

UP Board Class 10 Science 2024 Code : 824 (IN) Question Paper with Solutions

Time Allowed :3 Hours 15 Minutes	Maximum Marks :70	Total Questions :31
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. First 15 minutes are allotted for the candidates to read the question paper.
2. The question paper is divided into two parts — Part-A and Part-B.
3. Part-A and Part-B are divided into three Sub-Sections — (1), (2), and (3).
4. In Part-A of the question paper, there are multiple choice questions in which select the correct alternative and then by a blue or black ball-point pen, fill completely in the circle in OMR Answer Sheet. Do not erase, cut or use whitener on the OMR Answer Sheet after answering.
5. 1 mark is allotted for each multiple choice question in Part-A.
6. Part-B has descriptive questions.
7. The allotted marks are given in each question.
8. All the questions of Sub-Sections of Part-B are to be attempted all at a time. Start each Sub-Section from a new page.
9. All the 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 forming a real image of the same size as the object, the object and image must be placed at equal distances from the focal point. Thus, the object distance (u) and image distance (v) will be equal in magnitude but opposite in direction, and 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.

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 always forms a virtual, erect, and diminished image, which means the magnification is always less than 1. Since the image is always smaller than the object, the ratio of image height to object height is less than 1.

 Quick Tip

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

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 given by the formula:

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

where f is the focal length in cm. Given $f = 20$ cm:

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

Since it 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.

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, splitting into its constituent colors. The deviation of light depends on its wavelength; longer wavelengths deviate less. Among visible colors, red has the longest wavelength and, therefore, 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.

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

- (A) $4\ \Omega$
- (B) $8\ \Omega$
- (C) $16\ \Omega$
- (D) $32\ \Omega$

Correct Answer: (C) $16\ \Omega$

Solutions: The resistance of a wire is given by:

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

For the original wire:

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

For the second wire with length $2l$ and area $\frac{A}{2}$:

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

 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:

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

The expression IR^2 is incorrect, as power is not expressed in this form.

💡 Quick Tip

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

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 due to a long current-carrying conductor at a distance r is given by:

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

This indicates 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 a proton that increases the hydrogen ion concentration in a solution, making it acidic in nature. It is the fundamental ion in acids according to the Arrhenius definition.

 Quick Tip

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

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 $Na_2CO_3 \cdot 10H_2O$. This indicates that one 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.

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 normal conditions. 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.

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 typically form ionic compounds rather than covalent compounds. They readily lose electrons to form positive ions (cations), and their bonding is usually ionic rather than covalent.

 Quick Tip

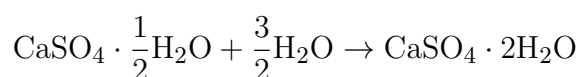
Metals generally form ionic compounds by losing electrons to form cations.

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 ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$) reacts with water to form Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), a hard solid.



 Quick Tip

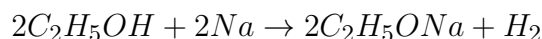
Plaster of Paris hardens into Gypsum when mixed with water.

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 ($\text{C}_2\text{H}_5\text{ONa}$) and hydrogen gas (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 46 chromosomes in total, out 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.

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 by which cells take in oxygen and break down glucose to release energy. This energy is used for various metabolic activities.

 Quick Tip

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

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, particularly the cerebrum, is responsible for higher cognitive functions such as thinking, decision-making, problem-solving, and voluntary movements.

 Quick Tip

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

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 contains either male (staminate) or female (pistillate) reproductive structures but not both. Papaya is an example of a plant with unisexual flowers.

 Quick Tip

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

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 about 10% of the energy from one trophic level is transferred to the next, while the rest is lost as heat.

 Quick Tip

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

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 by which plants synthesize glucose and release oxygen using sunlight, carbon dioxide, and water. The chemical equation for photosynthesis is:



💡 Quick Tip

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

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 responsible for growth and development, whereas Estrogen is a hormone found in animals, primarily in females, 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 provides a wider field of view and always forms an erect, diminished image of objects, allowing drivers to see 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 $h' = 4.5$ cm, $h = 3$ cm, and $u = -8$ cm:

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

Using the mirror formula:

$$\begin{aligned} \frac{1}{f} &= \frac{1}{v} - \frac{1}{u} \\ \frac{1}{f} &= \frac{1}{12} - \frac{1}{-8} = \frac{1}{12} + \frac{1}{8} \\ \frac{1}{f} &= \frac{2+3}{24} = \frac{5}{24} \\ f &= -24 \text{ cm} \end{aligned}$$

💡 Quick Tip

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

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

Solutions: Myopia, or short-sightedness, is a vision defect where a person can see nearby objects clearly but distant objects appear blurred. This occurs when the eyeball is elongated, causing light to focus in front of the retina instead of on it. A concave lens is used to correct myopia by diverging the incoming light rays before they enter the eye, ensuring they focus correctly on the retina.

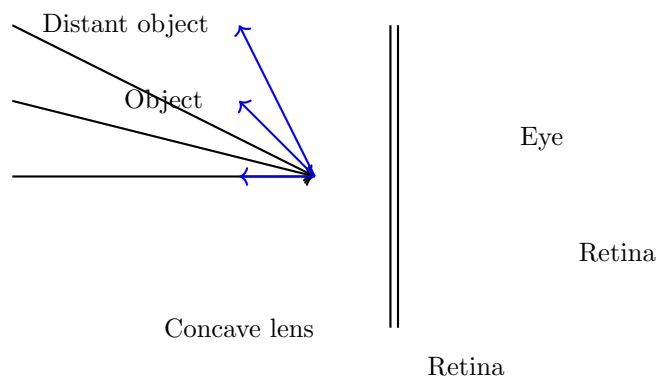


Figure 1: Ray diagram illustrating myopia and its correction with a concave lens.

 Quick Tip

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

2.(ii) 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.(i) 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 depends on:

1. The strength of the magnetic field (B).
2. The current (I) flowing through the conductor.
3. The length (L) of the conductor in 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: If the thumb, forefinger, and middle finger of the left hand are held perpendicular to each other, with the forefinger pointing in the direction of the magnetic field and the middle finger indicating the current, then the thumb points 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.

3.(ii) What is the unit of specific resistance? A resistance of $25\ \Omega$ 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:

$$H = I^2 R t$$

First, find the current using Ohm's law:

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

Now, calculating heat energy:

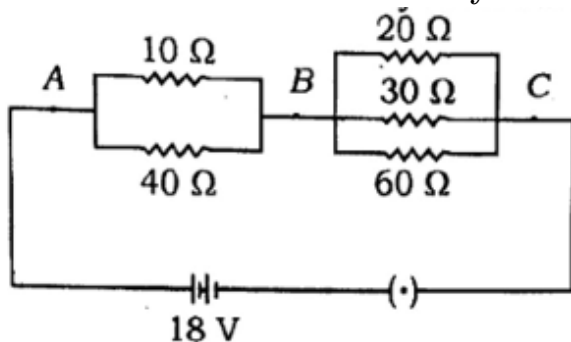
$$H = (0.48)^2 \times 25 \times 60$$

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

💡 Quick Tip

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

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:

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

$$R_{\text{total}} = \frac{24}{5} = 4.8\Omega$$

💡 Quick Tip

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

4.(ii) Total current flowing in the circuit

Solutions: Using Ohm's Law:

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

💡 Quick Tip

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

4.(iii) 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.

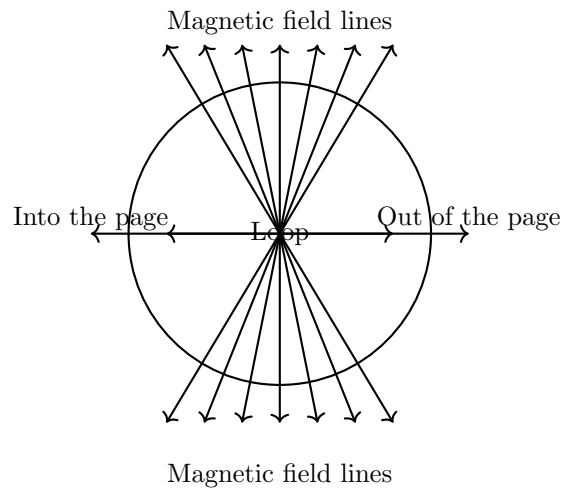


Figure 2: Magnetic field lines around a current-carrying circular loop, following the right-hand thumb rule.

💡 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 formed when an electric current flows through a coil wrapped around a soft iron core. The magnetic field disappears when the current is switched 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 helps determine the electrode potential of elements, predicting their tendency to gain or lose electrons. 2. It helps in identifying the reactivity of metals, with highly reactive metals placed 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).

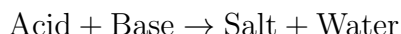
Solutions: Sodium (*Na*, atomic number 11) has one electron in its outermost shell and readily loses it to attain a stable noble gas configuration (Na^+). Chlorine (*Cl*, atomic number 17) has seven valence electrons and gains an electron to complete its octet, forming (Cl^-). The electrostatic attraction between Na^+ and Cl^- forms an ionic bond, creating sodium chloride (*NaCl*).

 Quick Tip

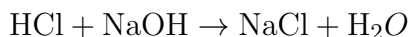
Ionic bonds form when one atom donates electrons and another accepts them to complete their octets.

6.(a) Neutralisation reaction

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



Example:



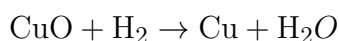
 Quick Tip

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:



Here, CuO is reduced to Cu by gaining electrons.

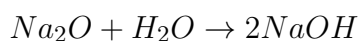
Quick Tip

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

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

7.(a) Sodium oxide reacts with water

Balanced Chemical Equation:

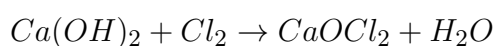


Quick Tip

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:

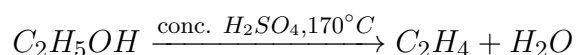


Quick Tip

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:

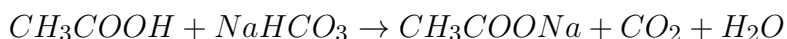


Quick Tip

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:

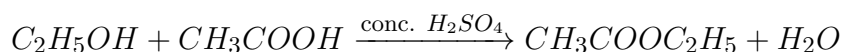


💡 Quick Tip

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:

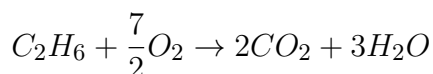


💡 Quick Tip

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

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

Balanced Chemical Equation:



💡 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 measures its acidity or alkalinity on a scale of 0 to 14. A pH value below 7 indicates an acidic solution, a pH of 7 is neutral, and a pH above 7 indicates a basic solution. The pH is determined by the concentration of hydrogen ions (H^+) 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 containing carbon-carbon double ($C = C$) or triple ($C \equiv C$) bonds. They are classified into alkenes (containing double bonds) and alkynes (containing triple bonds). Unsaturated hydrocarbons are more reactive than saturated hydrocarbons due to the presence of multiple bonds.

Example:

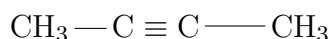


 Quick Tip

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

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

(i) Structure:

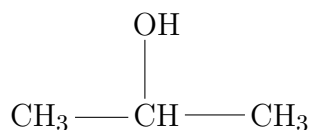


IUPAC Name: 2-Butyne

 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:



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.

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

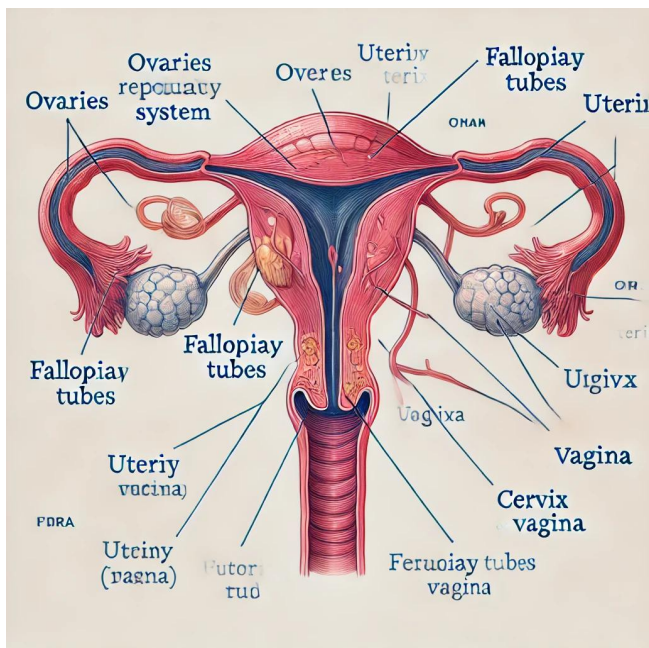
Solutions: The ozone layer is a protective shield in the Earth's stratosphere that absorbs harmful ultraviolet (UV) radiation from the Sun. It consists of ozone (O_3) molecules and prevents excessive UV exposure, which can cause skin cancer and environmental damage. However, human activities releasing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

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.

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.
