CBSE EXAMINATION PAPER-2026

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 90

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 2** are case based questions

iv. **Section B** – questions number **3 to 22** are multiple choice questions

v. **Section C** – questions number **23 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. Plants exhibit movements in response to various environmental stimuli to adopt and survive in their surroundings. These movements, influenced by external factors such as light, gravity, water and chemicals are regulated by specific plant hormones. For example, the differential growth of plant parts allows them to bend, grow or orient themselves in particular directions. Roots and shoots often show contrasting response to the same stimulus, highlighting the complex mechanisms involved in plant growth and development.

(1) Why is hydrotropism essential for plants ?

[1 Marks]

Answer: Hydrotropism is essential for plants because it helps roots grow towards water in the soil, ensuring that the plant gets enough water for survival and growth. This response, like phototropism and geotropism mentioned in the passage, helps plants adapt to their environment by directing growth towards necessary resources.

Key Points: Hydrotropism helps roots grow towards water - Ensures water availability for plant survival - Adapts plant growth to environmental conditions

(2) What role does auxin play in the growth of plants ?

[1 Marks]

Answer: Auxin is a plant hormone that helps in growth by making cells on the side away from light grow longer. This causes the plant to bend towards light, as explained in the case. This process helps the plant get more light for photosynthesis.

Key Points: Auxin causes growth by elongating cells - Auxin concentration increases on the side away from light - Bending of plant towards light is due to auxin action

(3) Differentiate between movement shown by the sensitive plant and tropic movement by plants (Two points).

[1 Marks]

Answer: The sensitive plant shows immediate movement that is independent of growth, like folding leaves quickly on touch. Tropic movement in plants is slow and growth-dependent, such as shoots bending towards light and roots growing downwards, as explained in the case passage.

Key Points: Sensitive plant movement is immediate and independent of growth - Tropic movement is slow and depends on growth - Sensitive plant responds to touch, tropic responses are towards or away from stimuli like light or gravity

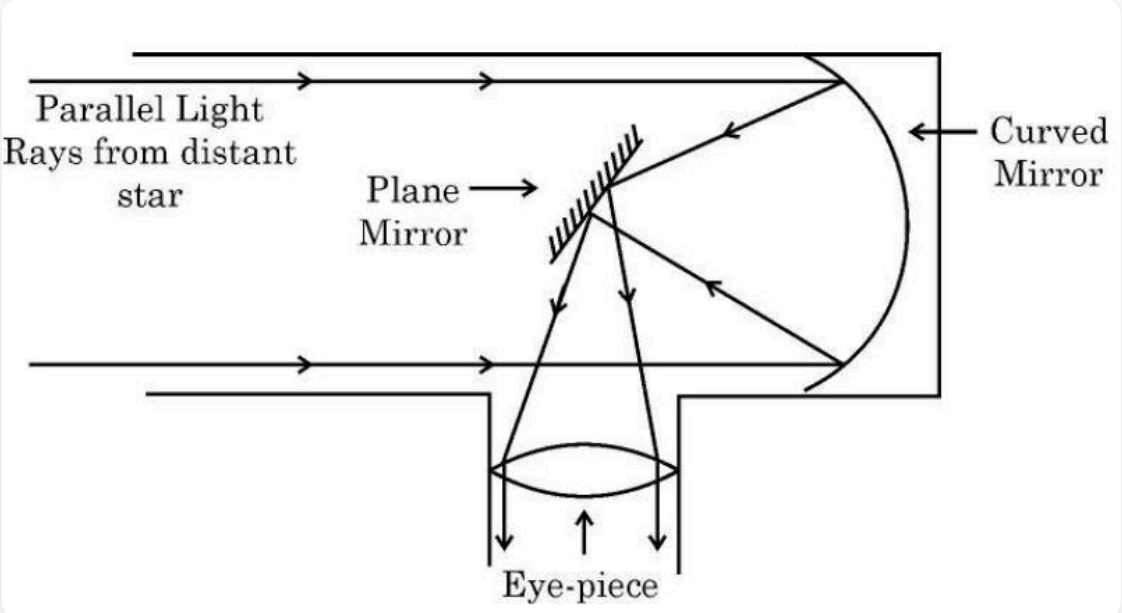
(4) How does movement of roots differ from that of shoots in response to gravity and light ?

[1 Marks]

Answer: In response to light, shoots bend towards it while roots bend away, and regarding gravity shoots grow upwards (negative geotropism) while roots grow downwards (positive geotropism). This helps the plant get more light for photosynthesis and anchors roots in soil for water and mineral absorption as explained in the passage.

Key Points: Shoots bend towards light - Roots bend away from light - Shoots grow upwards - Roots grow downwards - Helps plant survive and grow

Question 2. The above ray diagram is to show image formation by a reflecting telescope. Reflecting telescope revolutionized our way of looking into the sky. Reflecting telescopes employ large mirrors to gather and focus light rather than relying solely on lenses as we do in the refracting telescopes. These telescopes utilize precisely shaped and polished mirrors to capture incoming light and reflect it to a focal point, where the telescope forms an image for observation.



(1) What kind of image of a star is seen by the observer in the eye-piece ?

[1 Marks]

Answer: The image of a star seen by the observer in the eye-piece of a reflecting telescope is a real and inverted image. This image is formed at the focal point of the concave mirror which collects and focuses the light coming from the star, as explained in the case passage about reflecting telescopes.

Key Points: Image is real - Image is inverted - Formed at focal point of concave mirror

(2) What kind of mirror is used in this reflecting telescope ?

[1 Marks]

Answer: The reflecting telescope uses a **concave mirror** as shown in the case paragraph. This mirror gathers and focuses light to a focal point to form a real image for observation. Concave mirrors are ideal because they can focus parallel rays of light to one point efficiently.

Key Points: Concave mirror - Focuses light to a focal point - Forms real image

(3) Explain with the reason, what kind of optical device (type of lens or mirror) is used at the eye-piece.

[2 Marks]

Answer: The eyepiece of a reflecting telescope uses a convex lens because it magnifies the real image formed by the concave mirror. As explained in the case, the concave mirror focuses parallel rays to a real image, which the convex lens then enlarges for clear observation at the eye. This combination allows a detailed view of distant objects in space.

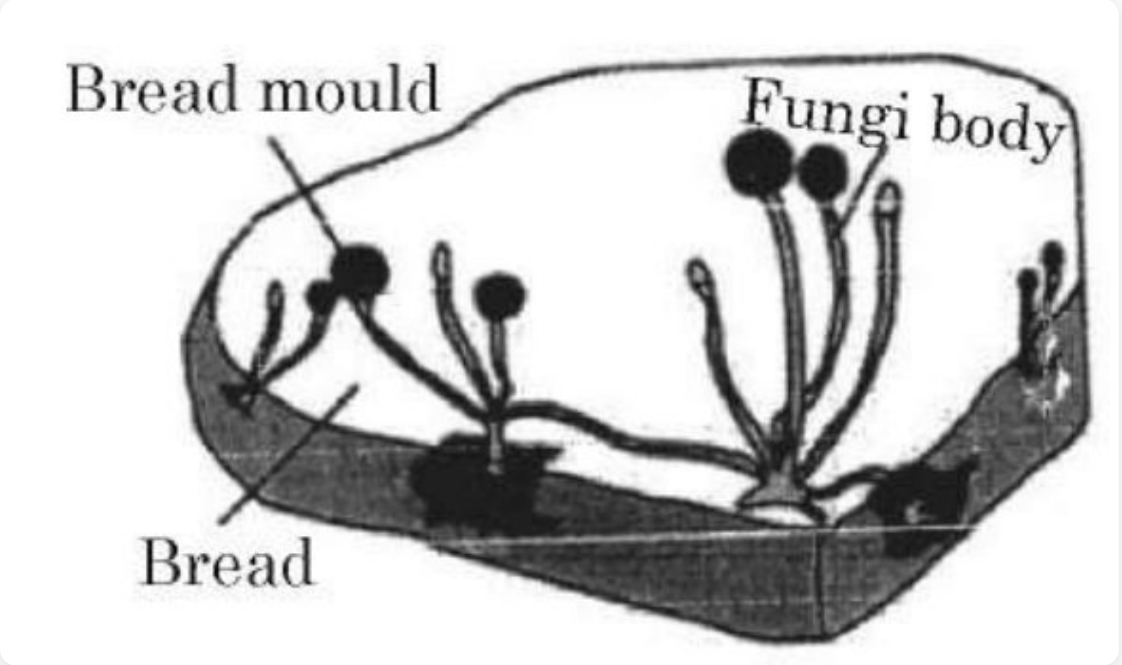
Key Points: Eyepiece uses convex lens - It magnifies the real image formed by concave mirror - Allows clear observation of distant objects

Section B

Question 3.

Observe the given figure and select the statement that correctly states how these fungi obtain nutrition.

[1 Marks]



(A) By eating the bread on which it is growing

(B) By breaking down the nutrients of bread outside the body and then absorbing them.

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

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

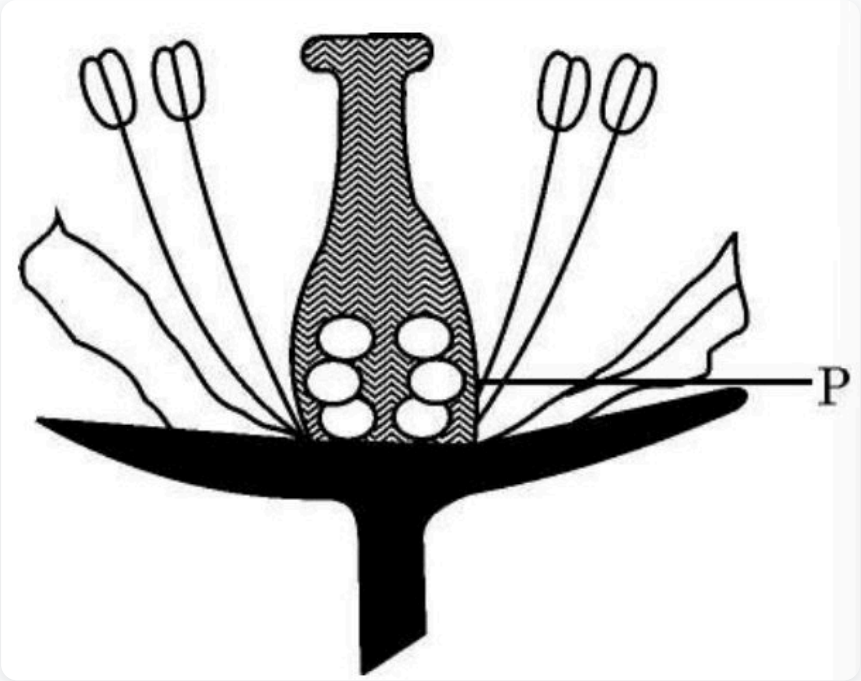
Explanation:

Fungi like bread moulds obtain nutrition by producing enzymes that break down the nutrients in the bread outside their body. They then absorb the digested nutrients, which is a mode of nutrition called saprotrophic nutrition. This method involves breaking down dead or decaying matter externally and then absorbing the simpler nutrients.

Question 4.

If the part ‘P’ of the flower is removed, which of the following processes will not take place ?

[1 Marks]



(A) Formation of flower

(B) Formation of pollens

(C) Formation of seed

(D) Formation of fruit

Explanation:

The part 'P' in the flower is likely the ovary, which after fertilization grows to form the fruit. If the ovary is removed, fruit formation will not take place. However, pollens are formed in the stamens and seeds develop from ovules inside the ovary. Flower formation is independent of part 'P'. Hence, removing 'P' stops the formation of fruit.

Question 5.

Given below are some of the statements regarding our environment :

(i) Change in our life-styles have resulted in greater amounts of waste material generation.

(ii) Changes in attitude have resulted in use of more disposable things.

(iii) Changes in packaging has resulted in much of our waste becoming non-biodegradable.

(iv) Organic farming

Which amongst these is not leading to any damage of environment ?

[1 Marks]

(A) (ii) and (iv)

(B) (i), (ii), (iii)

(C) (i) and (iii)

(D) (iv)

Explanation:

Statements (i), (ii), and (iii) describe activities that lead to environmental damage by increasing waste generation, usage of disposables, and producing non-biodegradable waste respectively. However, (iv) Organic farming is an environmentally friendly practice that promotes soil health and reduces pollution, thus it does not lead to environmental damage.

Question 6.

Identify the traits that cannot be transmitted from parents to the offsprings : (i) Swimming technique (ii) Blood group (iii) Eye colour (iv) Dancing skills

[1 Marks]

(A) (ii) and (iii)

(B) (iii) and (iv)

(C) (i) and (iv)

(D) (i) and (ii)

Explanation:

Traits like blood group and eye colour are inherited from parents because they are controlled by genes and transmitted through heredity. However, skills such as swimming technique and dancing are acquired traits, learned through practice and environment, and cannot be genetically inherited from parents to offspring.

Question 7. Following are the statements about the different parts of the brain. Select the correct statements. (i) The thinking part of the brain is the forebrain. (ii) Centres for smell, hearing, memory, sight are located in forebrain. (iii) Salivation, vomiting, blood pressure are controlled by medulla in the hind brain. (iv) Cerebellum does not control the posture and balance of the body.

[1 Marks]

(A) (i), (ii) and (iii)

(B) (ii), (iii) and (iv)

(C) (i), (ii) and (iv)

(D) (i), (iii) and (iv)

Explanation: Statements (i), (ii) and (iii) are correct based on the given context. The forebrain is the main thinking part of the brain (statement i) and contains areas responsible for senses like smell, hearing, memory, and sight (statement ii). The medulla in the hindbrain controls involuntary actions including salivation, vomiting, and blood pressure (statement iii). Statement (iv) is incorrect because the cerebellum does control posture and balance.

Question 8.

Two pea plants, one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds were crossed with each other which produced F_1 progeny that have only round yellow (RrYy) seeds. When F_1 plants are self-pollinated, the F_2 progeny will have which new combination of characters, as compared to the parents : (i) Round, yellow (ii) Round, green (iii) Wrinkled, yellow (iv) Wrinkled, green Correct options are :

[1 Marks]

(A) (ii) and (iv)

(B) (i) and (iii)

(C) (i) and (ii)

(D) (i) and (iv)

Explanation:

The parents are RRyy (round, green) and rrYY (wrinkled, yellow). The F1 progeny are all RrYy, showing round and yellow seeds. When F1 plants (RrYy) are self-pollinated, the F2 generation will have combinations of traits due to independent assortment. The parental combinations are (round, green) and (wrinkled, yellow). New combinations appearing in F2 are (round, green) and (wrinkled, green), which are (ii) Round, green and (iv) Wrinkled, green respectively.

Question 9.

In human beings the oxygen rich blood is pumped out to the body by :

[1 Marks]

(A) contraction of left ventricle

(B) relaxation of left ventricle

(C) contraction of right atrium

(D) contraction of right ventricle

Explanation:

The oxygen-rich blood from the lungs enters the left atrium and then flows into the left ventricle. When the muscular left ventricle contracts, it pumps the oxygen-rich blood out to the rest of the body. This is clearly stated in the context as: 'When the muscular left ventricle contracts in its turn, the blood is pumped out to the body.' Hence, the correct answer is contraction of left ventricle.

Question 10.

Two statements : Assertion (A) and Reason(R). Answer these questions selecting the appropriate option from (A), (B), (C) and (D) given below :

Assertion (A) : Variations are not often seen in off-springs produced by asexual reproduction.

Reason (R) : DNA molecule generated by replication is not similar to the original DNA.

[1 Marks]

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

Explanation:

The assertion that variations are not often seen in offspring produced by asexual reproduction is true because asexual reproduction generally produces genetically identical offspring. The reason given is false because DNA generated by replication is similar to the original DNA, although small errors can occur occasionally. These minor errors cause variation, but DNA replication is mostly accurate, so the reason does not correctly explain the assertion.

Question 11.

Two statements : Assertion (A) and Reason (R). Answer these questions selecting the appropriate option from (A), (B), (C) and (D) given below :

Assertion (A) : Highest percentage of pesticides is found in tertiary consumers in a food chain.

Reason (R) : Chemicals / pesticides get accumulated progressively at each trophic level.

[1 Marks]

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

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

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

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

Explanation:

The highest percentage of pesticides is indeed found in tertiary consumers because pesticides and other harmful chemicals accumulate progressively at each trophic level in a process called biological magnification. Since these chemicals are not degradable, they increase in concentration as they move from producers to primary consumers to secondary and then to tertiary consumers. Therefore, both Assertion (A) and Reason (R) are true, and Reason (R) correctly explains Assertion (A).

Question 12.

The volume ratio of hydrogen and oxygen gases liberated during electrolysis of water is

[1 Marks]

(A) 1:2

(B) 4:1

(C) 2:1

(D) 1:1

Explanation:

During the electrolysis of water, water (H_2O) splits into hydrogen and oxygen gases. Since water has 2 hydrogen atoms for every 1 oxygen atom, the volume of hydrogen gas produced is twice the volume of oxygen gas. Hence, the volume ratio of hydrogen to oxygen gases liberated is 2:1.

Question 13.

An aqueous solution turns red litmus blue. Excess addition of which of the following solution would reverse the change ?

[1 Marks]

(A) Sodium hydroxide

(B) Hydrochloric acid

(C) Baking soda

(D) Slaked lime

Explanation:

If an aqueous solution turns red litmus blue, it indicates the solution is basic (alkaline). Adding an acid such as hydrochloric acid (HCl) would neutralize the base and make the solution acidic or neutral, causing the red litmus paper to revert from blue back to red. Hence, hydrochloric acid will reverse the change caused by the basic solution.

Question 14. While washing dirty clothes by soap, micelles are formed. Select the correct statement about micelles.

[1 Marks]

(A) The hydrophobic tail of the soap molecule is in the interior of the cluster, whereas hydrophilic end is on the surface of the cluster

(B) The hydrophobic tail is on the surface of the cluster, whereas hydrophilic end is in the interior of cluster.

(C) Both hydrophobic tail and hydrophilic end are in the interior of the cluster.

(D) Both hydrophobic tail and hydrophilic end are on the surface of the cluster.

Explanation: In micelles formed by soap molecules, the hydrophobic tails, which repel water but attract oils and grease, point inward to trap the dirt or grease inside the micelle. The hydrophilic heads, which interact well with water, face outward towards the surrounding water. This arrangement allows the greasy dirt to be surrounded and lifted off while remaining suspended in water, helping to wash away the dirt.

Question 15.

Which one of the following metals does not react with cold water ?

[1 Marks]

(A) Sodium

(B) Potassium

(C) Calcium

(D) Magnesium

Explanation:

Magnesium does not react with cold water but reacts with hot water to form magnesium hydroxide and hydrogen gas. Sodium and potassium react violently with cold water, while calcium reacts with cold

water less violently but still reacts. Thus, Magnesium is the correct answer as it does not react with cold water.

Question 16.

Alloys are homogeneous mixture of metal with a metal or non-metal. Which among the following alloys contain non-metal as one of its constituents ?

[1 Marks]

(A) Brass

(B) Bronze

(C) Steel

(D) Amalgam

Explanation: Steel is an alloy consisting primarily of iron and carbon, where carbon is a non-metal. The other alloys listed (Brass, Bronze, and Amalgam) are mixtures of metals only. Thus, steel is the alloy that contains a non-metal as one of its constituents.

Question 17. How will you protect yourself from the heat generated while diluting a concentrated acid ?

[1 Marks]

(A) By adding acid to water with constant stirring.

(B) By adding water to acid with constant stirring.

(C) By adding water to acid followed by base.

(D) By adding base to acid with constant stirring.

Explanation: The acid must always be added slowly to water with constant stirring. This method prevents the sudden generation of heat which can cause the mixture to splash and cause burns. If water is added to a concentrated acid, the heat generated may be so intense that it causes the mixture to splash out or the container to break due to excessive local heating. Therefore, adding acid to water with constant stirring is the safe procedure for dilution.

Question 18. In the question, two statements are given – One labelled as Assertion (A) and other labelled as Reason (R). Write the correct answer selecting the appropriate option from (A), (B), (C) & (D) given below : Assertion (A) : Pure ethanoic acid is also known as glacial acetic acid. Reason (R) : Pure ethanoic acid often freezes during winter due to its low melting point of 290 K.

[1 Marks]

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

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

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

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

Explanation: Pure ethanoic acid is commonly known as glacial acetic acid because it has a melting point of 290 K (17°C). This relatively high melting point for a liquid means that pure ethanoic acid often freezes (solidifies) in winter in cold climates. This characteristic led to the name "glacial" acetic acid, as it forms ice-like crystals when solid. Therefore, both the assertion and reason are true, and the reason correctly explains the assertion.

Question 19. The pair of eye parts responsible for admitting different amount of light in to the eyes is

[1 Marks]

(A) Iris and pupil

(B) Ciliary muscles and pupil

(C) Retina and Iris

(D) Ciliary muscles and cornea

Explanation: The iris is a muscular diaphragm that controls the size of the pupil. The pupil is the opening through which light enters the eye. By changing the size of the pupil, the iris regulates the amount of light that enters the eye. Hence, the pair responsible for admitting different amounts of light is the iris and pupil.

Question 20.

The vision defect which arises due to gradual weakening of the ciliary muscles and diminishing flexibility of eye lens is :

[1 Marks]

(A) Myopia and hypermetropia both

(B) Hypermetropia

(C) Presbyopia

(D) Myopia

Explanation:

Presbyopia is the vision defect that occurs because of the gradual weakening of the ciliary muscles and the diminishing flexibility of the eye lens, making it difficult to see nearby objects clearly. This is different from myopia and hypermetropia, which are refractive defects related to the shape of the eyeball or the curvature of the lens, not the weakening of muscles or lens flexibility.

Question 21.

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

Assertion (A) : With the help of compass, magnetic field lines can be traced outside the bar magnet.
Reason (R) : The north pole of a compass needle always points towards the south pole of the magnet when brought close to it.

[1 Marks]

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

Explanation:

Assertion (A) is true because a compass needle aligns itself along the magnetic field lines and can therefore be used to trace magnetic field lines outside a bar magnet. Reason (R) is also true since the north pole of the compass needle is attracted to the south pole of the magnet. However, Reason (R) does not correctly explain the Assertion because the compass aligns along magnetic field lines regardless of which pole it points to; the ability to trace field lines depends on the needle's alignment, not just the direction it points. Hence, both statements are true but Reason (R) is not the correct explanation of Assertion (A).

Question 22.

$C_6H_{12}O_6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O_{(l)}$. The above reaction is an example of -

[1 Marks]

(A) Neutralisation Reaction

(B) Exothermic Reaction

(C) Endothermic Reaction

(D) Displacement Reaction

Explanation:

The given reaction represents respiration where glucose reacts with oxygen to produce carbon dioxide, water, and releases energy. Since heat and energy are released in this reaction, it is an example of an exothermic reaction. This is supported by the context where it mentions that a large amount of heat is evolved during these types of reactions.

Section C

Question 23.

"Transpiration in plants is a necessary evil." Comment on the statement giving two reasons.

[2 Marks]

Answer: Transpiration is called a necessary evil because, though plants lose a large quantity of water through transpiration, it is essential for their survival.
1. It helps in the upward movement of water and minerals from roots to leaves, which is vital for photosynthesis and growth.
2. It helps in cooling the plant by evaporation and maintains the temperature of the plant.
Thus, transpiration is necessary despite causing water loss.

Key Points: Loss of water through transpiration helps in water and mineral transport - Transpiration cools the plant by evaporation - Essential for plant survival despite water loss

Question 24.

Explain why food chains generally consist of three or four steps.

[2 Marks]

Answer: Food chains generally consist of only three or four steps because energy decreases at each step. Producers like plants make their own food and provide energy to the first-level consumers. When energy moves from one level to the next, much of it is lost as heat or used for life activities. After three or four levels, very little usable energy remains to support more consumers. This limits the length of food chains in ecosystems.

Key Points: Energy decreases at each trophic level - Much energy is lost as heat or used

by organisms - Limited energy available after three or four levels

Question 25.

Varun is diabetic. His latest ultrasound reports showed a blockage in his pancreatic duct. How will this affect the dual functioning of the pancreas ?

[2 Marks]

Answer: The pancreas has two main functions: producing digestive enzymes (exocrine function) and releasing hormones like insulin (endocrine function). A blockage in the pancreatic duct will prevent digestive enzymes from reaching the small intestine, causing digestion problems. Also, since Varun is diabetic, it indicates his pancreas is already not producing enough insulin. The blockage can worsen the condition by damaging the pancreas cells, affecting both digestion and blood sugar regulation. **Thus, the blockage reduces enzyme secretion affecting digestion and may worsen insulin production affecting blood sugar control.**

Key Points: Blockage prevents enzyme flow - Affects digestion - Worsens insulin production and blood sugar control

Question 26.

Sunil unconsciously touched the hot iron rod and immediately withdrew his hand. Which type of action is involved ? Also define this action. Draw a flow chart to show the path followed for this action.

[2 Marks]

Answer: (a) The type of action involved is a reflex action.
(b) Reflex action is an automatic, rapid, and involuntary response to a stimulus that does not involve the brain for processing but is controlled by the spinal cord.
(c) Flow chart showing the path for reflex action:
Stimulus (touching hot iron) → Receptors in skin detect heat → Sensory neuron carries impulse to spinal cord → Relay neuron in spinal cord processes impulse → Motor neuron carries impulse to muscles → Effector (muscles in hand) contracts → Response: hand is withdrawn immediately.

Key Points: Reflex action - Involuntary and rapid response - Path involves receptors, sensory neuron, relay neuron, motor neuron, and effector

Question 27.

(a) A compound ‘A’ is used in soda-lime fire-extinguisher and decomposes on heating to form compound ‘B’. Compound ‘B’ is used for removing permanent hardness of water. Identify ‘A’ and ‘B’.

(b) Write chemical formula of Plaster of Paris. At what temperature gypsum is heated to obtain Plaster of Paris ?

[2 Marks]

Answer: (a) Compound A is sodium hydrogen carbonate ($NaHCO_3$), used in soda-lime fire-extinguisher. On heating, it decomposes to form sodium carbonate (Na_2CO_3) which is compound B. Sodium carbonate is used to remove permanent hardness of water.
(b) The chemical formula of Plaster of Paris is $CaSO_4 \cdot 1/2\ H_2O$ (calcium sulphate hemihydrate). Gypsum ($CaSO_4 \cdot 2H_2O$) is heated at around 373 K (100 deg C) to obtain Plaster of Paris.

Key Points: Compound A is sodium hydrogen carbonate - Compound B is sodium carbonate - Plaster of Paris formula is CaSO4 . 1/2 H2O - Gypsum heated at 373 K to get Plaster of Paris

Question 28.

A fuse in electric circuit is rated 4 A. Can it be used with an electric heater of rating 2 kW, 200 V ? Explain your answer.

[2 Marks]

Answer: To check if a 4 A fuse can be used with a 2 kW, 200 V electric heater, first calculate the current: Current I = Power / Voltage = 2000 W / 200 V = 10 A. Since the heater requires 10 A, which is more than the fuse rating of 4 A, using a 4 A fuse will cause it to blow frequently. Therefore, a fuse with a rating equal to or higher than 10 A should be used.

Key Points: Calculate current using power and voltage - Compare current with fuse rating - Fuse rating must be equal or higher than operating current

Question 29.

How is an electromagnet made ? Write any two ways by which the strength of electromagnet can be increased.

[2 Marks]

Answer: (a) An electromagnet is made by winding a coil of insulated copper wire around a soft iron rod and passing electric current through the coil. The current through the coil produces a magnetic field that magnetizes the iron rod and makes it behave like a magnet.
(b) Two ways to increase the strength of an electromagnet are:
1. Increase the number of turns in the coil of wire.
2. Increase the current passing through the wire coil.

Key Points: Electromagnet is made by coil around soft iron rod - Electric current magnetizes the rod - Increase turns in coil increases strength - Increase current increases strength

Question 30.

(a) Define volt, the unit of potential difference.

(b) Calculate the work done required to move an electron between two points A and B located at a potential difference of 100 V in an electric field.

[2 Marks]

Answer: (a) A volt is the unit of potential difference. One volt is defined as the potential difference between two points when one joule of work is done to move one coulomb of charge from one point to the other.

(b) Given, potential difference V = 100 V, charge of electron q = $1.6 * 10^{-19}$ C

Work done (W) = V * q = $100 * 1.6 * 10^{-19} = 1.6 * 10^{-17}$ joules

Therefore, the work done to move the electron between points A and B is $1.6 * 10^{-17}$ joules.

Key Points: Definition of volt - Formula work done = potential difference * charge - Electron charge value used for calculation

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Section D

Question 31.

Give reasons for the following :

(a) Adrenal gland is known as the stress gland of the body.

(b) Prenatal sex determination is banned in India.

(c) Vegetative propagation is advantageous in some plants.

[3 Marks]

Answer: (a) Adrenal gland is known as the stress gland of the body because it produces hormones like adrenaline and cortisol that help the body to respond quickly to stress by increasing heart rate, blood pressure, and energy supply.

(b) Prenatal sex determination is banned in India to prevent female foeticide and maintain gender equality, as misuse of this technology leads to selective abortion of female fetuses.

(c) Vegetative propagation is advantageous in some plants because it allows rapid reproduction,

produces offspring identical to the parent plant, and helps plants survive in unfavorable conditions without the need for seeds.

Key Points: Adrenal gland produces stress hormones - Prenatal sex determination leads to female foeticide - Vegetative propagation allows rapid and identical reproduction

Question 32.

Study the given table and answer the following questions :

(a) Depict the information given in the table in the form of a cross.

(b) Deduce the F2 phenotypic ratio/F2 ratio showing external look as well as genotypic /genetic makeup, ratio.

[3 Marks]

Parents	F_1	F_2
A pea plant with red flowers was crossed with a pea plant with white flowers.	30 seeds were sown and all bore plants with red flowers.	44 seeds were sown, 33 plants bore red flowers and 11 plants bore white flowers.

Answer: (a) To depict the information in the form of a cross, consider the parental alleles: T (tall) is dominant and t (short) is recessive.
P Generation: TT (tall) × tt (short)
F1 Generation: All plants are Tt (tall) as T is dominant.
F1 Cross: Tt × Tt
Punnett Square for F2:
	T	t
T	TT	Tt
t	Tt	tt

(b) From the Punnett square, the genotypes of F2 are:
- TT (homozygous dominant): 1
- Tt (heterozygous): 2
- tt (homozygous recessive): 1
Phenotypic ratio (tall : short) = 3 : 1 (as both TT and Tt are tall, tt is short)
Genotypic ratio (TT : Tt : tt) = 1 : 2 : 1

Key Points: Parental cross TT x tt - F1 all Tt (tall) - F1 self-cross Tt x Tt - F2 genotypic ratio 1 TT : 2 Tt : 1 tt - F2 phenotypic ratio 3 tall : 1 short

Question 33.

Account for the following :

(a) White silver chloride turns grey when exposed to sunlight.

(b) Lead (II) nitrate on heating releases brown fumes.

(c) Bags of oil and fat containing food items are flushed with nitrogen gas.

[3 Marks]

Answer: (a) White silver chloride turns grey on exposure to sunlight because it decomposes into metallic silver and chlorine gas. The reaction is 2AgCl sunlight 2Ag + Cl_2. The grey colour is due to the formation of silver metal.
(b) When lead (II) nitrate is heated, it decomposes to form lead oxide, nitrogen dioxide, and oxygen. Nitrogen dioxide is a brown gas, so brown fumes are released. The reaction is $2Pb(NO_3)_2$ heat 2PbO + $4NO_2$ + O_2.
(c) Bags of oil and fat containing food items are flushed with nitrogen gas to prevent spoilage. Nitrogen is an inert gas and does not react with the contents, stopping oxidation and bacterial growth that require oxygen to survive, thus increasing the shelf life of food.

Key Points: Silver chloride decomposes in sunlight - Lead nitrate decomposes on heating releasing NO2 fumes - Nitrogen gas used to prevent oxidation and spoilage in food bags

Question 34.

(i) Which method will be used to convert each of them to their respective metal oxides ?

(a) Carbonate ore (b) Sulphide ore

(ii) Write a chemical reaction to illustrate the use of aluminium for joining cracked railway tracks.

(iii) During extraction of metals, electrolytic refining is used to obtain pure metals. Which material will be used as anode and cathode for the refining of copper metal by this process ?

[3 Marks]

Answer: (i) (a) Carbonate ores are converted to metal oxides by heating strongly in air, a process called calcination. Example: $CaCO_3$ heat → CaO + CO_2 (b) Sulphide ores are converted to metal oxides by heating in air, a process called roasting. Example: 2ZnS + $3O_2$ heat → 2ZnO + $2SO_2$
(ii) Aluminium is used to join cracked railway tracks by the thermit reaction. The chemical reaction is:
Fe_2O_3(s) + 2Al(s) → 2Fe(l) + Al_2O_3(s) + Heat
This reaction produces molten iron which joins the cracks.
(iii) In electrolytic refining of copper metal, the impure copper is used as the anode and a thin sheet of

pure copper is used as the cathode. The electrolyte is copper sulfate solution. During the process, pure copper is deposited at the cathode and impurities collect at the anode or fall as anode mud.

Key Points: Carbonate ore is converted by calcination - Sulphide ore is converted by roasting - Thermit reaction with aluminium joins cracked railway tracks - Anode is impure copper - Cathode is pure copper sheet in electrolytic refining

Question 35.

(i) Write all the reactions involved in the extraction of Zn from ZnS.

(ii) Hydrogen gas is not evolved when most of the metals react with nitric acid. Give reason.

[3 Marks]

Answer: (i) The extraction of zinc from zinc sulfide (ZnS) involves the following steps:

Step 1: Concentration of ore

ZnS ore is concentrated by froth flotation process to remove impurities.

Step 2: Roasting

The concentrated ZnS is heated in excess air to convert it into zinc oxide and sulfur dioxide:

$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$

Step 3: Reduction

Zinc oxide is reduced by carbon (coke) at high temperature to obtain zinc metal:

$ZnO + C \rightarrow Zn + CO$

(ii) Hydrogen gas is not evolved when most metals react with nitric acid because nitric acid is a strong oxidising agent. Instead of producing hydrogen gas, nitric acid gets reduced to nitrogen oxides like NO, NO_2, or N_2O, depending on the concentration of nitric acid and the metal. So, the reaction involves oxidation of metal and reduction of nitric acid, and hydrogen gas is not released.

Key Points: Extraction of Zn involves concentration, roasting, reduction - Roasting converts ZnS to ZnO and SO2 - Reduction of ZnO by carbon produces Zn metal - Nitric acid is a strong oxidising agent - No hydrogen gas evolves with nitric acid - Nitric acid gets reduced to nitrogen oxides instead

Question 36.

(a) Observe the given ray diagram and compare :

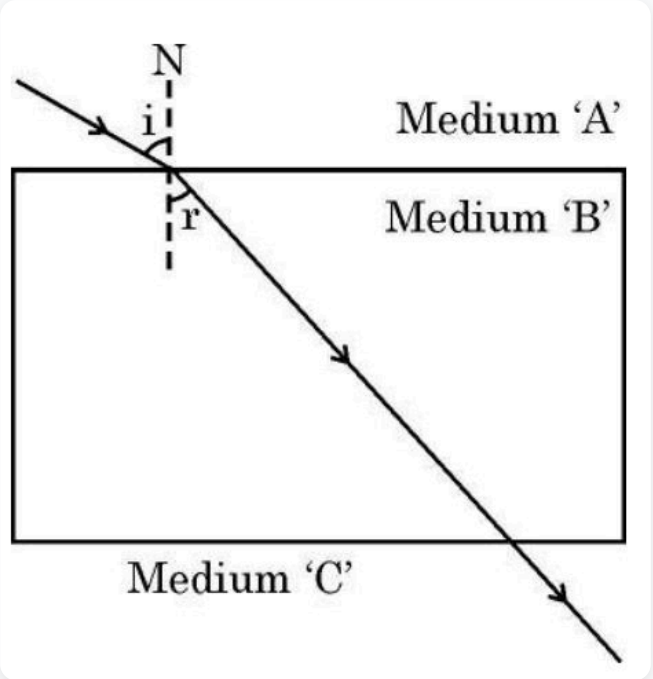
(i) the speed of light in medium A and the speed of light in medium B.

(ii) the optical densities of medium B and medium C.

(b) Draw a ray diagram for refraction where the optical density of medium ‘A’ becomes equal to the optical density of medium ‘C’ and optical density of medium ‘B’ is greater than the optical density of

medium ‘A’ and medium ‘C’.

[3 Marks]



Answer: (a)(i) When light travels from medium A to medium B and bends towards the normal, the speed of light in medium B is less than the speed of light in medium A. This means light travels slower in medium B than in medium A.
(ii) Optical density depends on how much light slows down in a medium. The medium where light travels slower is optically denser. Since light is slower in medium B compared to medium C (assuming from the ray diagram), medium B is optically denser than medium C.
(b) To draw the ray diagram as per the given condition: Optical density of medium A is equal to that of medium C, so light rays will pass from A to C without bending (no refraction). Optical density of medium B is greater than both, so at the boundary of A and B, and B and C, the light will bend towards the normal when entering B and bend away from the normal when leaving B to enter C. The ray will remain undeviated between A and C. Draw the incident ray entering from medium A to B bending towards normal, then bending away from normal when entering medium C from B, and straight line path from A to C where optical densities are equal.

Key Points: Speed of light is less in optically denser medium - Light bends towards normal when entering denser medium - No refraction occurs when optical densities are equal

Question 37.

Explain the phenomenon of rainbow formation in the sky. Draw the labelled ray diagram in support of your explanation.

[3 Marks]

Answer: Rainbow Formation:

A rainbow is formed when sunlight passes through water droplets present in the atmosphere after rain. The water droplets act like tiny prisms causing dispersion of white sunlight into its seven colours - red, orange, yellow, green, blue, indigo, and violet.

Explanation:

1. When sunlight enters a water droplet, it bends or refracts because light travels slower in water than in air.
2. Inside the droplet, light reflects off the inner surface of the droplet.
3. The light then refracts again as it comes out of the droplet back into air, bending at different angles for different colours because of dispersion.
4. Due to this dispersion and refraction, the white light splits into different colours.
5. Many such droplets together form a circular arc of colours called a rainbow, which is always seen opposite the Sun.

Ray Diagram:

The ray diagram shows sunlight entering a spherical water droplet, refracting at the surface, reflecting internally at the back of the droplet, and refracting again while exiting. The emerging rays display a spectrum of colours forming the rainbow.

Thus, the combined effect of refraction, reflection, and dispersion of sunlight in water droplets causes the formation of a rainbow in the sky.

> **Key Points: Sunlight refracted inside water droplets - Internal reflection inside droplets - Dispersion of light into seven colours - Formation of circular coloured arc opposite the Sun**

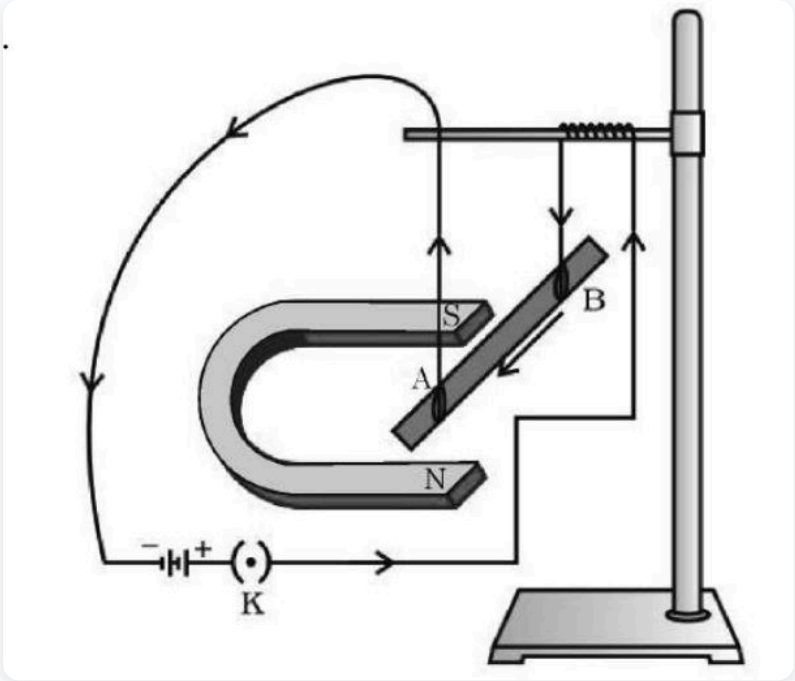
Question 38.

On the basis of the given circuit arrangement, answer the following questions :

(a) What happens to the rod AB when the key K is closed and why ?

(b) Name and state the rule that determines this behaviour of the rod AB in the above situation.

[3 Marks]



Answer: (a) When the key K is closed, current starts flowing through the rod AB from A to B. Due to this current and the magnetic field between the magnet poles, a force acts on the rod. This force causes the rod AB to move. The movement is because a current-carrying conductor placed in a magnetic field experiences a force.
(b) The rule that determines the direction of this force is Fleming's Left Hand Rule. It states that if the thumb, forefinger, and middle finger of the left hand are stretched such that the forefinger points in the direction of the magnetic field, the middle finger in the direction of the current, then the thumb will point in the direction of the force or motion on the conductor.

Key Points: Current flows through rod AB when key K is closed - Rod experiences force due to magnetic field and current - Fleming's Left Hand Rule determines the direction of the force

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Section E

Question 39.

(a) Draw a labelled diagram showing open and closed stomatal pore.

(b) List the main events that occur during the process of photosynthesis.

(c) Write a balanced chemical equation showing photo-synthesis in plants.

[5 Marks]

Answer: (a) The stomatal pores are openings on the surface of leaves controlled by guard cells. When the guard cells are turgid (swollen with water), they bend outwards and the stomatal pore opens. This is called an open stomatal pore, allowing gas exchange like intake of CO_2 and release of

O_2 and water vapor. When the guard cells lose water, they become flaccid and come together to close the stomatal pore. This is called a closed stomatal pore, which helps to prevent water loss.
Diagram: (Labelled to show guard cells, stomatal pore open and stomatal pore closed.)

(b) Main events during photosynthesis are:
1. Absorption of sunlight by chlorophyll in leaves.
2. Conversion of light energy into chemical energy.
3. Splitting of water molecules into hydrogen and oxygen.
4. Release of oxygen into the atmosphere.
5. Fixation of carbon dioxide from air to form glucose.

(c) The balanced chemical equation for photosynthesis is:
$6CO_2 + 6H_2O$ + light energy --> $C_6H_{12}O_6 + 6O_2$.

> **Key Points: Open stomatal pore allows gas exchange - Closed stomatal pore prevents water loss - Photosynthesis converts CO2 and water into glucose and oxygen using light energy**

Question 40.

(a) Draw a well-labelled diagram of nephron and label atleast 4 of its parts.

(b) Write the role of capillary cluster inside Bowman's capsule.

(c) What is meant by selective reabsorption ?

[5 Marks]

Answer: (a) A nephron consists of several parts:
1. Bowman's capsule: It is a cup-shaped structure that surrounds the glomerulus.
2. Glomerulus: A cluster of tiny blood capillaries inside Bowman's capsule where blood filtration occurs.
3. Proximal convoluted tubule: The first part of the tubular system where selective reabsorption begins.
4. Loop of Henle: A long loop that helps concentrate urine.
5. Distal convoluted tubule: Further adjusts the filtrate composition.

(b) The role of the capillary cluster (glomerulus) inside Bowman's capsule is to filter blood. The blood pressure forces water and small molecules like glucose, salts, and urea out of the blood into Bowman's capsule, forming the filtrate. Larger components like proteins and blood cells remain in the blood.

(c) Selective reabsorption is the process by which useful substances such as glucose, certain salts,

and a large amount of water are reabsorbed from the filtrate in the tubules of the nephron back into the blood. This process ensures that only waste products are excreted while valuable substances are retained by the body.

Key Points: Nephron structure with Bowman's capsule and glomerulus - Filtration by capillary cluster inside Bowman's capsule - Selective reabsorption of useful substances from filtrate

Question 41.

(i) Carbon cannot form C^{4+} cation and C^{4-} anion. Explain.

(ii) Define homologous series of carbon compounds. Why are the melting and boiling points of C_4H_{10} higher than C_3H_8 or C_2H_6 ?

(iii) What happens when ethanol is heated with acidified potassium dichromate ?

[5 Marks]

Answer: (i) Carbon cannot form C^{4+} cation because it requires losing four electrons which is highly energy-demanding due to strong nuclear attraction. Similarly, carbon cannot form C^{4-} anion because gaining four electrons leads to large electron-electron repulsion and instability. Hence, carbon does not form C^{4+} or C^{4-} ions.
(ii) A homologous series is a group of carbon compounds having the same functional group but differing by a CH_2 unit in successive members. Members of a homologous series show similar chemical properties and gradual change in physical properties.
The melting and boiling points of C_4H_{10} (butane) are higher than C_3H_8 (propane) and C_2H_6 (ethane) because as the number of carbon atoms increases, the molecular size and mass increase leading to stronger van der Waals forces between molecules. Stronger forces require more energy to break, thus higher melting and boiling points.
(iii) When ethanol is heated with acidified potassium dichromate, it is oxidized to produce ethanoic acid. The colour of potassium dichromate changes from orange to green due to reduction of dichromate ions. This reaction is an example of oxidation of a primary alcohol to a carboxylic acid.

Key Points: Carbon cannot lose or gain four electrons due to instability - Homologous series: same functional group and differ by CH2 unit - Melting and boiling points increase with molecular size due to stronger intermolecular forces - Ethanol oxidizes to ethanoic acid with acidified potassium dichromate changing colour from orange to green

Question 42.

(i) How would you name the following :

II. $CH_3 – C \equiv CH$

(ii) When ethanol reacts with ethanoic acid in the presence of conc. H_2SO_4, a substance with sweet smell is produced. Answer the following :

I. State the class of compounds to which the sweet smelling compounds belong.

II. Write the chemical equation for the reaction.

(iii) Why soaps do not produce foam with hard water ?

[5 Marks]

(i) How would you name the following :

I. $CH_3 – CH_2 – \underset{\underset{H}{|}}{C} = O$

Answer: (a) The compound CH_3 - C ≡ CH is named as Prop-1-yne. It is an alkyne with three carbon atoms and a triple bond between first and second carbon.

(b) (i) The sweet smelling compound formed when ethanol reacts with ethanoic acid in presence of concentrated H_2SO_4 is an Ester. Esters are known for their pleasant and sweet smell.
(ii) The chemical equation for the reaction is:
$CH_3CH_2OH + CH_3COOH$ --(conc. H_2SO_4)--> $CH_3COOCH_2CH_3 + H_2O$
This is an esterification reaction where ethanol and ethanoic acid produce ethyl ethanoate (an ester) and water.

(c) Soaps do not produce foam with hard water because hard water contains calcium and magnesium salts. These salts react with soap to form an insoluble substance called scum which does not foam. Thus, soap loses its ability to lather in hard water.

Key Points: Name of CH3-C≡CH is Prop-1-yne - Sweet smelling compounds formed are Esters - Soaps react with calcium and magnesium ions in hard water to form scum which reduces foam

Question 43.

(i) The given electric circuit is a part of an electrical device. Use the information given in the electric circuit diagram to calculate :

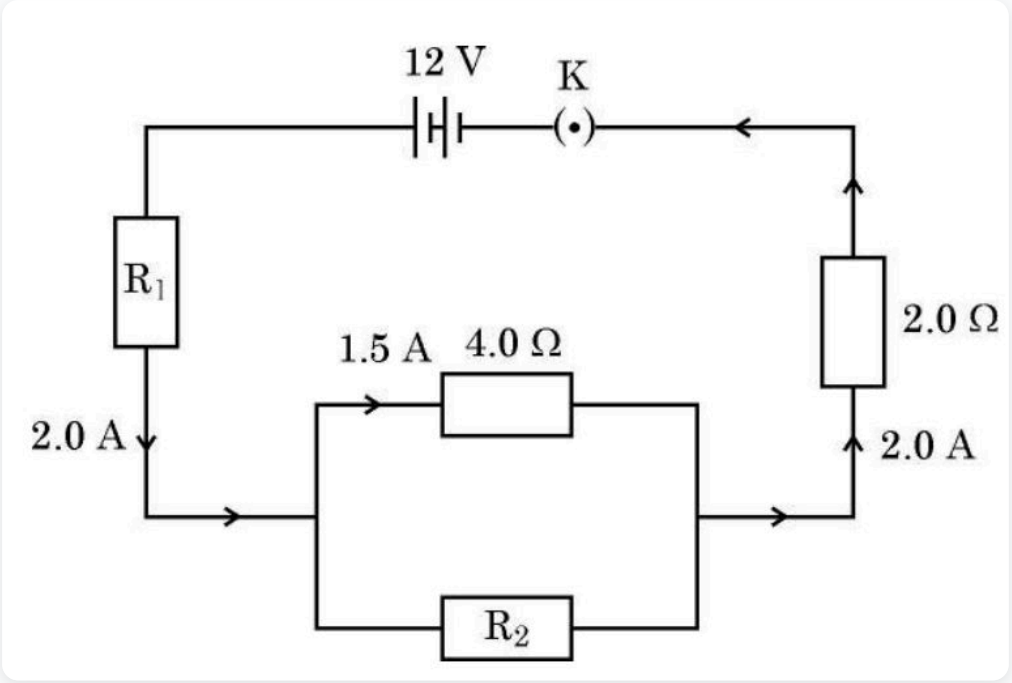
(I) Potential difference across the ends of resistor R_2 .

(II) Value of resistor R_2 .

(III) Value of resistor R_1 .

(ii) Write the factors on which resistance of a conductor depends and derive the formula for resistance of a given conductor.

[5 Marks]



Answer: (i) (I) To find the potential difference across resistor R_2, use Ohm's law: V = I * R. If the current through R_2 and its resistance are given or can be found, multiply them to get the potential difference (voltage) across R_2.
(II) To find the value of resistor R_2, if the potential difference V across it and the current I through it are known, use the formula R = V / I.
(III) Similarly, to find the value of resistor R_1, use the voltage across R_1 and the current through it with the formula R = V / I.
(ii) Factors on which resistance of a conductor depends are:
1. Length of the conductor (L): Resistance is directly proportional to the length of the conductor. Greater the length, greater the resistance.
2. Cross-sectional area (A): Resistance is inversely proportional to the area of cross-section. Larger the area, smaller the resistance.
3. Material of the conductor: Different materials have different resistivities affecting the resistance.
4. Temperature: Resistance changes with change in temperature.

Derivation of formula for resistance:
Resistance R is directly proportional to length L and inversely proportional to area A, hence $R \propto L / A$.
Introducing resistivity constant (ρ) dependent on material and temperature, R = ρ * (L / A).
This formula shows resistance depends on physical dimensions and material properties of the conductor.

Key Points: Ohm's law for voltage - Formula R = V / I - Factors affecting resistance: length, area, material, temperature - Formula R = ρ * (L / A) - Explanation of resistivity ρ

Question 44.

(i) How much electric current will an electric iron draw from 220 V source if the resistance of its heating element when hot, is 55Ω ? Calculate the power consumed by the electric iron when it is operated at 220 V.

(ii) In a house, 3 bulbs of 100 watt each, are lit for 5 hours daily and an electric heater of 1.0 kW is used for half an hour daily. Calculate the total energy consumed in a month of 30 days and its cost at the rate of Rs 3.60 per kWh.

(iii) With reason explain, why are alloys commonly used to make elements of electrical heating devices.

[5 Marks]

Answer: (i) Given Voltage, V = 220 V and Resistance, R = 55 Ω.
Using Ohm's law, Current I = V / R = 220 / 55 = 4 A.
Power consumed, P = V * I = 220 * 4 = 880 W.
(ii) Power of each bulb = 100 W, Number of bulbs = 3, Daily usage = 5 hours.
Total energy consumed by bulbs daily = 3 * 100 * 5 = 1500 Wh = 1.5 kWh.
Electric heater power = 1.0 kW, used for 0.5 hours daily.
Energy consumed by heater daily = 1.0 * 0.5 = 0.5 kWh.
Total energy consumed daily = 1.5 + 0.5 = 2.0 kWh.
Energy consumed in 30 days = 2.0 * 30 = 60 kWh.
Cost of energy = 60 * 3.60 = ` 216.
(iii) Alloys are used as heating elements because they have high resistivity and high melting points. This means they can generate a lot of heat without melting and do not oxidize easily at high temperatures, making them durable and efficient for heating devices.

Key Points: Ohm's law to calculate current - Power calculation using P=VI - Energy consumption calculation for bulbs and heater - Cost calculation from energy consumed - Alloys have high resistivity and high melting point making them suitable for heating elements