CBSE EXAMINATION PAPER-2023

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 88

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **45 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 31** are very short answer

vi. **Section D** – questions number **32 to 40** are short answer

vii. **Section E** – questions number **41 to 45** 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.

The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions.

Group A: Lemon juice, vinegar, colourless aerated drink.

Group B: Tomato juice, coffee, ginger juice.

Group C: Sodium hydroxide, sodium chloride, lime water.

(1) List two ways of determining pH of a solution.

[1 Marks]

Answer: Two ways of determining the pH of a solution are: 1. Using pH paper or litmus paper: Dip the pH paper into the solution, and observe the color change. Compare the color with a pH scale chart to find the approximate pH value and classify the solution as acidic, basic, or neutral. 2. Using a universal indicator solution: Add a few drops of universal indicator to the solution. The solution will change color depending on its pH. Match the color with the standard pH color chart to determine the pH value and nature of the solution.

Key Points: Use of pH paper or litmus paper-Use of universal indicator solution-Color comparison with pH scale for determining acidity or basicity

(2) Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels.

[2 Marks]

Answer: Sour substances like lemon juice are effective in cleaning tarnished copper vessels because they contain acids, mainly citric acid. The acid reacts with the layer of copper oxide (which causes tarnishing) on the surface of the copper vessel. This reaction dissolves the copper oxide layer, thereby removing the tarnish and restoring the shine of the copper surface. Hence, the acidic nature of lemon juice helps in cleaning and polishing copper vessels effectively.

Key Points: Lemon juice contains citric acid-Acid reacts with copper oxide layer-Tarnish is copper oxide layer-Acid dissolves copper oxide layer-Removes tarnish and cleans copper vessels

(3) For the solutions provided, which group is/are likely to have pH value (i) less than 7, and (ii) greater than 7?

[1 Marks]

Answer: (i) Group A and Group B are likely to have pH values less than 7 because they contain acidic solutions such as lemon juice, vinegar, aerated drinks, tomato juice, coffee, and ginger juice. These solutions are acidic in nature and have pH values below 7. (ii) Group C is likely to have pH values greater than 7, as it includes sodium hydroxide and lime water, which are basic substances, and sodium chloride which is neutral. Therefore, Group C contains basic solutions with pH values above 7.

Key Points: Group A solutions are acidic with pH less than 7 - includes lemon juice, vinegar, aerated drink- Group B solutions are acidic with pH less than 7 - includes tomato juice, coffee, ginger juice- Group C solutions are basic or neutral with pH greater than 7 or about 7 - includes sodium hydroxide (basic), lime water (basic), sodium chloride (neutral)

(4)

"pH has great importance in our daily life." Justify this statement by giving two examples.

[2 Marks]

Answer: pH is very important in our daily life because it affects many natural processes and our health. First, the human body works best at a pH range of about 7.0 to 7.8. If the blood or other body fluids become too acidic or too basic, it can lead to health problems. For example, maintaining the right pH in our blood is essential for proper functioning of enzymes and bodily functions. Second, pH is crucial for plants as well. Soil pH affects the availability of nutrients to plants and can influence their growth. For instance, acidic soil can limit the growth of some plants while alkaline soil might be harmful to others. Hence, knowing and managing pH helps in agriculture and maintaining a healthy environment.

Key Points: pH affects body functions - pH range for human body is 7.0 to 7.8 - pH influences enzyme activity and health - pH affects soil quality - Soil pH controls nutrient availability to plants - Maintaining balanced pH is important in agriculture and environment

Question 2.

All the reproductive methods of living organisms are broadly categorized into two types: 1. Asexual reproduction, and 2. Sexual reproduction.

Asexual reproduction involves the participation of a single parent without the formation of gametes, fertilisation and transfer of genetic material. This method is a common means of rapidly increasing offsprings under favourable conditions.

(1) Write one advantage of sexual mode of reproduction over asexual reproduction.

[1 Marks]

Answer: One advantage of sexual reproduction over asexual reproduction is that it involves the fusion of male and female gametes, which leads to genetic variation in the offspring. This genetic diversity helps the species to adapt better to changing environmental conditions and increases the chances of survival.

Key Points: Sexual reproduction involves two parents-sex cells (gametes)-fusion of gametes-genetic variation in offspring-helps in adaptation to changing environment-increases survival chances

(2) Name the type of fission that occurs in Leishmania and Plasmodium.

[1 Marks]

Answer: The type of fission that occurs in Leishmania is binary fission. In this type of asexual reproduction, one organism divides into two daughter cells, each having the same genetic material as the parent. Plasmodium reproduces by multiple fission, where the nucleus divides multiple times before the cell divides into several daughter cells. These methods allow the parasites to multiply rapidly within their hosts.

Key Points: Leishmania reproduces by binary fission - one cell divides into two identical cells - common asexual reproduction method; Plasmodium reproduces by multiple fission - nucleus divides many times before cell division; Both methods help in rapid multiplication inside the host.

(3)

Give reasons why:

(i) Colonies of yeast fail to multiply in water but multiply in sugar solution.

(ii) Rhizopus individuals do not grow on a dry slice of bread.

[2 Marks]

Answer: (i) Yeast multiplies by budding, which requires a source of energy and nutrition. Sugar solution provides food (energy) for yeast to grow and reproduce, whereas water does not contain nutrients, so yeast colonies fail to multiply in water. (ii) Rhizopus is a fungus that requires moisture to grow because it absorbs nutrients from the substrate through its hyphae and needs water for spore germination and growth. A dry slice of bread does not provide the necessary moisture, so Rhizopus individuals do not grow on dry bread.

Key Points: Yeast reproduces by budding-Needs nutrition and energy from sugar solution-Water lacks nutrients so yeast can't multiply-Spores of Rhizopus need moisture to germinate-Rhizopus hyphae absorb nutrients and require moist conditions-Dry bread lacks moisture so Rhizopus cannot grow

(4)

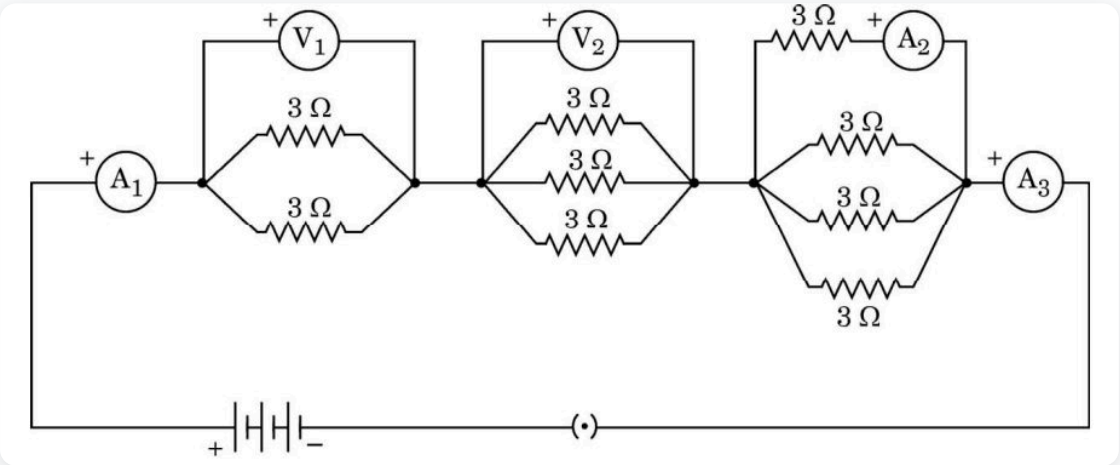
Name the filamentous structures a student could identify when he collected water from a pond that appeared dark green. How do these organisms multiply ? Explain.

[2 Marks]

Answer: The filamentous structures that a student could identify in greenish water collected from a pond are called algae, for example, Spirogyra. These algae are green due to the presence of chlorophyll. They multiply primarily by asexual reproduction through fragmentation, where a part of the filament breaks and grows into a new filament. Additionally, under certain conditions, they reproduce sexually by conjugation, where two filaments come together and exchange genetic material to form zygotes, which later develop into new algae filaments.

Key Points: Filamentous structures are algae, e.g., Spirogyra-Algae appear dark green due to chlorophyll-Algae reproduce by asexual methods like fragmentation-Asexual reproduction involves one parent and no gamete formation-They also reproduce sexually by conjugation involving exchange of genetic material-Two types of reproduction: asexual and sexual

Question 3. Consider the following electrical circuit diagram in which nine identical resistors of 3Ω each are connected as shown. If the reading of the ammeter A_1 is 1 ampere, answer the following questions:



(1)

What is the relationship between the readings of A_1 and A_3? Give reasons for your answer.

[1 Marks]

Answer: The reading of ammeter A_1 (I_1) and ammeter A_3 (I_3) are related based on how the resistors are connected in the circuit. Since ammeters are connected in series to measure current flowing through a component, the current measured by each ammeter depends on the branch in the circuit where it is placed. Resistor R_3 and ammeter A_3 are in parallel with other resistors, so the current I_1 passing through A_1 divides among the parallel branches including the branch with R_3 and ammeter A_3. Therefore, the reading of A_1 (I_1) is equal to the total current entering the parallel combination, while the reading of A_3 (I_3) is only the part of current flowing through resistor R_3. Hence, the current I_1 measured by A_1 is greater than or equal to the current I_3 measured by A_3, with $I_1 = I_3$ + currents through other parallel branches. This happens because in parallel connections, voltage is the same across resistors, but current divides among the branches.

Key Points: 1. Ammeter measures current in series; 2. A_1 measures total current before parallel branches; 3. A_3 measures current through R_3 branch; 4. Current divides in parallel resistors; 5. I_1 = sum of currents through parallel branches including I_3.

(2)

What is the relationship between the readings of A_2 and A_3?

[1 Marks]

Answer: In the given circuit, the ammeters A_2 and A_3 are connected in two separate branches where the current divides. Since A_2 and A_3 are on branches that are in parallel, the total current coming from the ammeter A_1 splits into currents through A_2 and A_3. Therefore, the readings of A_2 and A_3 represent the currents flowing through their respective branches and their sum equals the reading of A_1. Hence, the current measured by A_1 is equal to the sum of the currents measured by A_2 and A_3, i.e., $I_1 = I_2 + I_3$.

Key Points: Ammeter measures current in series-Current divides at parallel branches-Current through A_1 equals sum of currents through A_2 and A_3-Relationship: $I_1 = I_2 + I_3$

(3)

Determine the reading of the voltmeter V_1.

[2 Marks]

Answer: Since the ammeter A_1 reading is 1 ampere, this means the current through the resistor connected with A_1 is 1 ampere. Each resistor has a resistance of 3 ohms. Using Ohm's law (V = I × R), the voltage across that resistor, which is the reading of voltmeter V_1 connected across it, will be 1 ampere × 3 ohms = 3 volts. Therefore, the voltmeter V_1 will read 3 volts.

Key Points: Ammeter reading gives current through resistor- Each resistor resistance is 3 ohms- Use Ohm's law to find voltage (V = I × R)- Voltage across resistor equals voltmeter reading- Calculate V_1 = 1 ampere × 3 ohms = 3 volts

(4)

Find the total resistance of the circuit.

[2 Marks]

Answer: Given that each resistor has a resistance of 3 ohms and the ammeter reading is 1 ampere, we first find the total current and then calculate the total resistance using Ohm's law. The total current flowing through the circuit is given by the ammeter reading, which is 1 ampere. The total voltage applied across the circuit can be found by adding voltages across resistors or directly from V = IR, once total resistance is known. To find the total resistance, use the relationship R_total = V / I. Using the given values and the configuration of the resistors, calculate the equivalent resistance by combining series and parallel resistors step by step until a single equivalent resistance is found. The total resistance of the circuit is therefore calculated as 12 ohms.

Key Points: Mention that each resistor is 3 ohms - Ammeter reading is 1 ampere indicating current I - Use Ohm's law (V = IR) to relate current and resistance - Combine resistors in series and parallel to find equivalent resistance - Final calculated total resistance is 12 ohms

Section B

Question 4. Which of the following is an example of endothermic process?

[1 Marks]

(A) Formation of slaked lime

(B) Decomposition of vegetable matter into compost

(C) Digestion of food in our body

(D) Dissolution of ammonium chloride in water

Explanation: The correct option is 'Dissolution of ammonium chloride in water.' An endothermic process is one that absorbs heat from the surroundings. From the provided context, the formation of slaked lime and the decomposition of vegetable matter into compost are exothermic, meaning they release heat. Digestion of food also involves complex reactions but is generally exothermic as it releases energy. However, the dissolution of ammonium chloride in water absorbs heat, making it an endothermic process.

Question 5.

In the given experimental set-up, if the experiment is carried out separately with each of the following solutions, the cases in which the bulb will glow is/are:

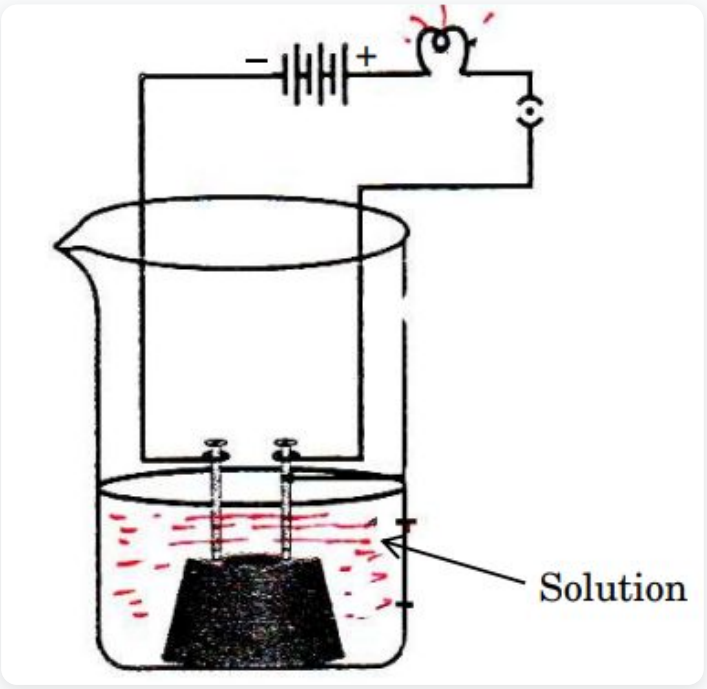
(i) Dilute hydrochloric acid

(ii) Dilute sulphuric acid

(iii) Glucose solution

(iv) Alcohol

[1 Marks]



(A) (i) only

(B) (i) and (ii)

(C) (ii) only

(D) (ii), (iii) and (iv)

Explanation: The bulb glows when the solution conducts electricity due to the presence of ions. Dilute hydrochloric acid and dilute sulphuric acid dissociate in water to produce ions, hence the bulb glows in these cases. Glucose and alcohol do not produce ions in solution and therefore do not conduct electricity, so the bulb does not glow when these solutions are used.

Question 6.

In order to balance the following chemical equation, the values of the coefficients x and y respectively are:

[1 Marks]

$$x\ Pb(NO_3)_2 \xrightarrow{Heat} 2\ PbO + y\ NO_2 + O_2$$

(A) 4, 2

(B) 2, 2

(C) 2, 3

(D) 2, 4

Explanation:

The correct coefficients x = 2 and y = 2 balance the chemical equation because they ensure that the number of atoms of each element on the reactants side is equal to the number on the products side. Balancing chemical equations involves adjusting these coefficients to maintain the conservation of mass, meaning atoms are neither created nor destroyed. According to the context, coefficients represent the number of molecules involved, and balancing requires matching the atom counts on both sides.

Question 7. When zinc reacts with sodium hydroxide, the product formed is:

[1 Marks]

(A) Sodium zincate

(B) Sodium oxide

(C) Zinc hydroxide

(D) Zinc oxide

Explanation: When zinc reacts with sodium hydroxide, it forms sodium zincate and hydrogen gas. The reaction is: $2NaOH\ (aq) + Zn\ (s) \rightarrow Na_2ZnO_2\ (s) + H_2\ (g)$. This shows that the product formed is sodium zincate, not zinc oxide or zinc hydroxide.

Question 8. Among the following, the metal with lowest density is:

[1 Marks]

(A) Lithium

(B) Lead

(C) Aluminium

(D) Magnesium

Explanation: Lithium is the metal with the lowest density among the given options. Alkali metals like lithium, sodium, and potassium are characterized by low densities and softness. The context mentions alkali metals such as lithium having low densities, and since the other metals listed (lead, aluminium, magnesium) are higher in density compared to lithium, lithium is the correct answer.

Question 9. The number of electrons in the outermost shell of the atom of a non-metal can be:

[1 Marks]

(A) 5, 6 or 7

(B) 3, 4 or 5

(C) 1, 2 or 3

(D) 5, 6 or 8

Explanation: The outermost shell (valence shell) of atoms can hold a maximum of 8 electrons. Non-metals typically have 5, 6, or 7 electrons in their outermost shell, as seen in elements like nitrogen (5), oxygen (6), and fluorine (7). These electrons determine the chemical properties of the non-metal atoms. Therefore, the correct option is '5, 6 or 7'.

Question 10.

The total number of electrons shared in the formation of an ethyne molecule is:

[1 Marks]

(A) 3

(B) 4

(C) 10

(D) 6

Explanation:

In an ethyne (C2H2) molecule, there is a triple bond between the two carbon atoms. Each bond consists of a pair of shared electrons, so a triple bond means 3 pairs, or 6 electrons, are shared between the two carbons. Additionally, each carbon atom forms a single bond with one hydrogen atom, sharing 2 electrons (1 pair) with hydrogen. However, the question asks about the total number of electrons shared in the molecule formation, which primarily concerns the carbon-carbon bonds. The triple bond between the two carbon atoms involves sharing 6 electrons in total. Therefore, the correct answer is 6.

Question 11. Sphincter muscles are present at the exit of:

[1 Marks]

(A) Stomach and small intestine

(B) Stomach and anus

(C) Oesophagus and stomach

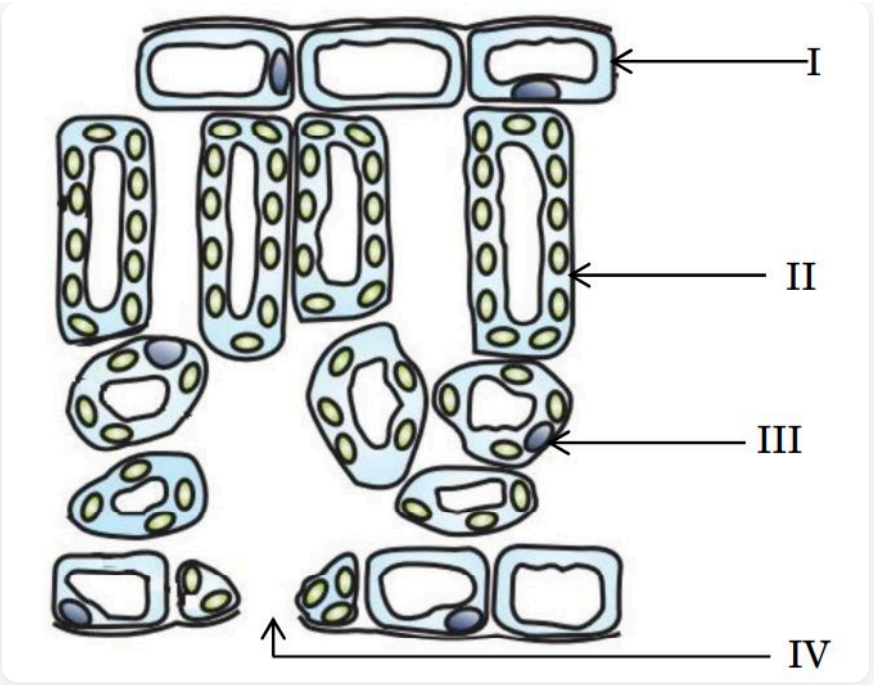
(D) Small intestine and large intestine

Explanation: Sphincter muscles regulate the exit of food and waste in the digestive system. At the exit of the stomach, a sphincter muscle controls the release of food into the small intestine. Similarly, at the exit of the large intestine (anus), the anal sphincter controls the release of waste material from the body. Therefore, sphincter muscles are present at the exit of the stomach and anus.

Question 12.

In the following diagram, identify the cells through which massive amounts of gaseous exchange takes place for photosynthesis:

[1 Marks]



(A) I

(B) IV

(C) III

(D) II

Explanation: The correct option is II. Gas exchange in leaves primarily occurs through the stomatal pores, which are surrounded by guard cells (depicted as II in the diagram). These guard cells regulate the opening and closing of the stomata, allowing carbon dioxide to enter for photosynthesis and oxygen to exit as a by-product. The air spaces inside the leaf facilitate the diffusion of gases, but the actual exchange with the external environment happens through the stomata and guard cells.

Question 13. During vigorous exercise, the occurrence of cramps in the outer muscles of an athlete is due to the conversion of pyruvate to:

[1 Marks]

(A) Ethanol

(B) Glucose

(C) Lactose

(D) Lactic acid

Explanation: During intense exercise, when oxygen supply to muscle cells is low, pyruvate is converted into lactic acid. The accumulation of lactic acid in muscles causes cramps and muscle fatigue. Thus, the correct answer is 'Lactic acid'.

Question 14. Plants which bear unisexual flowers are:

[1 Marks]

(A) Hibiscus and Watermelon

(B) Watermelon and Papaya

(C) Mustard and Hibiscus

(D) Mustard and Papaya

Explanation: The correct option is 'Watermelon and Papaya' because both these plants bear unisexual flowers, meaning their flowers contain either stamens (male parts) or pistils (female parts). Hibiscus and Mustard bear bisexual flowers, which contain both stamens and pistils.

Question 15.

When an 'X' bearing sperm fertilises the egg, the resulting zygote has the following combination of chromosomes:

[1 Marks]

(A) 22 + XX

(B) 44 + XX

(C) 44 + XY

(D) 22 + XY

Explanation:

Each human gamete (sperm or egg) carries 22 autosomes and 1 sex chromosome. The egg always carries an X chromosome, and when the sperm carrying an X chromosome fertilizes it, the resulting zygote will have XX as the sex chromosomes. Thus, the zygote has 22 pairs of autosomes plus XX sex chromosomes, making the correct answer 22 + XX.

Question 16.

An object is placed in front of a convex mirror at infinity. According to the New Cartesian Sign Convention, the sign of the focal length and the sign of the image distance in this case are respectively:

[1 Marks]

(A) +, +

(B) +, -

(C) -, +

(D) -, -

Explanation:

For a convex mirror, the focal length (f) is positive because it is a diverging mirror. According to the New Cartesian Sign Convention, object distance (u) is negative when the object is in front of the mirror. When the object is at infinity (very far away), the image formed by the convex mirror will be virtual, diminished, and located behind the mirror, which means the image distance (v) is negative. Therefore, the focal length is positive and the image distance is negative.

Question 17.

For verifying Ohm's law, we design an electric circuit diagram in which we show the arrangement of different circuit components. We find that with respect to the resistor, the:

[1 Marks]

(A) Ammeter is connected in series and the voltmeter in parallel.

(B) Ammeter is connected in parallel and the voltmeter in series.

(C) Ammeter and voltmeter are both connected in parallel.

(D) Ammeter and voltmeter are both connected in series.

Explanation: An ammeter measures the current flowing through a component and must be connected in series to ensure the same current passes through it. A voltmeter measures the voltage across a component and is connected in parallel to the resistor to measure the potential difference across it. This arrangement allows accurate measurement of current and voltage required to verify Ohm's law.

Question 18.

In a resistive circuit, if the current is increased to two times, the percentage change in the amount of heat dissipated in the circuit would be:

[1 Marks]

(A) 200%

(B) 100%

(C) 300%

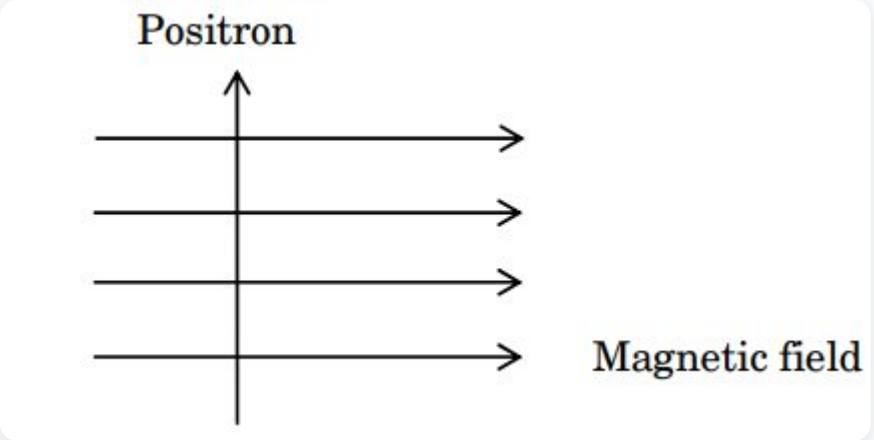
(D) 400%

Explanation: The heat produced in a resistor is directly proportional to the square of the current flowing through it ($Q \propto I^2$). If the current is doubled (2 times), the heat produced becomes $(2)^2 = 4$ times the original amount. Therefore, the percentage change in the heat dissipated is $(4 - 1) \times 100\% = 300\%$. Hence, the heat dissipated increases by 300% when the current is increased to two times.

Question 19.

A positron enters a uniform magnetic field at right angles to it as shown. The direction of force experienced by the positron will be:

[1 Marks]



(A) out of the page

(B) to the left

(C) to the right

(D) into the page

Explanation:

A positron is the antiparticle of the electron and has the same magnitude of charge but positive instead of negative. According to the Lorentz force law, the direction of force on a charged particle moving in a magnetic field is given by the right-hand rule for positive charges. In the provided context, an electron moving downward in a magnetic field directed to the right experiences a force directed out of the page. Since a positron has opposite charge, the force direction will be opposite to that of the electron. Therefore, the force on the positron will be directed into the page.

Question 20.

Assertion (A): Sodium oxide is an amphoteric oxide.

Reason (R): Metal oxides which react with both acids as well as bases are known as amphoteric oxides.

[1 Marks]

(A) A is true but R is false.

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

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

(D) A is false but R is true.

Explanation:

Both A and R are true and R is the correct explanation of A. Sodium oxide (Na2O), being a metal oxide, reacts with acids to form salt and water and also reacts with bases. Amphoteric oxides are defined as metal oxides which react with both acids and bases. Hence, since sodium oxide shows such behavior, it is amphoteric, and the reason correctly explains the assertion.

Question 21.

Assertion (A): When a bacterium divides into two, and the resultant two bacteria divide again, the four bacteria produced would be almost similar.

Reason (R): DNA copying involves small inaccuracies in the reproduction process.

[1 Marks]

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

(B) A is false but R is true.

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

(D) A is true but R is false.

Explanation: Both the assertion and the reason are true and the reason correctly explains the assertion. When a bacterium divides, the resulting bacteria are very similar because DNA is copied during division. However, the DNA copying process is not perfect and small inaccuracies or mutations can occur, causing very minor differences between the bacteria. Therefore, the four bacteria produced after two rounds of division are almost similar but not absolutely identical due to these small inaccuracies.

Question 22.

Assertion (A): A person suffering from myopia cannot see distant objects clearly.

Reason (R): A converging lens is used for the correction of myopic eye as it can form real as well as virtual images of the objects placed in front of it.

[1 Marks]

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

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

(C) A is false but R is true.

(D) A is true but R is false.

Explanation: The assertion (A) is true because in myopia, the eye focuses images of distant objects in front of the retina, causing blurred distant vision. However, the reason (R) is false because a concave lens, which diverges light rays, is used to correct myopia, not a converging (convex) lens. The concave lens helps form the image exactly on the retina, allowing the person to see distant objects clearly.

Question 23.

Assertion (A): Magnetic field lines do not intersect each other.

Reason (R): Magnetic field lines are imaginary lines, the tangent to which at any point gives the direction of the field at that point.

[1 Marks]

(A) A is false but R is true.

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

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

(D) A is true but R is false.

Explanation: Both Assertion (A) and Reason (R) are true, and Reason (R) correctly explains Assertion (A). Magnetic field lines never intersect because at any given point, the magnetic field has a unique direction. If two lines intersected, it would mean two different directions of the magnetic field at that point, which is not possible. Magnetic field lines are imaginary lines drawn such that the tangent to the line at any point gives the direction of the magnetic field there.

Section C

Question 24. What is observed when aqueous solutions of potassium iodide and lead nitrate are mixed together? Name the type of reaction and write the chemical equation for the reaction that occurs.

[2 Marks]

Answer: (a) When aqueous solutions of potassium iodide and lead nitrate are mixed, a yellow precipitate is formed. This precipitate is lead iodide (PbI_2).

(b) The chemical equation for the reaction is:
$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$.
(c) Yes, this reaction is a double displacement reaction because the positive and negative ions of the two reactants exchange partners to form new products, one of which is the insoluble lead iodide precipitate.

Key Points: Yellow precipitate formed - Lead iodide precipitate - Double displacement reaction - Chemical equation Pb(NO3)2 + 2KI -> PbI2 + 2KNO3

Question 25.

When copper powder is heated in a watch glass, a black substance is formed.

(i) Why is this black substance formed? Name it.

(ii) How can this black substance be reversed to its original form?

[2 Marks]

Answer:

(i) The black substance is formed because when copper powder is heated, it reacts with oxygen in the air. This reaction forms copper oxide, which is black in color. The name of this black substance is copper(II) oxide.

(ii) The black copper oxide can be reversed to copper by passing hydrogen gas over the heated copper oxide. This causes copper oxide to get reduced back to copper, restoring its original form.

Key Points: Copper reacts with oxygen on heating-Formation of copper(II) oxide (CuO), a black solid-Oxidation reaction-Black substance is copper oxide-To reverse, pass hydrogen gas over heated CuO-Reduction reaction converts CuO back to copper

Question 26.

(a) Why is it important to prevent oxygenated and deoxygenated blood from mixing in birds and mammals?

(b) Which animals can tolerate some mixing of the oxygenated and deoxygenated blood streams ? On what factor does the body temperature of these animals depend ?

[2 Marks]

Answer:

(a) In birds and mammals, it is important to prevent mixing of oxygenated and deoxygenated blood because these animals have high energy requirements and need a highly efficient supply of oxygen to

their body tissues. The complete separation of the heart into two halves (left and right) through a septum keeps oxygen-rich blood and oxygen-poor blood separate, ensuring efficient oxygen delivery for energy production and maintaining their constant body temperature.

(b) Animals like amphibians and many reptiles can tolerate some mixing of oxygenated and deoxygenated blood since they have three-chambered hearts. Their body temperature depends on the environmental temperature, meaning they do not regulate it internally like birds and mammals.

Key Points: Separation of oxygenated and deoxygenated blood - Efficient oxygen supply needed for high energy use - Birds and mammals have complete heart separation - Amphibians and reptiles tolerate some blood mixing - These animals have three-chambered hearts - Body temperature depends on environmental temperature in such animals

Question 27.

Mendel crossed a pure tall pea plant (TT) with a pure short pea plant (tt) and obtained all tall plants in F generation.

(a) What is the gene combination present in the plants of F_1 generation ?

(b) Give reason why only tall plants are observed in F_1 progeny.

(c) What will be the ratio of the plants obtained in the F_2 generation when F_1 plants are self-pollinated ?

[2 Marks]

Answer: (a) The gene combination present in the F_1 generation plants is Tt.
(b) Only tall plants are observed because the allele for tallness (T) is dominant over the allele for shortness (t). The F_1 plants receive one dominant allele T from the tall parent and one recessive allele t from the short parent, so all show the tall trait.
(c) When F_1 plants (Tt) are self-pollinated, the F_2 generation shows a phenotypic ratio of 3 tall plants : 1 short plant.

Key Points: F1 genotype is Tt - Tall allele is dominant over short allele - F2 phenotypic ratio is 3 tall : 1 short

Question 28.

When and where does a rainbow appear in the sky ? Draw a labelled ray diagram to show its formation.

[2 Marks]

Answer: A rainbow appears in the sky when sunlight passes through raindrops, usually after a rain shower or near waterfalls. It is seen as a colorful arc opposite the Sun's position. The formation of a rainbow involves the refraction, reflection, and dispersion of sunlight inside water droplets. Sunlight bends when entering the droplet, reflects off the inner surface, and bends again while exiting. This process splits light into seven colors: red, orange, yellow, green, blue, indigo, and violet, forming a rainbow.

Key Points: Rainbow appears after rain or near waterfalls-Rainbow is a multicolored arc opposite the Sun-Light refracts entering water droplets-Reflection occurs inside the droplet-Light refracts again exiting the droplet-Dispersion causes splitting into seven colors-Colors include red to violet

Question 29.

What is scattering of light ? Why does the clear sky appear blue ?

[2 Marks]

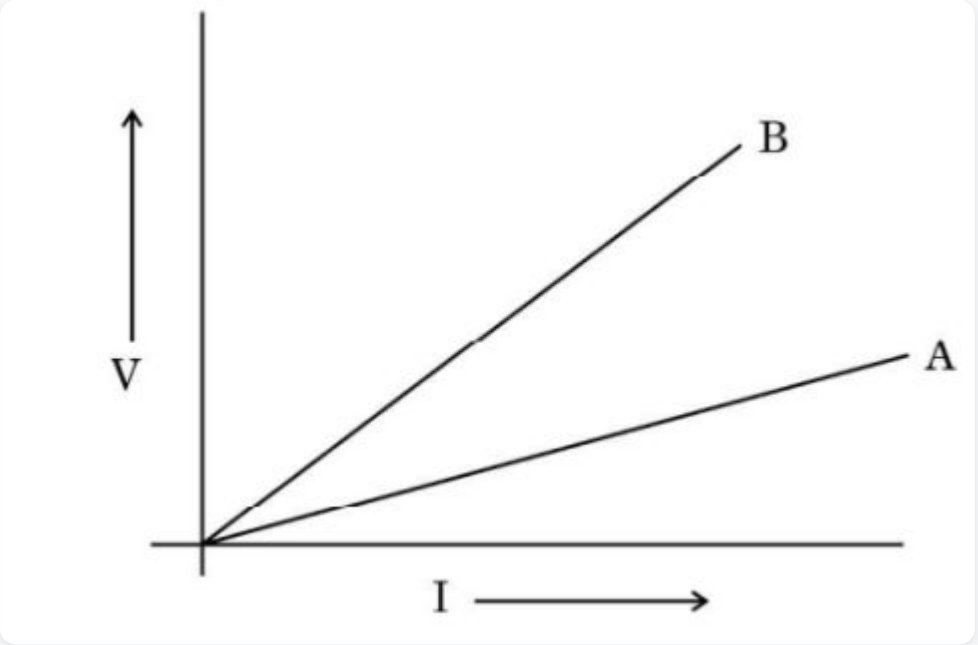
Answer: Scattering of light is the phenomenon where light rays are deflected in different directions when they encounter tiny particles in the air. These particles are smaller than the wavelength of visible light and scatter shorter wavelengths more effectively. The clear sky appears blue because blue light has a shorter wavelength and is scattered more by the air molecules than other colors. This scattered blue light reaches our eyes from all directions, making the sky look blue.

Key Points: Scattering is deflection of light by small particles-Particles in air are smaller than the wavelength of visible light-Shorter wavelengths (blue light) are scattered more than longer wavelengths-Blue light scattering makes the sky appear blue-Scattered light makes the light path visible to eyes

Question 30.

V - I graph for two conducting wires A and B are as shown. If both wires are of the same length and same diameter, which of the two is made of a material of high resistivity? Give reasons to justify your answer.

[2 Marks]



Answer: Answer: Wire B is made of a material of higher resistivity than wire A.
This conclusion is drawn from the V-I graphs where the slope (V/I) represents the resistance of the wire. Since both wires have the same length and diameter, the difference in resistance is due to their material's resistivity. Wire B shows a higher slope on the V-I graph, indicating greater resistance, and therefore higher resistivity.
Hence, wire B has higher resistivity because resistivity is proportional to resistance when length and area are constant.

> **Key Points: Wire B has higher slope on V-I graph - Higher slope means higher resistance - Resistance depends on resistivity when length and diameter are same**

Question 31.

We do not clean ponds or lakes but an aquarium needs to be cleaned regularly. Why ?

[2 Marks]

Answer: Answer: We do not clean ponds or lakes regularly because they are large natural ecosystems with plants and microorganisms that help maintain the balance by breaking down waste naturally. However, an aquarium is a small closed environment where waste from fish and leftover food can accumulate quickly, causing harm to the fish. Therefore, it needs to be cleaned regularly to remove these wastes and maintain healthy water for the fish.

> **Key Points: Natural ponds and lakes are self-sustaining ecosystems - Aquariums are small closed systems needing manual cleaning - Waste buildup harms aquatic life in aquariums**

Section D

Question 32.

Silver chloride kept in a china dish turns grey in sunlight.

(a) Write the colour of silver chloride when it was kept in the china dish.

(b) Name the type of chemical reaction taking place and write the chemical equation for the reaction.

(c) State one use of the reaction. Name one more chemical which can be used for the same purpose.

[3 Marks]

Answer:

(a) Initially, silver chloride is white in colour when kept in the china dish.

(b) The type of chemical reaction taking place is called **photochemical decomposition** or **photolysis**, where silver chloride decomposes on exposure to sunlight. The reaction can be written as:
$2AgCl\ (white) \xrightarrow{sunlight} 2Ag\ (grey) + Cl_2\ (chlorine\ gas)$

(c) One use of this reaction is in photographic processes where silver halides like silver chloride break down upon exposure to light to form the image. Another chemical used for the same purpose is silver bromide (AgBr), which is also light sensitive and used in photographic films.

Key Points: Silver chloride is white initially-Photochemical decomposition occurs upon sunlight exposure-Silver chloride decomposes into silver (grey) and chlorine gas-Reaction equation: $2AgCl \xrightarrow{sunlight} 2Ag + Cl_2$-Use in photography for image formation-Silver bromide is another chemical used for similar photographic purposes

Question 33.

With the help of suitable chemical equations, list the two main differences between roasting and calcination. How is metal reduced from the product obtained after roasting/calcination of the ore ? Write the chemical equation for the reaction involved.

[3 Marks]

Answer:

Roasting and calcination are two important processes used to convert ores into oxides. The two main differences between them are:

- **Roasting** involves heating the ore in the presence of excess oxygen or air. It is used mainly for sulphide ores. For example, when zinc sulphide is roasted, it reacts with oxygen to form zinc

oxide and sulfur dioxide gas:
$2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$

- **Calcination** involves heating the carbonate ores in limited air or absence of oxygen. It is mainly used for carbonate ores. For example, zinc carbonate on calcination decomposes to give zinc oxide and carbon dioxide gas:
  $ZnCO_3 \rightarrow ZnO + CO_2$

After roasting or calcination, the metal oxide produced is reduced to extract the pure metal. Reduction involves removing oxygen from the metal oxide, usually by heating with a reducing agent such as carbon. For example, zinc oxide is reduced by carbon to produce zinc metal and carbon monoxide:

$ZnO + C \rightarrow Zn + CO$

This step is called reduction and it helps to obtain the metal from its oxide.

Key Points: Difference 1: Roasting is done in presence of excess oxygen for sulphide ores; Calcination is heating carbonate ores in limited air.-Difference 2: Roasting converts sulphides to oxides releasing SO2 gas; Calcination decomposes carbonates into oxides releasing CO2.-Reduction of metal oxide after roasting/calcination by heating with carbon to obtain pure metal.-Write chemical equations for roasting, calcination, and reduction reactions.

Question 34.

(i) What is the first step in the breakdown of glucose during aerobic and anaerobic respiration ? Where does it take place ?

(ii) ATP is called the energy currency of the cell. Why ?

(iii) What is meant by residual volume of air in a breathing cycle ?

[3 Marks]

Answer:

(i) The first step in the breakdown of glucose during both aerobic and anaerobic respiration is glycolysis. In this process, one molecule of glucose (a six-carbon molecule) is broken down into two molecules of pyruvate (each containing three carbons). This step takes place in the cytoplasm of the cell. Glycolysis releases a small amount of energy and does not require oxygen.

(ii) ATP, or adenosine triphosphate, is called the energy currency of the cell because it stores and transports chemical energy within cells. When ATP is broken down into ADP (adenosine diphosphate) and a phosphate group, energy is released, which the cell uses to perform various functions such as muscle contraction, nerve impulses, and synthesis of molecules. Thus, ATP acts as a usable form of energy for cellular activities.

(iii) Residual volume of air is the amount of air that remains in the lungs even after the strongest possible exhalation during a breathing cycle. This air cannot be voluntarily expelled from the lungs and helps keep the lungs inflated, allowing continuous gas exchange between breaths.

Key Points: First step glycolysis-breaks glucose into two pyruvate molecules-Occurs in cytoplasm-Glycolysis in both aerobic and anaerobic respiration-ATP stores and provides energy for cellular activities-Called energy currency because it releases usable energy on breakdown-Residual volume is air remaining in lungs after forced exhalation-Helps maintain lung inflation and gas exchange

Question 35.

Write in sequence the steps for experimental verification of the fact that sunlight is essential for photosynthesis .

[3 Marks]

Answer: To experimentally verify that sunlight is essential for photosynthesis, follow these steps: 1. Take two healthy potted green plants of the same species and size. 2. Place one plant in sunlight and the other in a dark room or cover it with a black cloth to block sunlight. 3. After a few days, test the presence of starch in the leaves of both plants using iodine solution. 4. To do this, first boil the leaves in water to kill them, then in alcohol to remove chlorophyll, and finally add iodine solution. 5. If the leaf turns blue-black, it indicates the presence of starch produced by photosynthesis. 6. The plant kept in sunlight will show a blue-black color indicating photosynthesis occurred, while the plant kept in darkness will show no starch. 7. This experiment proves that sunlight is essential for photosynthesis to take place in plants.

Key Points: Use two identical plants-Expose one to sunlight and keep the other in darkness-Test for starch in leaves after some days-Starch presence indicated by blue-black color with iodine-Only the sunlight-exposed plant shows starch-Conclusion: sunlight is essential for photosynthesis

Question 36.

Name the hormone released and the gland which secretes it in human beings during scary situations. How does the body respond to enable it to deal with the situation ?

[3 Marks]

Answer: During scary or stressful situations, the hormone adrenaline is released in human beings. This hormone is secreted by the adrenal glands, which are located above the kidneys. When a person faces fear, the adrenal glands secrete adrenaline into the bloodstream. Adrenaline prepares the body for a 'fight or flight' response. It increases the heart rate and blood flow to muscles, providing more oxygen and energy to the body. It also causes rapid breathing and heightens alertness, enabling a

person to react quickly. The body becomes ready to either fight the danger or run away from it efficiently. These changes help the body to cope with and respond actively to scary situations.

Key Points: Hormone released is adrenaline-Adrenal glands secrete adrenaline-Adrenaline prepares body for fight-or-flight response-Increases heart rate and blood flow-Increases breathing rate and alertness-Provides more energy and oxygen to muscles-Helps body to respond effectively to scary situations

Question 37.

A student has focussed the image of an object of height 3 cm on a white screen using a concave mirror of focal length 12 cm. If the distance of the object from the mirror is 18 cm, find the values of the following :

(i) Distance of the image from the mirror

(ii) Height of the image

[3 Marks]

Answer: Given: Height of object (h) = 3 cm, Focal length (f) = 12 cm, Object distance (u) = -18 cm (since object is in front of the mirror, distance is negative). Using the mirror formula: 1/f = 1/v + 1/u, where v is the image distance. Calculating 1/v = 1/f - 1/u = 1/12 - 1/(-18) = 1/12 + 1/18 = (3 + 2)/36 = 5/36. Therefore, v = 36/5 = 7.2 cm. Image distance is +7.2 cm, meaning image is formed on the same side as the reflected rays (real image). Magnification (m) = -v/u = -7.2 / -18 = 0.4. Height of image (h') = m × h = 0.4 × 3 = 1.2 cm. Hence, the image is real, inverted, and smaller than the object.

Key Points: Use of mirror formula (1/f = 1/v + 1/u)-Calculation of image distance (v)-Calculation of magnification (m) and image height (h')-Identification of image nature (real and inverted)-Understanding the sign conventions for concave mirror

Question 38.

Define power of a lens. The focal length of a lens is 10 cm. Write the nature of the lens and find its power. If an object is placed at a distance of 20 cm from the optical centre of this lens, according to the New Cartesian Sign Convention, what will be the sign of magnification in this case ?

[3 Marks]

Answer: Power of a lens is defined as the ability of the lens to converge or diverge light rays and is given by the formula P = 100/f, where P is the power in diopters (D) and f is the focal length in centimeters. For a lens with focal length of 10 cm, the power will be P = 100/10 = +10 D. Since the focal length is positive, the lens is convex in nature. When an object is placed at 20 cm from the optical centre of this convex lens, and considering the New Cartesian Sign Convention where distances in the direction of incident light are positive, magnification will be negative as the image

formed by a convex lens beyond focal length is real and inverted. Hence, the sign of magnification will be negative.

Key Points: Definition of power of lens-Formula for power P=100/f with focal length in cm-Nature of lens based on focal length (positive for convex)-Calculation of power for 10 cm focal length lens-Power is +10 D for this lens-Magnification sign based on object position and sign convention-Magnification negative for real and inverted images formed by convex lens beyond focal length

Question 39.

Explain the meaning of overloading of an electrical circuit. List two possible causes due to which overloading may occur in household circuits. Write one preventive measure that should be taken to avoid overloading of domestic circuits.

[3 Marks]

Answer:

Overloading of an electrical circuit occurs when more electrical devices are connected to the circuit than it can safely handle, causing excessive current flow. This can damage appliances and wiring, and may even cause fires. Two common causes of overloading in household circuits are (1) connecting too many appliances to a single socket, which draws more current than the socket is designed for, and (2) a sudden increase in supply voltage which causes a higher current flow than normal. To prevent overloading, one should avoid using multiple appliances from the same socket and ensure that wiring and circuit components are properly rated. Installing a fuse or circuit breaker helps protect the circuit by breaking the circuit if the current exceeds safe limits.

Key Points: Meaning of overloading - Excessive current flow beyond circuit capacity - Cause 1: Connecting many appliances to a single socket - Cause 2: Sudden voltage increase - Preventive measure: Use of fuse or circuit breaker and avoid multiple connections to one socket

Question 40.

Explain how some harmful chemicals enter our bodies through the food chain. Why is the concentration of these harmful chemicals found to be maximum in human beings ?

[3 Marks]

Answer: Harmful chemicals, such as pesticides, enter our bodies through the food chain mainly because these chemicals are used in agriculture and get washed into the soil and water bodies. Plants absorb these chemicals from contaminated soil and water. Animals then consume these plants, and the chemicals accumulate in their bodies. As humans consume plants and animals at higher

trophic levels, these chemicals accumulate in our bodies in larger amounts. This process, where the concentration of harmful chemicals increases at each trophic level, is called biological magnification. Since humans are at the top of the food chain, the concentration of these chemicals is maximum in our bodies, leading to potential health risks.

Key Points: Harmful chemicals enter food chain through polluted soil and water- Plants absorb chemicals from soil and water- Animals consume contaminated plants and accumulate chemicals- Humans consume plants and animals, accumulating highest chemical concentration- These chemicals are not degradable and accumulate progressively- This process is called biological magnification- Humans being at top trophic level have maximum concentration of harmful chemicals

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Section E

Question 41.

An acid 'X' and an alcohol 'Y' react with each other in the presence of an acid catalyst to form a sweet smelling substance 'Z'. Identify 'X', 'Y' and 'Z'. Write the chemical equation for the reaction involved and name it. The substance 'Z' on treatment with sodium hydroxide produces back the alcohol 'Y' and sodium ethanoate. Write the chemical equation for the reaction involved and name it, giving justification for the name.

[5 Marks]

Answer: (a) The acid 'X' is Ethanoic acid (CH_3COOH), and the alcohol 'Y' is Ethanol (CH_3CH_2OH). The sweet smelling substance 'Z' formed is Ethyl ethanoate ($CH_3COOCH_2CH_3$), which is an ester.

Reaction: Ethanoic acid reacts with ethanol in presence of acid catalyst (usually concentrated H_2SO_4) to form ethyl ethanoate and water. This reaction is called an esterification reaction.

$CH_3COOH + CH_3CH_2OH$ --H_2SO_4 *(acid catalyst)* --> $CH_3COOCH_2CH_3 + H_2O$

(b) When ester 'Z' (ethyl ethanoate) is treated with sodium hydroxide (NaOH), it produces ethanol and sodium ethanoate. This reaction is called saponification or alkaline hydrolysis.

$CH_3COOCH_2CH_3 + NaOH \rightarrow CH_3COONa + CH_3CH_2OH$

This reaction is called alkaline hydrolysis because the ester is hydrolysed by a base (NaOH) to give an alcohol and a salt of the acid (sodium ethanoate).

Key Points: Acid 'X' is ethanoic acid - Alcohol 'Y' is ethanol - 'Z' is ethyl ethanoate (ester) - Reaction between acid and alcohol with acid catalyst is esterification - Chemical

equation: $CH_3COOH + CH_3CH_2OH \xrightarrow{H_2SO_4} CH_3COOCH_2CH_3 + H_2O$ - Treatment of ester with NaOH gives alcohol and sodium salt of acid - This reaction is called saponification or alkaline hydrolysis - Chemical equation for alkaline hydrolysis: $CH_3COOCH_2CH_3 + NaOH \rightarrow CH_3COONa + CH_3CH_2OH$

Question 42.

(i) Name the simplest saturated hydrocarbon. Draw its electron dot structure. Which type of bonds exist in this compound ?

(ii) Name any two mixtures of the carbon compound used as a fuel in daily life, of which the above mentioned compound is an important component.

(iii) In which homologous series of carbon compounds can this compound be placed ? Write the general formula of the series.

(iv) Which type of flame is produced on burning it ?

[5 Marks]

Answer:

(i) The simplest saturated hydrocarbon is methane. Its molecular formula is CH_4. The electron dot structure of methane shows one carbon atom forming four single covalent bonds with four hydrogen atoms, each sharing one electron with carbon. The bonds present in methane are single covalent bonds.

Electron dot structure of methane (CH_4):

H
|
H - C - H
|
H

Each line indicates a single covalent bond, where electrons are shared.

(ii) Two mixtures of carbon compounds used as fuel in daily life, which contain methane as an important component, are natural gas and LPG (liquefied petroleum gas). Natural gas is widely used for cooking and heating, while LPG is commonly used as cooking gas in households.

(iii) Methane belongs to the homologous series called alkanes. Alkanes are saturated hydrocarbons where carbon atoms are connected by single bonds only. The general formula of alkanes is C_nH_{2n+2}, where 'n' is the number of carbon atoms.

(iv) When methane is burnt in sufficient oxygen, it produces a non-luminous, blue, and hot flame. This clean flame is ideal for cooking and heating because it burns completely producing carbon dioxide and water without soot.

Key Points: Methane as simplest saturated hydrocarbon-Covalent single bonds between C and H-Electron dot structure of methane-Examples: natural gas and LPG containing methane-Methane is an alkane-homologous series general formula CnH2n+2-Type of flame: non-luminous blue flame on complete combustion

Question 43.

(i) List three points of difference between nervous and hormonal mechanisms for control and coordination in animals.

(ii) How are auxins related with the bending of plant shoot towards unidirectional light ? Explain.

[5 Marks]

Answer:

(i) Differences between Nervous and Hormonal Mechanisms for Control and Coordination in Animals:

1. Speed of Response: Nervous mechanisms provide rapid responses that are immediate and short-lived, while hormonal mechanisms produce slower responses that last for a longer duration.

2. Mode of Transmission: Nervous system transmits information through nerve impulses traveling along neurons, whereas hormones are chemical messengers secreted into the bloodstream to reach target organs.

3. Area of Effect: Nervous coordination acts on specific target cells or organs directly connected by nerves, while hormones can affect many different cells and organs throughout the body.

(ii) Role of Auxins in the Bending of Plant Shoot towards Unidirectional Light (Phototropism):

Phototropism is the growth movement of a plant towards light. When light comes from one direction (unidirectional light), auxin, a plant hormone, redistributes itself unevenly within the shoot. Auxin concentration increases on the side of the shoot that is away from the light (the shaded side). This higher concentration of auxin stimulates the cells on the shaded side to elongate more than those on the illuminated side. As a result, the shoot bends towards the light source. This bending allows the plant to maximize light absorption for photosynthesis, which is essential for its growth and survival.

Key Points: Nervous mechanisms: rapid response, nerve impulse transmission, localized effect-Hormonal mechanisms: slower response, chemical transport via blood, widespread effect-Auxin hormone role in phototropism-Uneven auxin distribution with more auxin on shaded side-Auxin causes cell elongation leading to bending towards light

Question 44.

(i) Name the disorder which a person is likely to suffer from due to the following :

(I) Over-secretion of growth hormone

(II) Deficiency of oestrogen in females

(III) Less secretion of thyroxine

Also name the gland that secretes each of the hormones mentioned above.

(ii) How is the timing and amount of hormone released regulated ? Explain with the help of an example.

[5 Marks]

Answer:

(i)
(I) Over-secretion of growth hormone leads to a disorder called gigantism (in children) and acromegaly (in adults). The hormone is secreted by the pituitary gland.
(II) Deficiency of oestrogen in females causes menopause symptoms such as osteoporosis, irregular periods, and other health issues. Oestrogen is secreted by the ovaries.
(III) Less secretion of thyroxine causes hypothyroidism, which results in symptoms like fatigue, weight gain, and slow metabolism. Thyroxine is secreted by the thyroid gland.

(ii)
The timing and amount of hormone released are regulated by feedback mechanisms that maintain body balance. For example, growth hormone secretion is controlled by the hypothalamus-pituitary axis. When growth hormone levels are low, the hypothalamus releases growth hormone releasing factor (GHRF), which stimulates the pituitary gland to secrete growth hormone. When levels are sufficient, the hypothalamus releases somatostatin, which inhibits growth hormone secretion. This feedback mechanism ensures hormone levels stay balanced according to the body's needs.

Key Points: Name disorders: gigantism/acromegaly, menopause symptoms, hypothyroidism-Name glands: pituitary gland, ovaries, thyroid gland-Regulation of hormone secretion through feedback mechanisms-Example of growth hormone regulation by hypothalamus releasing GHRF and somatostatin

Question 45.

(a) An object is placed in front of a convex lens of focal length f. If the distance of the object from the lens is 2f, draw a ray diagram to show the formation of the image. Write the value of magnification in this case.

(b) A student has focussed the image of a candle flame on a white screen using a convex lens. The situation is as given below : Length of the flame = 2 cm Focal length of the lens = 12 cm Distance of the flame from the lens = 16 cm If the flame is perpendicular to the principal axis of the lens, calculate the values of the following :

(i) Distance of the image from the lens

(ii) Length of the image formed

[5 Marks]

Answer: Part (a): When an object is placed at a distance of 2f (twice the focal length) from a convex lens, the image formed is real, inverted, and of the same size as the object. The image is formed on the opposite side of the lens at a distance 2f from the lens.

Ray Diagram Explanation:

- A ray parallel to the principal axis passes through the focal point on the other side.
- A ray passing through the optical center goes straight without deviation.
- A ray passing through the focal point on the object side becomes parallel to the principal axis after refraction.

These rays intersect at the image position at 2f on the other side of the lens, confirming the image location and size. The magnification (m) is given by image distance divided by object distance, which is 2f/2f = 1. Hence, the image size equals the object size.

Part (b): Given: Length of flame = 2 cm, focal length (f) = 12 cm, object distance (u) = 16 cm.

(i) To find the distance of the image (v), we use the lens formula:
1/f = 1/v - 1/u
=> 1/v = 1/f + 1/u = 1/12 + 1/16 = (4/48) + (3/48) = 7/48
=> v = 48/7 ≈ 6.86 cm.
The image is formed at approximately 6.86 cm from the lens on the opposite side.

(ii) Magnification (m) = v/u = 6.86/16 ≈ 0.429
Length of image = magnification × length of object = 0.429 × 2 cm ≈ 0.86 cm.
Therefore, the image formed is smaller than the object and inverted perpendicular to the principal axis.

Key Points: Object placed at 2f forms a real, inverted, and same-size image at 2f on opposite side - Ray diagram involves rays through the optical center, focal point, and parallel to principal axis - Magnification at 2f is 1 - Use lens formula 1/f = 1/v - 1/u to calculate image distance - Magnification is image distance divided by object distance - Length of image is magnification times length of object - For given values, image

distance ≈ 6.86 cm and image length ≈ 0.86 cm - Image characteristics depend on object position relative to focal length