due to a current-carrying conductor at a point on a distance r is

(A) directly proportional to r

(B) directly proportional to r^2

(C) inversely proportional to r

(D) inversely proportional to r^2

Correct Answer: (C) inversely proportional to r

Solutions: The magnetic field produced by a long current-carrying conductor at a distance r is given by:

$$B = \frac{\mu_0 I}{2\pi r}$$

This shows that the magnetic field is inversely proportional to the distance r.

Quick Tip

Magnetic field due to a long straight current-carrying wire follows $B \propto \frac{1}{r}$.

Sub-Section - (2)

8. Nature of hydrogen ion (H^+) is

(A) Acidic

(B) Alkaline

(C) Neutral

(D) None of these

Correct Answer: (A) Acidic

Solutions: The hydrogen ion (H^+) is essentially a proton, and its presence increases the hydrogen ion concentration in a solution, resulting in an acidic nature. According to the Arrhenius definition, it is the key ion in acids.

Quick Tip

H^+ ions are responsible for the acidic nature of a solution.

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9. Number of molecules of water in one molecule of washing soda is

(A) 2

(B) 5

(C) 8

(D) 10

Correct Answer: (D) 10

Solutions: Washing soda has the chemical formula $Na_2CO_3 \cdot 10H_2O$, which means that each molecule of washing soda contains 10 molecules of water of crystallization.

Quick Tip

Washing soda ($Na_2CO_3 \cdot 10H_2O$) contains 10 water molecules of crystallization.

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10. Which is a non-metal in the following?

(A) Cr

(B) Fe^{2+}

(C) He

(D) Hg

Correct Answer: (C) He

Solutions: Helium (He) is a noble gas and a non-metal. It is chemically inert and does not form compounds under standard conditions. In contrast, the other options—Chromium (Cr), Iron ion (Fe^{2+}), and Mercury (Hg)—are metals.

Quick Tip

Noble gases like Helium (He) are non-metals and are chemically inert.

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11. Which is not true for metals?

(A) Metals always form covalent compounds

(B) Metals form positive ions

(C) Metals have tendency to lose electrons

(D) Metals have the property of conductivity

Correct Answer: (A) Metals always form covalent compounds

Solutions: Metals generally form ionic compounds rather than covalent compounds. They easily lose electrons to create positive ions (cations), and their bonding is typically ionic rather than covalent.

Quick Tip

Metals generally form ionic compounds by losing electrons to form cations.

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12. Which is formed by reaction of Plaster of Paris with water?

(A) Epsom

(B) Gypsum

(C) Limestone

(D) None of these

Correct Answer: (B) Gypsum

Solutions: Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$) reacts with water to form Gypsum ($CaSO_4 \cdot 2H_2O$), a hard solid.

$$CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

Quick Tip

Plaster of Paris hardens into Gypsum when mixed with water.

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13. Which is obtained by the reaction of ethanol with sodium?

(A) O_2 gas

(B) H_2 gas

(C) C_2H_4 gas

(D) C_2H_6 gas

Correct Answer: (B) H_2 gas

Solutions: Ethanol reacts with sodium metal to form sodium ethoxide (C_2H_5ONa) and hydrogen gas (H_2):

$$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$$

Quick Tip

The reaction of ethanol with sodium metal releases hydrogen gas.

Sub-Section - (3)

14. The number of sex chromosomes in humans is

(A) 23

(B) 2

(C) 21

(D) 20

Correct Answer: (B) 2

Solutions: Humans have a total of 46 chromosomes, of which 2 are sex chromosomes (XX for females and XY for males). The remaining 44 chromosomes are autosomes.

Quick Tip

Humans have 2 sex chromosomes (XX in females, XY in males) and 44 autosomes.

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15. Intake of oxygen from outside of the body and breakdown of food sources as per requirement of the cell is called

(A) Excretion

(B) Reproduction

(C) Respiration

(D) Photosynthesis

Correct Answer: (C) Respiration

Solutions: Respiration is the biological process through which cells absorb oxygen and break down glucose to release energy. This energy is then utilized for various metabolic processes.

Quick Tip

Respiration involves oxygen intake and the breakdown of food to produce energy.

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16. The main thinking part of the brain is called

(A) Forebrain

(B) Midbrain

(C) Hind brain

(D) Cerebellum

Correct Answer: (A) Forebrain

Solutions: The forebrain, especially the cerebrum, governs higher cognitive functions like thinking, decision-making, problem-solving, and voluntary movements.

Quick Tip

The forebrain controls higher cognitive functions, including thinking and decision-making.

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17. Which of the following plants has a unisexual flower?

(A) Hibiscus

(B) Mustard

(C) Pea

(D) Papaya

Correct Answer: (D) Papaya

Solutions: A unisexual flower has either male (staminate) or female (pistillate) reproductive organs, but not both. An example of a plant with unisexual flowers is papaya.

Quick Tip

Unisexual flowers contain only male or female reproductive parts. Papaya is a unisexual plant.

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18. How much organic matter reaches from one trophic level to the next trophic level?

(A) 0%

(B) 10%

(C) 50%

(D) 100%

Correct Answer: (B) 10%

Solutions: According to the 10% law of energy transfer in an ecosystem, only approximately 10% of the energy from one trophic level is passed on to the next, with the remainder being lost as heat.

Quick Tip

The 10% rule states that only 10% of energy is passed on to the next trophic level.

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19. The product of photosynthesis in plants is

(A) Protein + Oxygen + Water

(B) Glucose + Oxygen + Water

(C) Fat + Nitrogen + Water

(D) Fat + Carbon dioxide + Water

Correct Answer: (B) Glucose + Oxygen + Water

Solutions: Photosynthesis is the process through which plants generate glucose and release oxygen by utilizing sunlight, carbon dioxide, and water. The chemical equation representing photosynthesis is:

$$6CO_2 + 6H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$$

Quick Tip

Photosynthesis produces glucose ($C_6H_{12}O_6$) and oxygen as its primary products.

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20. Which among the following is not a plant hormone?

(A) Auxin

(B) Gibberellin

(C) Estrogen

(D) Cytokinin

Correct Answer: (C) Estrogen

Solutions: Auxin, Gibberellin, and Cytokinin are plant hormones that play key roles in growth and development, while Estrogen is a hormone found in animals, primarily in females, and is responsible for regulating reproductive functions.

Quick Tip

Estrogen is an animal hormone, not a plant hormone.

PART - B
(Descriptive Questions)

Sub-Section - (1)

1.(i) Which type of mirror is used as a rear-view mirror in cars? Why do we prefer it?

Solutions: A convex mirror is used as a rear-view mirror in cars because it offers a broader field of view and consistently forms an upright, reduced image of objects, enabling drivers to observe more traffic behind them.

Quick Tip

Convex mirrors provide a wider view, making them ideal for rear-view mirrors in vehicles.

1.(ii) An object of 3 cm height is placed at a distance of 8 cm from a concave mirror which produces a virtual image of 4.5 cm height. Find the position of the image and focal length of the mirror.

Solutions: Using the magnification formula:

$$m = \frac{-v}{u} = \frac{h'}{h}$$

Given that $h' = 4.5$ cm, $h = 3$ cm, and $u = -8$ cm, we can calculate v as follows:

$$\frac{-v}{-8} = \frac{4.5}{3} \Rightarrow v = 12 \text{ cm}$$

Next, applying the mirror formula:

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

Substitute $v = 12$ cm and $u = -8$ cm:

$$\frac{1}{f} = \frac{1}{12} - \frac{1}{-8} = \frac{1}{12} + \frac{1}{8}$$

Simplifying:

$$\frac{1}{f} = \frac{2+3}{24} = \frac{5}{24}$$

Thus:

$$f = -24 \text{ cm}$$

Quick Tip

For a concave mirror, a virtual image is formed when the object is placed between the pole and the focus.

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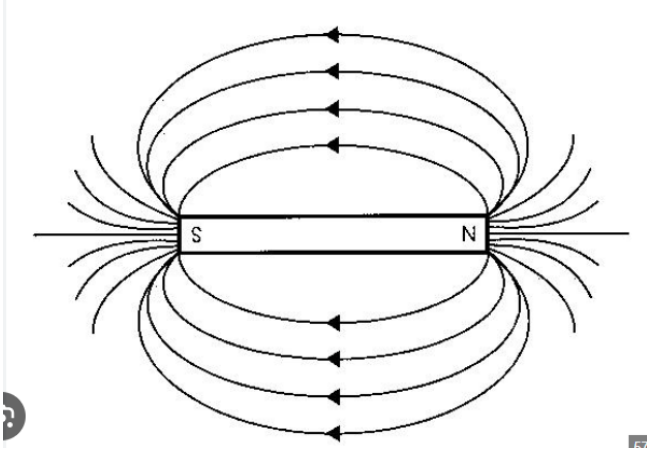
2. (i) What is short-sightedness (myopia)? Explain with a ray diagram. This defect is corrected by which type of lens?

Solutions: Myopia, also known as short-sightedness, is a vision defect in which a person can see nearby objects clearly, but distant objects appear blurry. This condition occurs when the eyeball is elongated, causing light to focus in front of the retina rather than directly on it. A concave lens is used to correct myopia by spreading out the incoming light rays before they enter the eye, ensuring proper focus on the retina.



Quick Tip

Myopia is corrected using a concave lens, which helps in diverging light rays before they enter the eye.

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2 (2) Explain why the colour of the clear sky appears blue.

Solutions: The blue colour of the sky is due to the scattering of sunlight by the atmosphere. Shorter wavelengths, such as blue light, scatter more than longer wavelengths like red due to Rayleigh scattering. As a result, the scattered blue light reaches our eyes, making the sky appear blue.

Quick Tip

Rayleigh scattering causes blue light to scatter more than other wavelengths, making the sky appear blue.

---

3. (1) What are the factors on which the force acting on a current-carrying conductor depends when placed in a uniform magnetic field? Write the rule to find the direction of this force.

Solutions: The force on a current-carrying conductor in a magnetic field is influenced by the following factors:
1. The strength of the magnetic field (B). 2. The current (I) flowing through the conductor. 3. The length (L) of the conductor within the field. 4. The angle (θ) between the magnetic field and the conductor.
The direction of this force is determined by Fleming's Left-Hand Rule. To apply this rule, hold the thumb, forefinger, and middle finger of the left hand perpendicular to each other. Position the forefinger in the direction of the magnetic field, and the middle finger in the direction of the current. The thumb will then point in the direction of the force.

Quick Tip

Fleming's Left-Hand Rule helps determine the direction of force on a current-carrying conductor in a magnetic field.

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3. (2) What is the unit of specific resistance? A resistance of 25 Ω is connected to a 12-volt battery. Calculate the heat energy in joules generated per minute.

Solutions: The unit of specific resistance (resistivity) is Ωm.

To calculate heat energy generated per minute, use Joule's law of heating:

$$H = I^2 Rt$$

First, find the current using Ohm's law:

$$I = \frac{V}{R} = \frac{12}{25} = 0.48 \text{ A}$$

Now, calculating heat energy:

$$H = (0.48)^2 \times 25 \times 60$$

$$H = 345.6 \text{ J}$$

Quick Tip

Heat energy (H) in a resistor is calculated using $H = I^2 Rt$.

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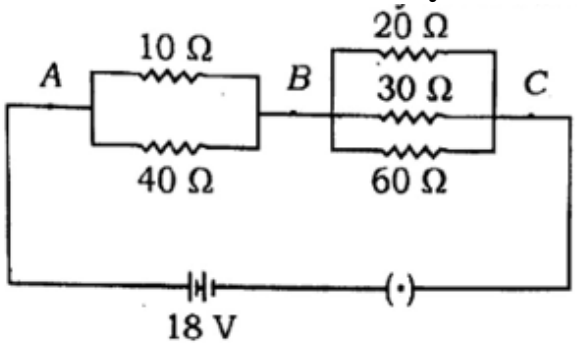
4. In the circuit given below, five resistances of 10Ω, 40Ω, 20Ω, 30Ω, and 60Ω are connected as shown to a battery of 18 volts.



Calculate:

4.(i) Total resistance of the circuit

Solutions: - The 10Ω and 40Ω resistors are in parallel:

$$\frac{1}{R_1} = \frac{1}{10} + \frac{1}{40} = \frac{4+1}{40} = \frac{5}{40}$$

$$R_1 = \frac{40}{5} = 8\Omega$$

- The 20Ω and 30Ω resistors are in parallel:

$$\frac{1}{R_2} = \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60}$$

$$R_2 = \frac{60}{5} = 12\Omega$$

- The total resistance in parallel with the 60Ω resistor:

$$\frac{1}{R_{\text{total}}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{8} + \frac{1}{12} = \frac{3+2}{24} = \frac{5}{24}$$

$$R_{\text{total}} = \frac{24}{5} = 18\Omega$$

Quick Tip

For resistors in parallel, use $\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2}$, and for resistors in series, add them directly.

4.(ii) Total current flowing in the circuit

Solutions: Using Ohm's Law:

$$I = \frac{V}{R} = \frac{18}{18} = 1\,A$$

Quick Tip

Ohm's Law states that current $I = \frac{V}{R}$. Knowing total resistance and voltage allows calculating total current.

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4. (3)Potential difference between points A and B

Solutions: Voltage across R_1 (which is equivalent to 8Ω):

$$V_{AB} = I \times R_1 = 1 \times 8 = 8\,\text{V}$$

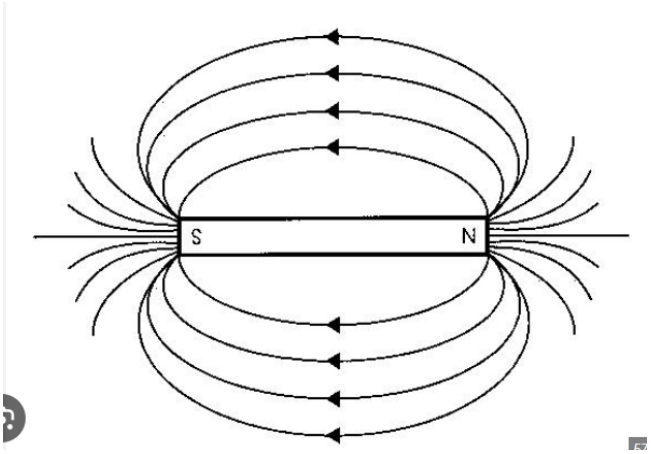
Quick Tip

Potential difference (V) is calculated using $V = IR$, where I is the current and R is the resistance between two points.

OR

4.(i) Draw the pattern of the magnetic lines of force produced due to a current-carrying circular loop.

Solutions: The magnetic field lines of a current-carrying circular loop form concentric circles around the wire. At the center of the loop, the lines are nearly straight and perpendicular to the plane of the loop. The direction of the field can be determined using the right-hand thumb rule.



Quick Tip

The magnetic field around a current-carrying circular loop forms concentric circles, and its direction follows the right-hand thumb rule.

4.(ii) What is an electromagnet? State its two uses.

Solutions: An electromagnet is a temporary magnet created when an electric current passes through a coil wound around a soft iron core. The magnetic field vanishes once the current is turned off.

Uses of electromagnets:

1. Used in electric bells and relays.
2. Used in MRI machines in hospitals.

Quick Tip

Electromagnets work only when current flows and are widely used in medical and industrial applications.

4.(iii) How does an electromagnet differ from a permanent magnet?

Solutions: An electromagnet produces a magnetic field only when an electric current flows through it, whereas a permanent magnet retains its magnetism indefinitely. Additionally, the strength of an electromagnet can be controlled, but a permanent magnet has a fixed strength.

Quick Tip

Unlike permanent magnets, electromagnets can be switched on or off and have adjustable strength.

Sub-Section - (2)

5.(a) State any two properties of the electrochemical series.

Solutions: 1. The electrochemical series is used to determine the electrode potential of elements, allowing us to predict their ability to gain or lose electrons.

2. It also aids in identifying the reactivity of metals, with highly reactive metals positioned at the top and less reactive ones at the bottom.

Quick Tip

The electrochemical series ranks elements based on their electrode potential, aiding in reactivity and displacement reactions.

5.(b) Explain the formation of Na^+Cl^- by combination of Na atom (Atomic number 11) and Cl atom (Atomic number 17).

Solutions: Sodium (Na, atomic number 11) has a single electron in its outermost shell and easily loses it to achieve a stable noble gas configuration (Na^+). Chlorine (Cl, atomic number 17) has seven valence electrons and gains an electron to complete its octet, forming (Cl^-). The electrostatic attraction between Na^+ and Cl^- results in the formation of an ionic bond, producing sodium chloride ($NaCl$).

Quick Tip

Ionic bonds form when one atom donates electrons and another accepts them to complete their octets.

6.(a) Neutralisation reaction

Solutions: A neutralisation reaction occurs when an acid reacts with a base to produce salt and water. This reaction results in the neutralisation of both the acidic and basic properties. The general form of the reaction is:

$$\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water}$$

Example:

$$HCl + NaOH \rightarrow NaCl + H_2O$$

Quick Tip

Neutralisation reactions help in maintaining pH balance and are used in antacids and wastewater treatment.

6.(b) Reduction reaction

Solutions: A reduction reaction involves the gain of electrons or a decrease in oxidation state. It often occurs alongside oxidation in redox reactions.

Example:

$$\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2O$$

Here, CuO is reduced to Cu by gaining electrons.

Quick Tip

Reduction is the gain of electrons or a decrease in oxidation state. It occurs simultaneously with oxidation in redox reactions.

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7. What happens when - (Write only balanced chemical equations)

7.(a) Sodium oxide reacts with water

Balanced Chemical Equation:

$$Na_2O + H_2O \rightarrow 2NaOH$$

Quick Tip

Sodium oxide (Na_2O) dissolves in water to form sodium hydroxide, a strong base.

7.(b) Dry chlorine gas reacts with dry slaked lime

Balanced Chemical Equation:

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

Quick Tip

This reaction produces bleaching powder ($CaOCl_2$), used for disinfection.

7.(c) Ethanol reacts with excess of concentrated H_2SO_4 at 160°C to 170°C

Balanced Chemical Equation:

$$C_2H_5OH \xrightarrow{\text{conc. } H_2SO_4, 170^\circ C} C_2H_4 + H_2O$$

Quick Tip

Ethanol undergoes dehydration in the presence of concentrated H_2SO_4 to form ethene.

7.(d) Ethanoic acid reacts with sodium bicarbonate

Balanced Chemical Equation:

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

Quick Tip

Ethanoic acid reacts with sodium bicarbonate to release carbon dioxide gas, which is observed as effervescence.

7.(e) Ethanol reacts with ethanoic acid in presence of concentrated H_2SO_4

Balanced Chemical Equation:

$$C_2H_5OH + CH_3COOH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$

Quick Tip

This esterification reaction forms ethyl ethanoate, which has a fruity smell.

7.(f) Ethane is allowed to burn in air

Balanced Chemical Equation:

$$C_2H_6 + \frac{7}{2}O_2 \rightarrow 2CO_2 + 3H_2O$$

Quick Tip

Ethane undergoes complete combustion in oxygen, producing carbon dioxide and water vapor.

OR

(a) Write a short note on pH of a solution.

Solutions: The pH of a solution indicates its acidity or alkalinity on a scale ranging from 0 to 14. A pH value below 7 signifies an acidic solution, a pH of 7 represents neutrality, and a pH above 7 indicates a basic solution. The pH is determined by the concentration of hydrogen ions (H^+) present in the solution.

Quick Tip

pH is a logarithmic scale where a decrease in one unit means a tenfold increase in acidity.

(b) Write a short note on unsaturated hydrocarbon.

Solutions: Unsaturated hydrocarbons are organic compounds that contain carbon-carbon double ($C = C$) or triple ($C \equiv C$) bonds. They are divided into two categories: alkenes (which have double bonds) and alkynes (which have triple bonds). Unsaturated hydrocarbons are more reactive than saturated hydrocarbons due to the presence of multiple bonds.
Example:

$$\text{Ethene}(C_2H_4), \quad \text{Ethyne}(C_2H_2)$$

Quick Tip

Unsaturated hydrocarbons undergo addition reactions, making them useful in polymer production and industrial applications.

(c) . Write IUPAC names of the following compounds:

(i) Structure:

$$CH_3 - C \equiv C - CH_3$$

IUPAC Name: 2-Butyne

Quick Tip

In IUPAC nomenclature, the longest carbon chain containing the functional groups is chosen, and priority is given to the triple bond over the hydroxyl group.

(ii) Structure:

$$CH_3 - CH(-[2]OH) - CH_3$$

IUPAC Name: Propan-2-ol (Isopropanol)

Quick Tip

In IUPAC nomenclature, alcohols are named with the suffix -ol, and the position of the hydroxyl (-OH) group is indicated by the lowest possible number.

Sub-Section - (3)

8. Write one example of each of the following:

(i) Fission

Solutions: Fission is a type of asexual reproduction in which a single organism divides into two or more individuals. Example: Amoeba undergoes binary fission by splitting into two identical daughter cells.

Quick Tip

Fission is common in unicellular organisms like Amoeba and Paramecium.

(ii) Fragmentation

Solutions: Fragmentation is a mode of asexual reproduction in which an organism breaks into fragments, and each fragment grows into a new individual. Example: Spirogyra reproduces by fragmentation, where filaments break and grow into new individuals.

Quick Tip

Fragmentation occurs in multicellular organisms like Spirogyra and some fungi.

(iii) Regeneration

Solutions: Regeneration is the ability of an organism to regrow lost or damaged body parts, sometimes resulting in a new individual. Example: Planaria can regenerate its entire body from a small cut portion.

Quick Tip

Regeneration is common in lower animals like Planaria and Starfish.

(iv) Budding

Solutions: Budding is a type of asexual reproduction where a new organism develops from an outgrowth or bud due to cell division. Example: Hydra reproduces by budding, where a small bud grows on the parent body and detaches when fully developed.

Quick Tip

Budding is common in organisms like Hydra and Yeast.

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9. Write short notes on the following:

(i) Ecosystem

Solutions: An ecosystem is a community of living organisms interacting with their physical environment. It includes biotic components (plants, animals, microorganisms) and abiotic components (air, water, soil, sunlight). Ecosystems can be natural (forests, rivers) or artificial

(aquariums, gardens), and they maintain ecological balance by supporting food chains and nutrient cycles.

Quick Tip

An ecosystem consists of biotic and abiotic factors interacting for survival and sustainability.

(ii) Ozone layer

Solutions: The ozone layer is a protective shield in the Earth's stratosphere that absorbs harmful ultraviolet (UV) radiation from the Sun. It consists of ozone (O_3) molecules and prevents excessive UV exposure, which can cause skin cancer and environmental damage. However, human activities releasing CFCs have led to ozone depletion, increasing health risks.

Quick Tip

The ozone layer protects life on Earth from UV rays, but pollutants like CFCs are depleting it.

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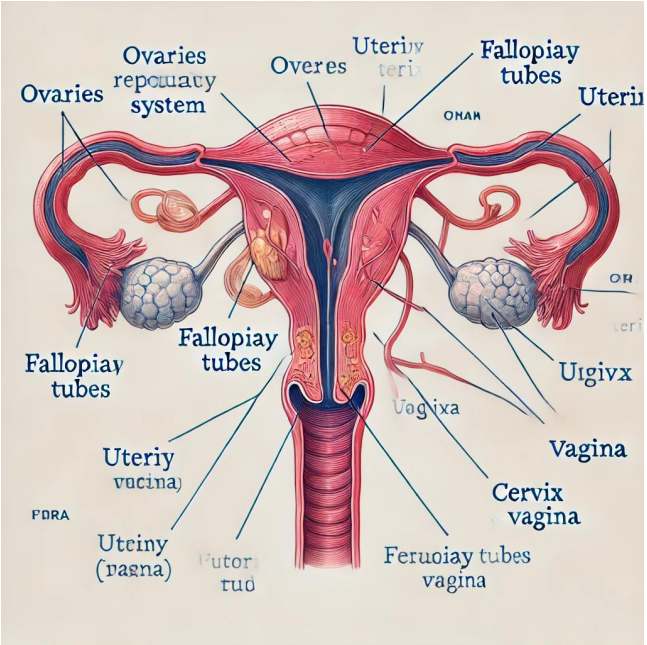
10. Draw a labelled diagram of the female reproductive system of humans and describe it in brief.

Diagram:



Solutions: The female reproductive system consists of ovaries, fallopian tubes, uterus, cervix, and vagina. The ovaries produce ova (eggs) and release hormones like estrogen and progesterone, regulating the menstrual cycle. The fallopian tubes transport the ovum to the uterus, where fertilization and implantation occur. The uterus is a muscular organ where fetal development takes place. The cervix acts as a gateway between the uterus and vagina, while the vagina serves as the birth canal. The system plays a vital role in reproduction, pregnancy, and childbirth.

Quick Tip

The female reproductive system is responsible for ovum production, fertilization, and fetal development.

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11. Describe in brief the structure of the kidney in humans and also describe its functions.

Solutions: The human kidneys are bean-shaped, reddish-brown organs located on either side of the spine, just below the rib cage. Each kidney is about 10–12 cm long and weighs around 150 g. The kidney consists of three major regions:

1. Cortex – The outermost layer containing nephrons, the functional units.

2. Medulla – The inner region containing renal pyramids and loops of Henle.

3. Pelvis – The funnel-shaped cavity that collects urine before passing it to the ureter.

Functions of the Kidney: The kidneys perform several vital functions:

1. Filtration of Blood – Nephrons filter waste, excess salts, and toxins from the blood.

2. Urine Formation – The kidney regulates water balance and forms urine.

3. Electrolyte Balance – Maintains the balance of sodium, potassium, and calcium ions.

4. Regulation of Blood Pressure – The kidney releases renin, which controls blood pressure.

5. Hormone Secretion – Produces erythropoietin, which stimulates red blood cell production.

Quick Tip

The kidneys filter around 50 gallons of blood daily, maintaining homeostasis and detoxifying the body.

OR

Write short notes on the following:

(i) Geotropism in plants

Solutions: Geotropism (also known as gravitropism) is the directional growth of plants in response to gravity. The roots of plants exhibit positive geotropism by growing downward towards gravity, while the shoots exhibit negative geotropism by growing upwards, away from gravity. This movement is controlled by the plant hormone auxin, which redistributes in response to gravitational force.

Example: The roots of a germinating seed always grow downward into the soil, whereas the shoot grows upward towards light.

Quick Tip

Geotropism helps roots anchor plants in soil and absorb nutrients while guiding shoots towards light.

(ii) Growth hormones in humans

Solutions: Growth hormones are chemical messengers that regulate body growth, metabolism, and development. The human growth hormone (HGH) is secreted by the pituitary gland and stimulates growth in bones and muscles. Other important growth hormones include thyroxine (secreted by the thyroid gland), which regulates metabolism, and insulin (from the pancreas), which controls blood sugar levels.

Deficiency of HGH results in dwarfism, whereas excessive secretion leads to gigantism or acromegaly.

Quick Tip

Growth hormones are essential for height, muscle development, and metabolism in humans.

(iii) Heterotrophic nutrition

Solutions: Heterotrophic nutrition is a mode of nutrition in which organisms depend on other organisms for food because they cannot produce their own. It includes holozoic nutrition (e.g., humans, animals), saprophytic nutrition (e.g., fungi, bacteria), and parasitic nutrition (e.g., leeches, tapeworms).

Example: Humans and animals consume plant and animal matter for energy, while fungi decompose dead matter.

Quick Tip

Heterotrophic organisms depend on plants or other animals for energy and survival.
