CBSE EXAMINATION PAPER-2026

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 88

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **44 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 3** are case based questions

iv. **Section B** – questions number **4 to 23** are multiple choice questions

v. **Section C** – questions number **24 to 30** are very short answer

vi. **Section D** – questions number **31 to 38** are short answer

vii. **Section E** – questions number **39 to 44** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1.

Read the following passage and answer the questions that follow :

Not all plants carry out photosynthesis by the same mechanism. In most plants, it depends directly on gaseous carbon dioxide that diffuses into the leaf. However, some plants can store carbon dioxide in the vacuole of the leaf cells as part of a complex carbon compound. This compound is transported to the chloroplast and releases carbon dioxide when required for photosynthesis. This special

mechanism is believed to have evolved as an adaptation in such plants which do not open stomata during the daytime to conserve water for survival in dry conditions (desert conditions).

(1) Which process in these plants is minimised to help the plants survive in dry conditions ?

[2 Marks]

Answer: Answer: In these plants, the opening of stomata during the daytime is minimised. Since stomata are pores through which carbon dioxide enters and water vapour escapes, closing stomata helps in reducing water loss in dry conditions. These plants store carbon dioxide at night and use it for photosynthesis during the day, thus conserving water while still performing photosynthesis as described in the case passage.

Key Points: Opening of stomata is minimised - Water loss is reduced - Carbon dioxide is stored for photosynthesis

(2) Which part of the leaf is responsible for exchange of gases during photosynthesis ?

[2 Marks]

Answer: Answer: The exchange of gases during photosynthesis takes place through tiny pores called stomata present on the surface of leaves. Stomata allow carbon dioxide to enter the leaf and oxygen to exit by diffusion. The inter-cellular spaces in the leaf help the gases to spread and reach the cells where photosynthesis occurs. This mechanism is essential for plants as mentioned in the case passage, because gases like carbon dioxide are necessary for photosynthesis to take place.

Key Points: Stomata responsible for gas exchange - Gases move by diffusion through stomata - Inter-cellular spaces help spread gases in leaf

Question 2.

Read the following passage and answer the questions that follow :

An electrochemical process is used for refining metals by selectively dissolving and depositing them through electrolysis. Electrolytic refining is used for metals like Copper, Zinc, Tin, Nickel, Silver and Gold.

(1) In electrolytic refining of copper, name the anode and the cathode.

[1 Marks]

Answer: Answer: In electrolytic refining of copper, the **anode** is made of impure copper and the **cathode** is a thin strip of pure copper. This is explained in the passage where it states that the impure metal forms the anode and the pure metal strip forms the cathode.

Key Points: Anode is impure copper - Cathode is pure copper strip - Electrolytic refining involves electrolysis of copper

(2) Define anode mud.

[1 Marks]

Answer: Anode mud is the insoluble impurities that do not dissolve during the electrolytic refining of metals. These impurities settle down at the bottom of the anode and are collected as a sludge called anode mud, as explained in the passage about electrolytic refining.

Key Points: Impurities in anode - Insoluble impurities settle down - Called anode mud

(3) With the help of chemical equations, show the extraction of copper from its ore Cu_2S.

[2 Marks]

Answer: In the extraction of copper from its ore Cu_2S, first Cu_2S is roasted in the presence of oxygen to form copper(I) oxide and sulfur dioxide: $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$. Then, copper(I) oxide reacts with more Cu_2S in a smelting furnace, producing copper metal and sulfur dioxide: $Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$. This process is followed by electrolytic refining, as explained in the passage, to get pure copper metal.

Key Points: Roasting of Cu_2S - Formation of Cu_2O and SO_2 - Smelting to produce metallic copper

Question 3. The variation of image distance (v) with the object distance (u) for a convex lens is given in the following observation table. Analyse it and answer the questions given below :

S.No.	Object distance (u) cm	Image distance (v) cm
1	– 150	+ 30
2	– 75	+ 37·5
3	– 50	+ 50
4	– 37·5	+ 75
5	– 30	+ 150
6	– 15	+ 37·5

(1) Without calculation, find out the focal length of the given convex lens. Justify your answer.

[1 Marks]

Answer: Without calculation, the focal length of the convex lens can be found by observing that when the object distance u is very large (at infinity), the image distance v equals the focal length f. From the case passage, lens formula is 1/v - 1/u = 1/f. As u tends to infinity, 1/u becomes zero and hence 1/v = 1/f, meaning v = f. Therefore, the focal length is the image distance when the object is very far. Since it is a convex lens, the focal length is positive, as explained in the passage.

Key Points: Focal length found when object distance is very large - For large u, image distance v equals focal length - Focal length positive for convex lens as per lens formula

(2) Which one of the observations given in the table is not correct and why ?

[1 Marks]

Answer: Answer: The observation where the image distance (v) value does not satisfy the lens formula 1/f = 1/v - 1/u is not correct. According to the case passage, the lens formula relates object distance (u), image distance (v), and focal length (f). If the calculated v does not match the value in the table using this formula, it means that observation is incorrect.

Key Points: Observation does not satisfy lens formula - Lens formula relates u, v and f - Incorrect image distance value

(3) Find out the value of magnification for u = – 30 cm. Write the nature of the image formed. Give reason for your answer.

[2 Marks]

Answer: For u = − 30 cm, using the lens formula 1/f = 1/v − 1/u given in the case paragraph, we find the image distance v. The magnification m = v / u. Since u is negative, v will be positive for a real image. The image formed is real, inverted, and smaller or larger depending on the value of v. This is because a convex lens forms a real and inverted image when the object is beyond the focal length, as explained in the case.

Key Points: Use lens formula - Calculate magnification as v/u - Convex lens forms real and inverted image for u = − 30 cm

Section B

Question 4.

Pravin was given a list of characteristics associated with the process of anaerobic respiration in humans, in the table given below : Which of the above characteristics is/are related to the above process ?

[1 Marks]

	Location	Condition	End Product
Characteristic	(i) Muscle Cell	(ii) Requires presence of Oxygen (O_2) and Carbon dioxide (CO_2)	(iii) 3-Carbon molecules

(A) (i) only

(B) (ii) and (iii)

(C) (i) and (ii)

(D) (i) and (iii)

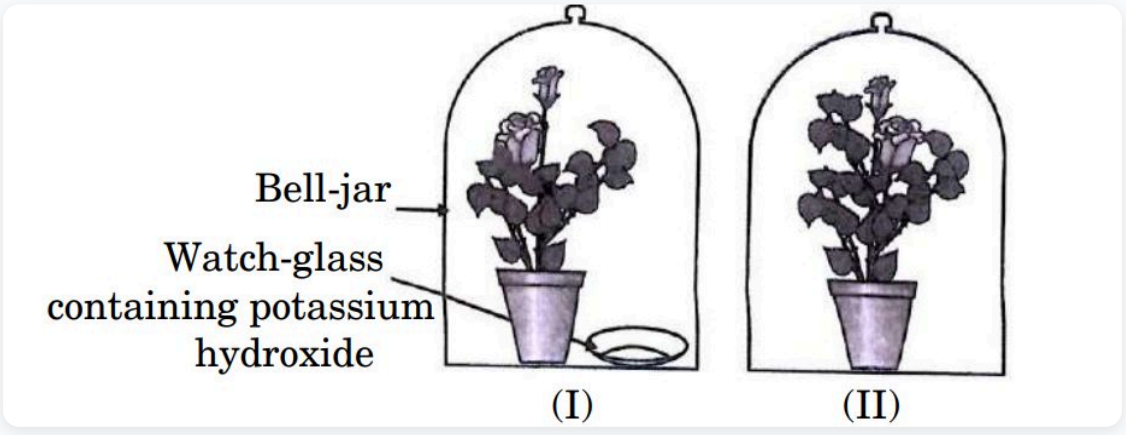
Explanation:

Anaerobic respiration in humans occurs when oxygen supply is insufficient, such as during heavy exercise. During this process, glucose is broken down without oxygen, producing energy and lactic acid. Hence, characteristics related to the absence of oxygen (anaerobic conditions) and the production of lactic acid are correct. The given context explains that anaerobic respiration involves food breakdown without oxygen and formation of lactic acid, which corresponds to statements (i) and (iii).

Question 5.

Observe the figure given below and identify the incorrect step for the activity set-up :

[1 Marks]



(A) Both plants are covered with separate wooden bell-jars

(B) Both plants are kept in the dark room for three days before placing them in separate glass jars.

(C) Use vaseline to seal the bottom of the jars with the glass plates.

(D) Both potted plants were kept in sunlight for a few hours before the iodine test for the presence of starch.

Explanation: The context indicates that the plants are first kept in a dark room for three days, but are then placed under sunlight for about two hours before the iodine test. The incorrect step is stating that both plants are kept in the dark room before placing them in separate glass jars, because according to the procedure, after keeping one plant in the dark for 72 hours, it is then placed in sunlight before testing. Other steps like covering plants with bell-jars, using vaseline to seal the jars air-tight, and exposing plants to sunlight before the iodine test are correct.

Question 6.

Walking in a straight line and riding a bicycle are activities which are possible due to coordination of which part of the brain ?

[1 Marks]

	(Part of the Brain)	*(Name of the area of the Brain)*
(A)	Fore-Brain	Cerebrum
(B)	Mid-Brain	Cerebellum
(C)	Hind-Brain	Cerebellum
(D)	Hind-Brain	Medulla

(A) Fore-Brain - Cerebrum

(B) Mid-Brain - Cerebellum

(C) Hind-Brain - Medulla

(D) Hind-Brain - Cerebellum

Explanation:

Activities like walking in a straight line and riding a bicycle require coordination, balance, and precision of voluntary actions. These functions are controlled by the cerebellum, which is a part of the hind-brain. The cerebellum maintains posture and balance, enabling smooth and coordinated movements for such activities.

Question 7.

In a synapse, the chemical signal is transmitted from :

[1 Marks]

(A) Dendritic end of one neuron to axonal end of another neuron.

(B) Axon to cell body of the same neuron.

(C) Axonal end of one neuron to dendritic end of another neuron.

(D) Cell body to axonal end of the same neuron.

Explanation:

According to the provided context, the electrical impulse travels along the axon to its end, where it triggers the release of chemicals. These chemicals cross the synapse and initiate an electrical impulse in the dendrite of the next neuron. Hence, the chemical signal is transmitted from the axonal end of one neuron to the dendritic end of another neuron.

Question 8. Organisms of a higher trophic level which feed on several types of organisms belonging to a lower trophic level form the :

[1 Marks]

(A) Food web

(B) Ecosystem

(C) Food chain

(D) Ecological pyramid

Explanation: A food web represents the complex feeding relationships in an ecosystem where organisms at a higher trophic level feed on multiple types of organisms at a lower trophic level. Unlike a food chain that shows a single linear path of energy flow, a food web consists of several interconnected food chains illustrating how various organisms are linked through multiple feeding connections.

Question 9.

In accumulation of toxic substances at higher trophic levels of an ecosystem through the food chain, which of the following organisms is affected the most ?

[1 Marks]

(A) Small aquatic plants

(B) Human beings

(C) Small fish

(D) Large fish

Explanation:

Toxic substances that are not degradable accumulate progressively at each trophic level in a food chain, a phenomenon called biological magnification. Since human beings occupy the top level in any food chain, they accumulate the maximum concentration of these toxic chemicals in their bodies, making them the most affected organisms.

Question 10.

The growth of tendrils in grapes plants is due to :

[1 Marks]

(A) Effect of gravity

(B) Rapid cell division in tendril cells that are away from the support

(C) Rapid cell division in tendril cells in contact with the support

(D) Effect of light

Explanation:

Tendrils are sensitive to touch. When they come in contact with a support, the cells of the tendril that touch the support grow slower compared to the cells away from the support. This differential growth causes the tendril to curl around the support and help the plant cling to it. Hence, the rapid growth occurs in the tendril cells away from the support.

Question 11.

Two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

Assertion (A) : Natural replenishment of soil will not take place in absence of microbes.

Reason (R) : Microbes, comprising of bacteria and fungi, break down dead remains and waste products of organisms, and they go into the soil.

[1 Marks]

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

(B) Assertion (A) is false, but Reason (R) is true.

(C) Assertion (A) is true, but Reason (R) is false.

(D) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

Explanation: The assertion states that natural replenishment of soil will not take place without microbes. This is true because microbes like bacteria and fungi act as decomposers, breaking down dead plants and animal remains into simpler substances, releasing nutrients back into the soil. The reason explains this process correctly, stating that microbes break down dead remains and waste products and help enrich the soil. Thus, both statements are true, and the reason correctly explains the assertion.

Question 12.

Two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

Assertion (A) : The basic filtration unit in the kidneys, like in the lungs, is a cluster of very thin-walled blood capillaries.

Reason (R) : Each capillary cluster in the kidney is associated with the cup-shaped end of a coiled tube called Bowman's capsule.

[1 Marks]

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

(B) Assertion (A) is true, but Reason (R) is false.

(C) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(D) Assertion (A) is false, but Reason (R) is true.

Explanation:

The basic filtration unit in the kidneys is a cluster of very thin-walled blood capillaries known as the glomerulus. This is similar to the lungs where capillary clusters facilitate exchange. Each cluster (glomerulus) is associated with the cup-shaped end of a coiled tube called Bowman's capsule, which collects the filtrate from blood. Therefore, both the assertion and reason are true, and the reason correctly explains the assertion.

Question 13.

Which of the following is an example of a displacement reaction ?

[1 Marks]

(A) The electrolysis of water

(B) The combustion of natural gas

(C) The reaction of a reactive metal with dilute acid

(D) The reaction of quick lime with water

Explanation:

A displacement reaction occurs when a more reactive metal displaces a less reactive metal from its compound or solution. According to the provided context, reactive metals reacting with dilute acid is an example of displacement reaction, where the metal displaces hydrogen from the acid. The other options such as electrolysis of water, combustion of natural gas, and the reaction of quick lime with water are not displacement reactions; they represent electrolysis, combustion, and combination reactions, respectively.

Question 14.

To a small amount of copper oxide in a beaker, when we add dilute hydrochloric acid slowly with stirring, the change in the colour of the solution is due to the formation of :

[1 Marks]

(A) Copper(I) oxide, which is black in colour.

(B) Copper(II) oxide, which is black in colour

(C) Copper(I) chloride, which is blue in colour

(D) Copper(II) chloride, which is blue-green in colour

Explanation:

When dilute hydrochloric acid is added to copper oxide, the copper oxide dissolves and reacts to form copper(II) chloride. This salt imparts a blue-green colour to the solution. Copper oxide is black and is a basic oxide, and in reaction with the acid it forms the salt copper(II) chloride and water. Thus, the blue-green colour change is due to the formation of copper(II) chloride.

Question 15. In the following equation. x KI + H_2O_2 □□→ I_2 + y KOH x and y respectively are :

[1 Marks]

(A) 2, 2

(B) 1,2

(C) 1,1

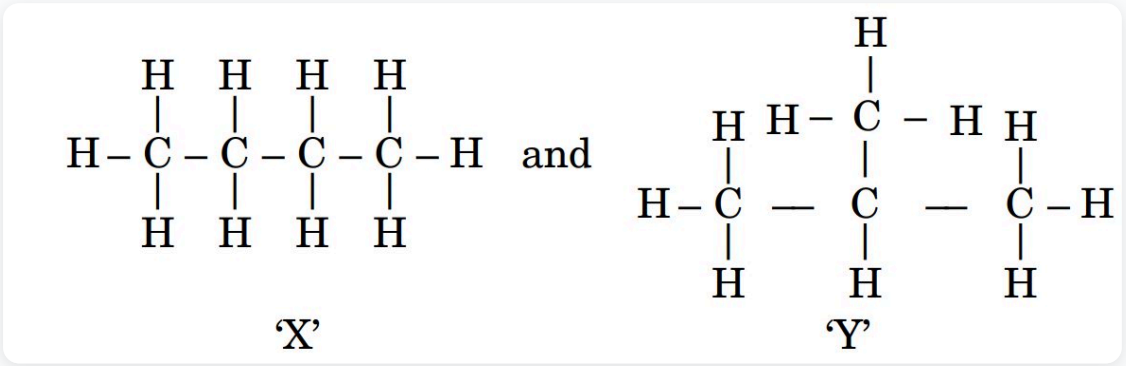
(D) 2,1

Explanation: The reaction between potassium iodide (KI) and hydrogen peroxide (H_2O_2) produces iodine (I_2) and potassium hydroxide (KOH). Balancing the atoms on both sides, 2 molecules of KI react with H_2O_2 to produce 1 molecule of I_2 and 2 molecules of KOH. Therefore, x = 2 and y = 2.

Question 16.

Consider the structures 'X' and 'Y' given below : Which of the following statements are correct ? (i) 'X' and 'Y' are homologues. (ii) 'X' and 'Y' have the same structural formula, but different molecular formula. (iii) 'X' and 'Y' have the same molecular formula, but different structural formula. (iv) 'X' and 'Y' are structural isomers.

[1 Marks]



(A) (ii) and (iv)

(B) (i) and (iv)

(C) (i) and (iii)

(D) (iii) and (iv)

Explanation:

Structures 'X' and 'Y' both have the same molecular formula C4H10 but differ in their structural arrangement. Compounds with the same molecular formula but different structures are called structural isomers. Hence, statements (iii) and (iv) are correct. They are not homologues because homologous compounds differ by a CH2 unit and thus have different molecular formulas, so statement (i) is incorrect. Also, statement (ii) is incorrect because the molecular formula is the same, not different.

Question 17.

The reaction of calcium with cold water is :

[1 Marks]

(A) Exothermic, but the heat evolved is not sufficient for the hydrogen to catch fire.

(B) Slow and endothermic.

(C) Less violent, but the heat evolved is sufficient for the hydrogen to catch fire

(D) Very violent and exothermic and hydrogen catches fire.

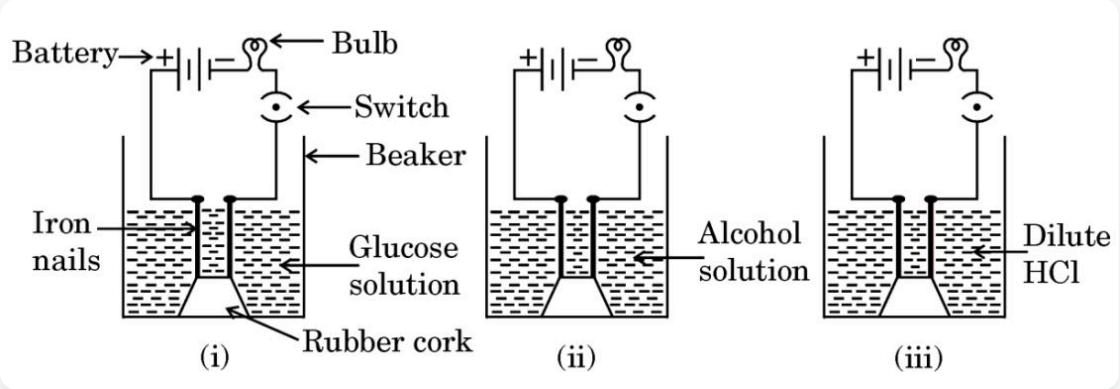
Explanation:

Calcium reacts with cold water to form calcium hydroxide and hydrogen gas. The reaction is less violent compared to sodium or potassium, and although it is exothermic, the heat evolved is not enough to ignite the hydrogen gas. Therefore, the hydrogen does not catch fire during the reaction.

Question 18.

In which case/cases will the bulb glow considering that all other connections of electric circuit are complete and working ?

[1 Marks]



(A) Case (iii) only

(B) Cases (ii) and (iii)

(C) Case (ii) only

(D) Case (i) only

Explanation:

The bulb glows when the switch is ON and the electric circuit is complete, allowing current to flow through the bulb. In the given context, the bulb glows when the circuit is complete and current passes through it. Cases (ii) and (iii) both represent situations where the circuit is complete and conducting, so the bulb will glow. Case (i) does not allow current to flow, so the bulb will not glow.

Question 19.

When zinc reacts with NaOH, the product formed is :

[1 Marks]

(A) Na_2ZnO_2

(B) Zno

(C) $Zn(OH)_2$

(D) Na_2O

Explanation:

When zinc reacts with sodium hydroxide (NaOH), sodium zincate (Na_2ZnO_2) is formed along with the release of hydrogen gas (H_2). This is shown by the reaction: 2NaOH (aq) + Zn (s) → Na_2ZnO_2 (s) + H_2 (g). Therefore, the correct product formed is sodium zincate (Na_2ZnO_2).

Question 20. two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to this question from the codes (A), (B), (C) and (D) as given below. Assertion (A) : There are large number of compounds with many carbon atoms linked to each other. Reason (R) : Carbon-Carbon bond is very strong and stable

[1 Marks]

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

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

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Explanation: Both the assertion and the reason are true, and the reason correctly explains the assertion. Carbon atoms form a large number of compounds with many carbon atoms linked together because the carbon-carbon bond is very strong and stable. This strength and stability arise due to carbon's ability to form strong covalent bonds with other carbon atoms, thanks to its small atomic size and valency of four, allowing it to form stable chains and complex molecules.

Question 21.

The correct way to connect an ammeter and a voltmeter in an electric circuit is :

[1 Marks]

(A) Ammeter in series and voltmeter in parallel

(B) Ammeter in parallel and voltmeter in series

(C) Ammeter and voltmeter both in series

(D) Ammeter and voltmeter both in parallel

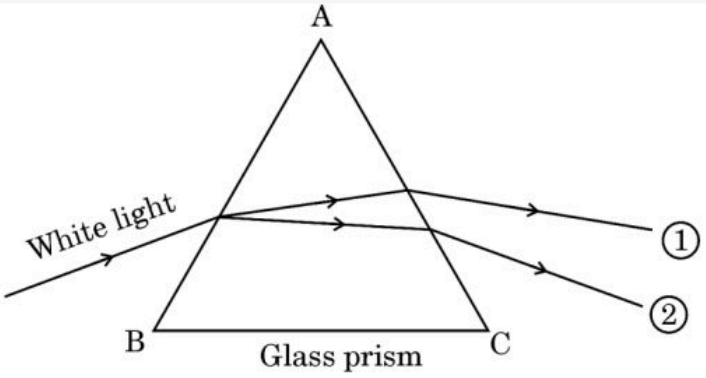
Explanation:

An ammeter measures the current flowing through the circuit, so it must be connected in series to ensure all the current passes through it. A voltmeter measures the voltage across a component, so it must be connected in parallel to the component to measure the potential difference correctly. Connecting the ammeter in series and the voltmeter in parallel follows the correct method of measuring current and voltage in a circuit.

Question 22.

Observe the given ray diagram showing refraction through a prism and choose the correct option for colour of rays 1 and 2 :

[1 Marks]



	Colour of ray 1	*Colour of ray 2*
(A)	Blue	Red
(B)	Green	Yellow
(C)	Red	Violet
(D)	Violet	Red

(A) Blue - Red

(B) Green - Yellow

(C) Red - Violet

(D) Violet - Red

Explanation:

When white light passes through a prism, it disperses into its constituent colors due to different degrees of bending for each color. Violet light bends the most while red light bends the least.

Therefore, in the ray diagram, ray 1 corresponds to violet (which bends the most), and ray 2 corresponds to red (which bends the least). This is consistent with the explanation that red appears near the top and violet near the bottom of the spectrum.

Question 23.

Two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to this question from the codes (A), (B), (C) and (D) as given below.

Assertion (A) : The needle of a compass, kept in an external magnetic field, always aligns itself in the North-South direction of the Earth.

Reason (R) : The behaviour of the needle of the compass is similar to the behaviour of a freely suspended bar magnet.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(C) Assertion (A) is false, but Reason (R) is true.

(D) Assertion (A) is true, but Reason (R) is false.

Explanation:

The compass needle is a tiny bar magnet that can freely rotate and aligns itself with the Earth's magnetic field, pointing towards the North-South direction. This behaviour is exactly like that of a freely suspended bar magnet which aligns itself along the magnetic field lines. Therefore, both the assertion and the reason are true, and the reason correctly explains the assertion.

Section C

Question 24.

(i) Chlorofluorocarbons (CFCs) have been linked to depletion of ozone layer. In 1987, the United Nations Environment Programme (UNEP) succeeded in making an agreement. State this agreement.

(ii) What is the role of ozone in our atmosphere ?

[2 Marks]

Answer: (i) The agreement made in 1987 by the United Nations Environment Programme (UNEP) is called the Montreal Protocol. This agreement aimed to freeze the production of CFCs at 1986 levels and later to reduce and eventually eliminate their use.
(ii) Ozone in the atmosphere plays a very important role by absorbing the harmful ultraviolet (UV) radiation from the Sun. This protects living organisms on Earth from dangerous UV rays which can cause skin cancer and other harmful effects.

> **Key Points: Montreal Protocol - Freeze CFC production at 1986 levels - Ozone absorbs harmful UV radiation and protects life on Earth**

Question 25.

What kind of respiration provides more energy and why ?

[2 Marks]

Answer: Aerobic respiration provides more energy because it uses oxygen to completely break down glucose into carbon dioxide and water, releasing a large amount of energy. In contrast, **anaerobic respiration** happens without oxygen and produces less energy along with lactic acid. Therefore, aerobic respiration is more efficient and provides more energy for muscle activities.

> **Key Points: Aerobic respiration provides more energy - Uses oxygen to fully break down glucose - More efficient than anaerobic respiration**

Question 26.

Separation of right side and left side of the heart is useful to keep oxygenated and deoxygenated blood from mixing. Various organisms have different types of heart.

(I) Fill in the blanks

(i) to (iii) correctly according to the type of organisms and their evolution in terms of blood circulation :

(II) Which type of circulation is most efficient ?

[2 Marks]

Organisms	Number of chambers in heart	Type of blood being circulated	Type of circulation
Fish	(i) _____	Mixed	Single
(ii) _____	3-chambered	Mixed	Incomplete double circulation
Birds and Mammals	4-chambered	Separated circulation path of oxygenated and deoxygenated blood	(iii) _____

Answer: (I) Fill in the blanks:
(i) Organisms with a two-chambered heart like fish have a single circulation.
(ii) Organisms like amphibians and reptiles with a three-chambered heart have incomplete double circulation.
(iii) Mammals and birds have a four-chambered heart and complete double circulation.
(II) Complete double circulation is the most efficient because it separates oxygenated and deoxygenated blood completely, ensuring that the body receives fully oxygenated blood for better energy supply.

Key Points: Two-chambered heart - Single circulation - Three-chambered heart - Incomplete double circulation - Four-chambered heart - Complete double circulation - Complete double circulation most efficient

Question 27.

Show the formation of the following ionic compounds by transfer of electrons between the combining atoms :

(i) Sodium oxide (Na_2O)

(ii) Magnesium chloride ($MgCl_2$)

(Given : Atomic number : Na = 11, Mg = 12, O = 8, Cl = 17)

[2 Marks]

Answer: (i) Sodium oxide (Na_2O): Sodium atom (Na) loses 1 electron to form Na^+ (Na: 2,8,1 → Na^+: 2,8). Oxygen atom (O) gains 2 electrons to form O^{2-} (O: 2,6 → O^{2-}: 2,8). Two Na^+ ions combine with one O^{2-} ion electrostatically to form Na_2O.
(ii) Magnesium chloride ($MgCl_2$): Magnesium atom (Mg) loses 2 electrons to form Mg^{2+} (Mg: 2,8,2 →

Mg^{2+}: 2,8). Each chlorine atom (Cl) gains 1 electron to form Cl^- (Cl: 2,8,7 → Cl^-: 2,8,8). One Mg^{2+} ion combines with two Cl^- ions to form $MgCl_2$.

Key Points: Sodium loses 1 electron to form Na^+ - Oxygen gains 2 electrons to form O^{2-} - Two Na^+ combine with one O^{2-} to form Na_2O - Magnesium loses 2 electrons to form Mg^{2+} - Chlorine gains 1 electron to form Cl^- - One Mg^{2+} combines with two Cl^- to form $MgCl_2$

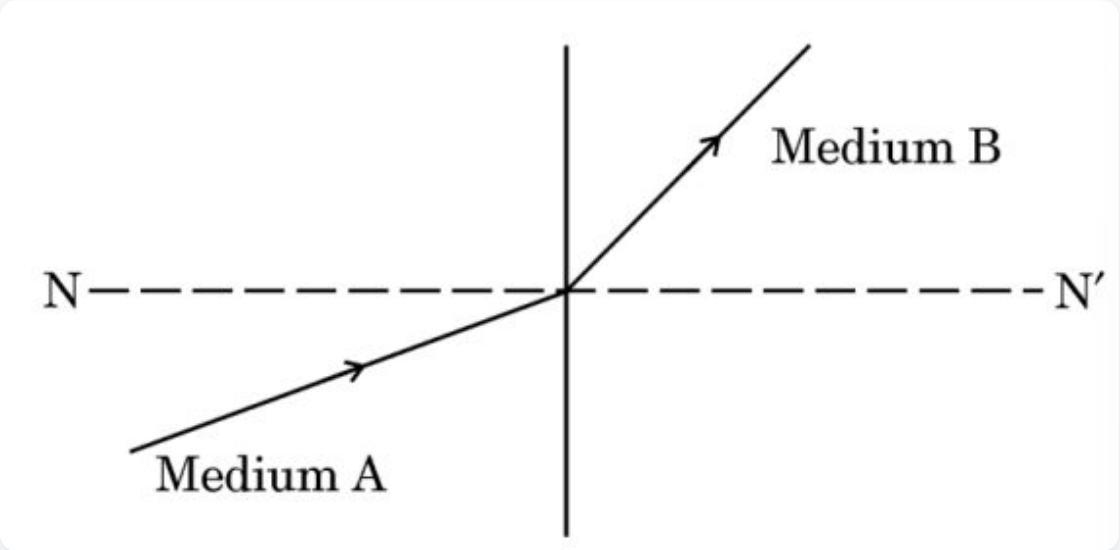
Question 28.

A ray of light enters into medium B from medium A as shown in the given figure :

(a) Which one of these two media is optically denser than the other medium ? Justify your answer.

(b) If the speed of light in medium A is V_A and in medium B is V_B , then what is the refractive index of medium B with respect to medium A ?

[2 Marks]



Answer: (a) Medium B is optically denser than medium A because the ray of light bends towards the normal when it enters medium B from medium A. This bending towards the normal indicates that light slows down in medium B, showing it is optically denser.
(b) The refractive index of medium B with respect to medium A is given by $n = V_A / V_B$. This means refractive index measures how much slower light travels in medium B compared to medium A.

Key Points: Medium B is optically denser - Light bends towards normal when entering denser medium - Refractive index of B with respect to A is V_A divided by V_B

Question 29.

What happens when light is scattered from (i) very fine particles and (ii) very large size particles of medium ? Justify your answer in each case.

[2 Marks]

Answer: (i) When light is scattered from very fine particles, mainly shorter wavelengths like blue light are scattered more. This is why the sky appears blue as tiny particles in the air scatter blue light more than other colors.
(ii) When light is scattered from very large particles, all wavelengths are scattered almost equally, making the scattered light appear white. This happens because large particles scatter light of longer wavelengths too, which combines to give white light.

> **Key Points: Very fine particles scatter shorter wavelengths more - Large particles scatter all wavelengths equally - Blue light scattering causes sky color**

Question 30.

With the help of a ray diagram, explain any phenomenon of formation of spectrum in nature.

[2 Marks]

Answer: Formation of Spectrum by Dispersion of Light:
When white sunlight passes through a glass prism, it bends or refracts due to change in speed. Different colors in white light have different wavelengths, so they bend by different angles while passing through the prism. This causes the white light to split into its constituent colours forming a spectrum. The colors appear in the order: red, orange, yellow, green, blue, indigo, and violet.
Ray Diagram Explanation:
In the ray diagram, an incident ray of white light approaches the prism and refracts at the first surface. Inside the prism, light undergoes dispersion as different colours bend differently. After refraction at the second surface, a spectrum is formed.
This natural phenomenon is observed as a rainbow when sunlight passes through raindrops acting like tiny prisms, separating light into a spectrum.

> **Key Points: White light - Prism - Refraction - Dispersion - Spectrum - Rainbow**

Section D

Question 31.

In xylem tissue, vessels and tracheids of the roots, stems and leaves are interconnected to form a continuous system of water-conducting channels reaching all parts of the plant. Explain how this is

achieved.

[3 Marks]

Answer: In xylem tissue, vessels and tracheids form a continuous system of water-conducting channels throughout the plant.
Structure: Vessels are long tubes made from cells joined end to end, with their end walls broken or perforated, allowing free flow of water. Tracheids are elongated cells with tapering ends and pores in their walls, permitting water to move laterally.
Interconnection: Vessels and tracheids in roots, stems and leaves are connected end-to-end and side-to-side via pits and perforations, forming an uninterrupted pipeline.
Function: This continuous network enables efficient upward movement of water from roots to leaves. Water moves up through xylem vessels by capillary action and transpiration pull caused by evaporation from leaves, ensuring water reaches all parts of the plant.

> **Key Points: xylem vessels and tracheids form continuous tubes - vessels have perforated end walls - tracheids have pits for lateral water movement - vessels and tracheids interconnect in roots, stems, leaves - water moves up by capillary action and transpiration pull**

Question 32.

Show the cross and observations made by Mendel when he crossed pure tall pea plant with a pure short pea plant to get F_1 progeny.

[3 Marks]

Answer: Mendel took a pure tall pea plant (TT) and a pure short pea plant (tt) and crossed them.
Cross: TT (tall) × tt (short) = All F_1 progeny are Tt (heterozygous tall).
Observations:
1. All F_1 plants were tall, showing that the tall trait is dominant.
2. No medium or short plants appeared in F_1 generation.
3. This shows that the short trait is recessive and masked in F_1.
4. Mendel concluded that each plant has two factors (genes) for a trait, one inherited from each parent.

> **Key Points: Cross TT × tt - All F_1 progeny tall (Tt) - Tall is dominant, short is recessive**

Question 33.

2 g of green coloured crystals of ferrous sulphate are heated in a dry boiling tube. Name the type of chemical reaction taking place. Write the balanced chemical equation for the reaction. Is this an exothermic or an endothermic reaction ?

[3 Marks]

Answer: (a) Type of chemical reaction: The reaction taking place when ferrous sulphate crystals are heated is a **decomposition reaction.**

(b) Balanced chemical equation: $2FeSO_4(s)$ --Heat--> $Fe_2O_3(s) + SO_2(g) + SO_3(g)$

(c) Nature of reaction: This is an **endothermic reaction** because heat energy is absorbed to break down ferrous sulphate into ferric oxide and sulphur oxides.

When green coloured ferrous sulphate crystals are strongly heated, they lose water and break down to form reddish brown ferric oxide and gases sulphur dioxide and sulphur trioxide, which have a characteristic smell of burning sulphur. This process requires continuous supply of heat, confirming it is endothermic.

Key Points: Decomposition reaction - Balanced equation 2FeSO4(s) --Heat--> Fe2O3(s) + SO2(g) + SO3(g) - Reaction is endothermic

Question 34.

Give reasons :

(i) For dilution of an acid, acid is added into water and not water into acid.

(ii) Dry HCl gas does not turn blue litmus red whereas dilute hydrochloric acid does.

(iii) Blue colour of Copper(II) sulphate crystals turns white on heating.

[3 Marks]

Answer: (i) Acid is added into water and not water into acid because acid is highly concentrated and adding water to acid causes a violent reaction that can splash acid and cause burns. When acid is added slowly to water, the heat released is absorbed by the larger volume of water, making the process safer.

(ii) Dry HCl gas does not turn blue litmus red because it does not have free hydrogen ions (H^+) in the absence of moisture, so it is not acidic in dry form. Dilute hydrochloric acid contains H^+ ions which turn blue litmus paper red showing its acidic nature.

(iii) Blue copper(II) sulphate crystals turn white on heating because the water of crystallization is removed as water vapour. The blue colour is due to water molecules, and when these are lost, the remaining anhydrous copper sulphate is white or greyish-white.

Key Points: Acid added to water to avoid splashing and heat absorption - Dry HCl gas lacks H+ ions to show acidity - Colour change due to loss of water of crystallization in copper sulphate

Question 35.

Write the preparation of the following compounds with balanced chemical equation :

(i) NaOH by chlor-alkali process

(ii) Baking Soda

(iii) Plaster of Paris

[3 Marks]

Answer: (a) Preparation of NaOH by chlor-alkali process:
The chlor-alkali process involves the electrolysis of aqueous sodium chloride (brine) solution to produce sodium hydroxide (NaOH), chlorine gas (Cl_2), and hydrogen gas (H_2).
Chemical equation: $2NaCl + 2H_2O$ --electrolysis--> $2NaOH + Cl_2 + H_2$

(b) Preparation of Baking Soda (Sodium bicarbonate):
Baking soda is prepared by the Solvay process where sodium chloride, ammonia, and carbon dioxide react in water.
Chemical equation: $NaCl + NH_3 + CO_2 + H_2O \rightarrow NaHCO_3 + NH_4Cl$

(c) Preparation of Plaster of Paris:
Plaster of Paris (POP) is prepared by heating gypsum (calcium sulfate dihydrate) to about 150 deg Celsius which removes water of crystallization.
Chemical equation: $CaSO_4.2H_2O$ --heat to 150 deg C--> $CaSO_4.1/2H_2O + 1.5H_2O$
$CaSO_4.1/2H_2O$ is Plaster of Paris (POP).

Key Points: Chlor-alkali process involves electrolysis of brine to produce NaOH - Solvay process used for baking soda preparation - Heating gypsum forms Plaster of Paris by removing water of crystallization

Question 36.

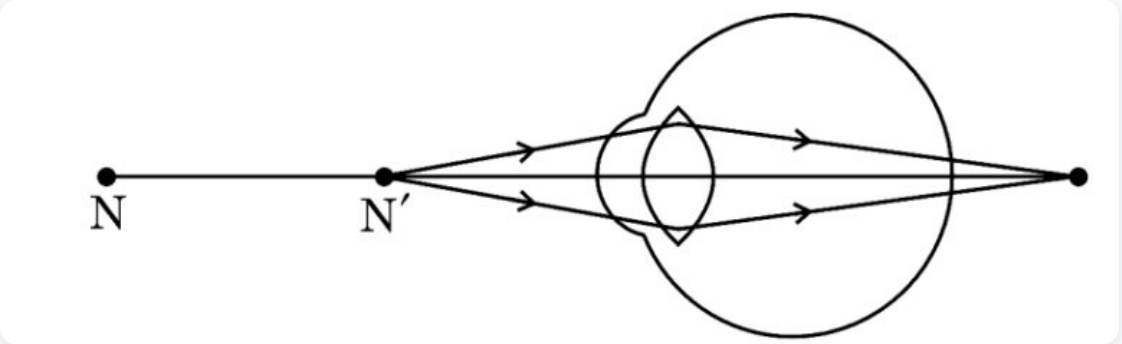
Study the given diagram and answer the questions that follow :

(a) Write the name of the eye defect shown in the diagram. Where is the image formed in this eye defect with respect to the retina of the eye ?

(b) List two causes of this eye defect.

(c) With the help of a diagram, show how this eye defect of vision is corrected.

[3 Marks]



Answer: (a) The eye defect shown in the diagram is Myopia or Near-sightedness. In this defect, the image of a distant object is formed in front of the retina instead of on the retina.
(b) Two causes of myopia are: (i) Excessive curvature of the eye lens which leads to increased refractive power, (ii) Elongation of the eyeball which increases the distance between the lens and the retina.
(c) Myopia can be corrected by using a concave lens of suitable power. The concave lens diverges the light rays before they enter the eye, so that the eye lens focuses the image exactly on the retina, restoring clear vision.

Key Points: Myopia - Image formed in front of retina - Causes: excessive lens curvature and elongated eyeball - Corrected using concave lens

Question 37.

(a) Name a device which is used to :

(i) Maintain a constant potential difference in a circuit.

(ii) Change the electric current in an electric circuit.

(b) When the potential difference between the terminals of an electric heater is 110 V, a current of 5 A flows through it. What will be the value of current flowing through it when the potential difference is increased to 220 V ?

[3 Marks]

Answer: (a) (i) A device used to maintain a constant potential difference in a circuit is a **voltage regulator** or a **battery**. (ii) A device used to change the electric current in an electric circuit is a **variable resistor** or **rheostat**.

(b) Given, potential difference V_1 = 110 V, current I_1 = 5 A, and new potential difference V_2 = 220 V. Assuming the resistance R of heater remains constant, using Ohm's law, I = V / R. First, find resistance R = V_1 / I_1 = 110 V / 5 A = 22 ohms. Now find new current I_2 = V_2 / R = 220 V / 22 ohms = 10 A.

Therefore, the current flowing through the heater when the potential difference is increased to 220 V is **10 A**.

> **Key Points: Voltage regulator maintains constant potential difference - Rheostat changes current - Use Ohm's law I = V / R to calculate current changes with voltage**

Question 38.

Consider the given electric circuit :

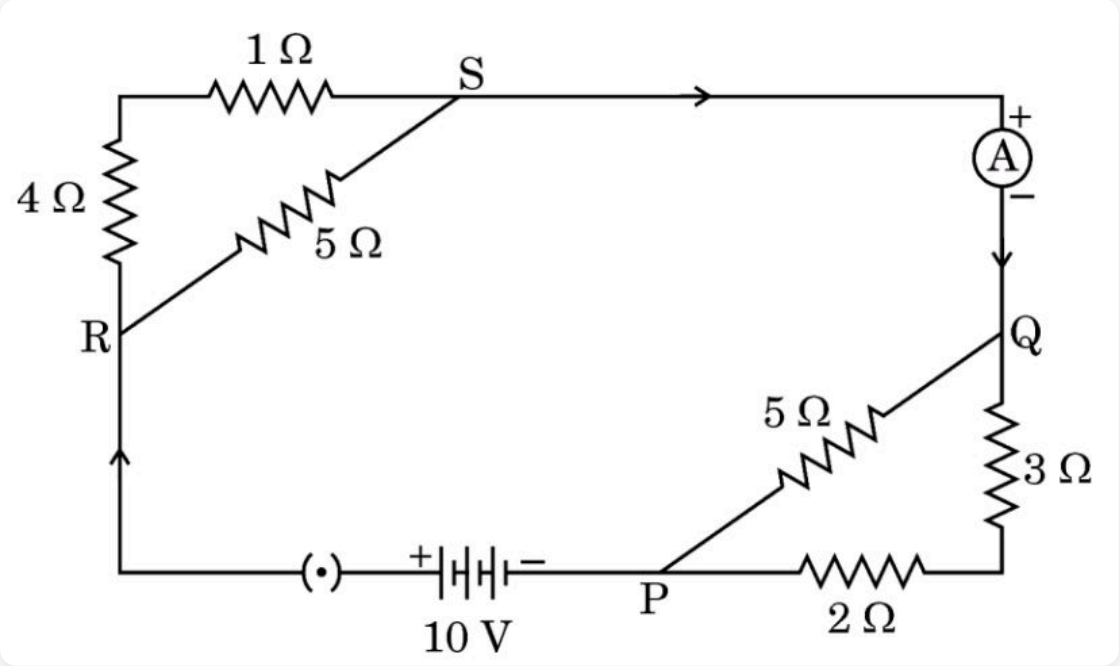
Calculate the following :

(a) Total resistance of the circuit

(b) The electric current drawn from the battery

(c) Potential difference between points P and Q

[3 Marks]



Answer: (a) The total resistance of the circuit is calculated by adding all resistances if they are in series, or by using the formula for parallel resistors if specified. For example, if resistors are in series: $R_{total} = R_1 + R_2 + ...$

(b) The electric current drawn from the battery is found using Ohm's law: $I = V / R_{total}$, where V is the voltage of the battery.

(c) The potential difference between points P and Q depends on their position in the circuit. It can be calculated by finding the voltage drop across the resistors between P and Q using $V = I * R$ for each resistor.

These steps will give the total resistance, current from the battery, and potential difference between points P and Q in the circuit.

Key Points: Calculate total resistance based on series or parallel connection - Use Ohm's law to find total current - Calculate potential difference using voltage drops between points

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Section E

Question 39.

Observe the given diagram and answer the questions that follow :

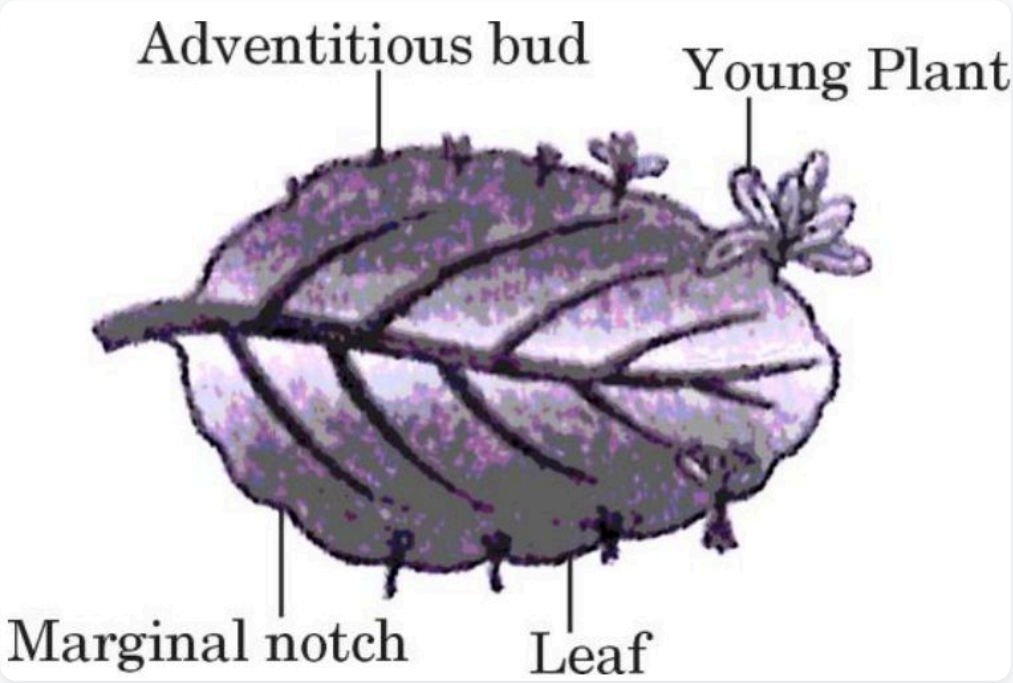
(i) Give the name of the structure and type of reproduction shown in the above diagram.

(ii) State one advantage and one disadvantage of the above mentioned method of reproduction.

(iii) Give reason : Asexual reproduction lacks genetic variation.

(iv) Why have higher organisms resorted to sexual reproduction in spite of its complexity ?

[5 Marks]



Answer: (a) The structure shown in the diagram is a 'Budding in Hydra', which is a type of asexual reproduction.
(b) Advantage: It is a quick process and does not require a mate, thus helps in rapid population increase.
Disadvantage: It produces genetically identical offspring, which may be harmful if the environment changes.
(c) Reason: Asexual reproduction involves only one parent and no fusion of gametes occurs, so the offspring are genetically identical to the parent, leading to lack of genetic variation.

(d) Higher organisms have resorted to sexual reproduction because it produces genetically varied offspring, which increases the chances of survival in changing environmental conditions and helps in evolution.

> **Key Points: Budding in Hydra - Asexual reproduction - Advantage rapid reproduction - Disadvantage genetic uniformity - Lack of genetic variation due to single parent - Sexual reproduction promotes genetic diversity**

Question 40.

Observe the given diagram and answer the questions that follow :

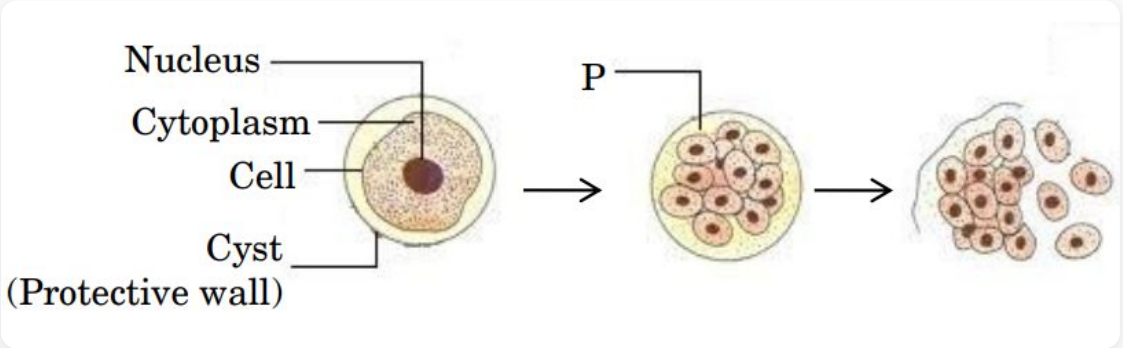
(i) Give the name and type of reproduction shown in the above diagram.

(ii) Comment on the processes taking place in stage P.

(iii) Name an organism which reproduces by the above mentioned method.

(iv) Name the method that can be used to raise plants that have lost their capacity to produce seeds. List any two advantages of growing plants by such a method.

[5 Marks]



Answer: (a) The reproduction shown in the diagram is called **vegetative propagation**, which is a type of **asexual reproduction**. In this method, new plants are produced from parts of the parent plant such as stem, root or leaf without the formation of seeds.
(b) In stage P, the process taking place is the development of new shoots and roots from the vegetative part of the plant like a stem cutting or runner. This stage involves cell division and differentiation that enable the formation of a new plant.
(c) An example of an organism that reproduces by vegetative propagation is **grass** (using runners) or **potato** (using tubers).
(d) The method used to raise plants that have lost the capacity to produce seeds is called **tissue culture or micropropagation**. Two advantages of growing plants by this method are:
1. Large number of plants can be produced in a short time.
2. Plants produced are free from diseases and are genetically identical to the parent plant.

Key Points: Vegetative propagation - Asexual reproduction - New plant develops from vegetative part - Examples: grass, potato - Tissue culture method - Advantages: rapid multiplication, disease-free plants

Question 41.

(i) What is homologous series ? Which two of the following organic compounds belong to the same homologous series ? C2H4 , C4H10, C3H4 , C4H8

(ii) Write the product(s) in the following reactions :

(iii) Why does micelle formation take place when soap is added to water ?

[5 Marks]

$$\text{(I)} \quad CH_3 - CH_2 - OH + CH_3COOH \xrightarrow{\text{Acid}}$$

$$\text{(II)} \quad C_2H_5OH + O_2 \xrightarrow{\text{Burning}}$$

Answer: (i) A homologous series is a group of organic compounds that have the same functional group and similar chemical properties but differ by a CH_2 unit in their molecular formula. For example, alkanes like methane, ethane, propane, etc. Among the given compounds, C2H4 and C4H8 belong to the same homologous series called alkenes because both have a carbon-carbon double bond and differ by C_2H_4 units. (ii) The products of the reactions depend on the specific reactants and conditions which are not given here. Please provide the chemical reactions to write the products. (iii) Micelle formation takes place when soap is added to water because soap molecules have two parts: a hydrophobic (water-repelling) tail that dissolves in oil and grease, and a hydrophilic (water-attracting) head that interacts with water. When soap is added to water, the molecules arrange themselves into spherical structures called micelles, with the hydrophobic tails inward trapping grease and oil, and the hydrophilic heads outward interacting with water. This helps in cleaning because dirt and grease get trapped inside micelles and can be washed away with water.

Key Points: Definition of homologous series - C2H4 and C4H8 are alkenes and belong to same series - Micelles form due to soap molecules having hydrophobic tails and hydrophilic heads

Question 42.

(I) Name the following compounds :

(ii) Name the reaction which is commonly used in the conversion of vegetable oils to fats.

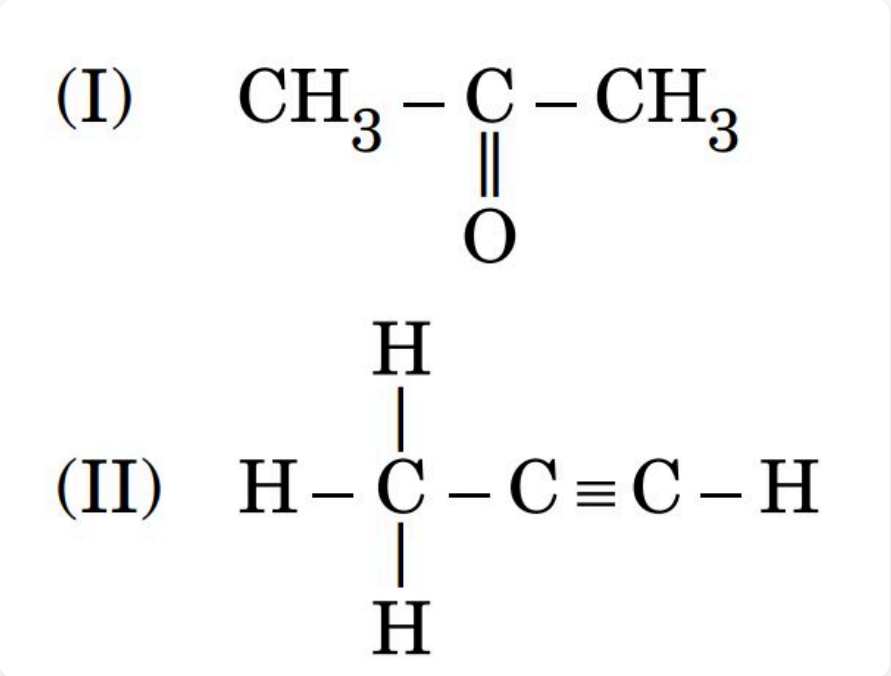
(iii) Why is the melting point of C_4H_{10} higher than C_3H_8 ?

(iv) What happens when a piece of sodium is dropped into ethanol ?

(v) Write the products in the following reaction :

$CH_3COOC_2H_5$+ NaOH □□→

[5 Marks]



Answer: (i) Naming the compounds: $CH_3COOC_2H_5$ is called Ethyl acetate.
(ii) The reaction commonly used in the conversion of vegetable oils to fats is called Hydrogenation. It involves adding hydrogen to unsaturated fats to make them saturated, thus solidifying the oils.
(iii) The melting point of C_4H_{10} (butane) is higher than C_3H_8 (propane) because butane has a larger molecular size and more surface area, leading to stronger Van der Waals forces (intermolecular forces), thus requiring more heat to melt.
(iv) When a piece of sodium is dropped into ethanol, it reacts to form sodium ethoxide and hydrogen gas is evolved. The reaction is:
$2Na + 2C_2H_5OH \rightarrow 2C_2H_5ONa + H_2$
(v) In the reaction $CH_3COOC_2H_5 + NaOH \rightarrow$, the products are ethanol (C_2H_5OH) and sodium acetate (CH_3COONa). This reaction is called saponification or base hydrolysis of ester.
The equation is:
$CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$

Key Points: Ethyl acetate - Hydrogenation reaction - Melting point depends on molecular size and forces - Sodium reacts with ethanol to produce sodium ethoxide and hydrogen gas - Ester hydrolysis produces alcohol and sodium salt

Question 43.

(i) What is a solenoid ? Draw a diagram showing the magnetic field pattern due to a current-carrying solenoid (inside and outside).

(ii) Name any two factors on which the magnitude of the magnetic field due to a current-carrying solenoid depends.

(iii) A current-carrying solenoid is stretched and converted into a straight wire carrying current. Draw a diagram showing the magnetic field pattern around it and mark the direction of the magnetic field.

[5 Marks]

Answer: (i) What is a solenoid?
A solenoid is a long coil of insulated wire wound in many turns. When an electric current passes through it, it produces a magnetic field similar to that of a bar magnet. The magnetic field inside the solenoid is strong and uniform, and outside it, the field lines spread out and loop back from one end to the other.
Diagram: The magnetic field lines inside the solenoid are parallel and closely spaced, indicating a strong and uniform magnetic field. Outside the solenoid, the field lines curve around from one end to the other, showing the magnetic field pattern created by the current in the solenoid.

(ii) Two factors on which the magnitude of the magnetic field due to a current-carrying solenoid depends:
1. The magnitude of the electric current passing through the solenoid.
2. The number of turns (or loops) of the wire in the solenoid per unit length.

(iii) Magnetic field pattern around a straight current-carrying wire when the solenoid is stretched:
When the solenoid is stretched and converted into a straight wire carrying current, the magnetic field lines form concentric circles around the wire. The direction of the magnetic field can be found using the right-hand thumb rule: if the thumb points in the direction of current, the curled fingers show the direction of the magnetic field lines.
Diagram: Draw a straight wire with circular magnetic field lines around it. Show current direction with an arrow along the wire and use curved arrows around the wire to indicate magnetic field direction.

> **Key Points: Solenoid is a coil of insulated wire with many turns - Magnetic field inside solenoid is strong and uniform - Magnetic field magnitude depends on current and number of turns per unit length**

Question 44.

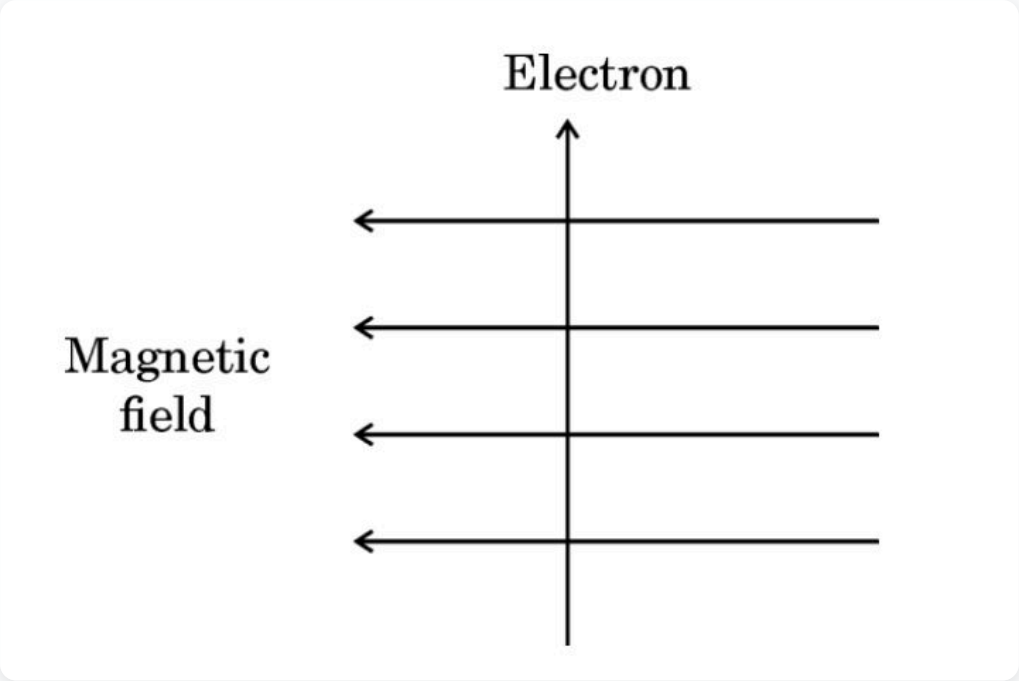
(i) With the help of a diagram, show that a current-carrying conductor placed in an external magnetic field, experiences a force. Indicate the direction of the field, current and force clearly.

(ii) The diagram given below shows an electron moving in a uniform magnetic field.

(I) What will be the direction of the force acting on the electron ?

(II) What will happen to the direction of the force acting on the electron, if the direction of the magnetic field as well as the direction of motion of the electron, both are reversed ?

[5 Marks]



Answer: (i) When a current-carrying conductor is placed in an external magnetic field, it experiences a force. This can be demonstrated by Fleming's Left-Hand Rule. In the diagram, assume the magnetic field is directed from north to south (left to right), the current flows into the conductor from front to back, and the resulting force acts perpendicular to both. According to Fleming's Left-Hand Rule, if you stretch the First finger in the direction of the magnetic Field (from N to S), the seCond finger in the direction of Current (direction of positive charge flow), then the thuMb will point in the direction of the Motion (force) experienced by the conductor. The force is perpendicular to both magnetic field and current.

(ii)(I) For the electron moving in a uniform magnetic field, the force on it is given by the Lorentz force which is perpendicular to both the velocity of electron and magnetic field. Since electron charge is negative, the force direction is opposite to that given by Fleming's Left-Hand Rule for positive charges. If the electron moves downward and the magnetic field is to the right, then the force will be directed into the page (perpendicular to both).

(ii)(II) If both the direction of the magnetic field and the electron's velocity are reversed, then the direction of the force on the electron remains the same. This is because reversing both vectors reverses the direction twice, cancelling out the change in force direction. Therefore, the electron will continue to experience a force in the same direction as before.

Key Points: Current-carrying conductor in magnetic field experiences force - Fleming's Left-Hand Rule determines force direction - Force on electron is perpendicular to velocity and magnetic field and opposite to positive charge direction