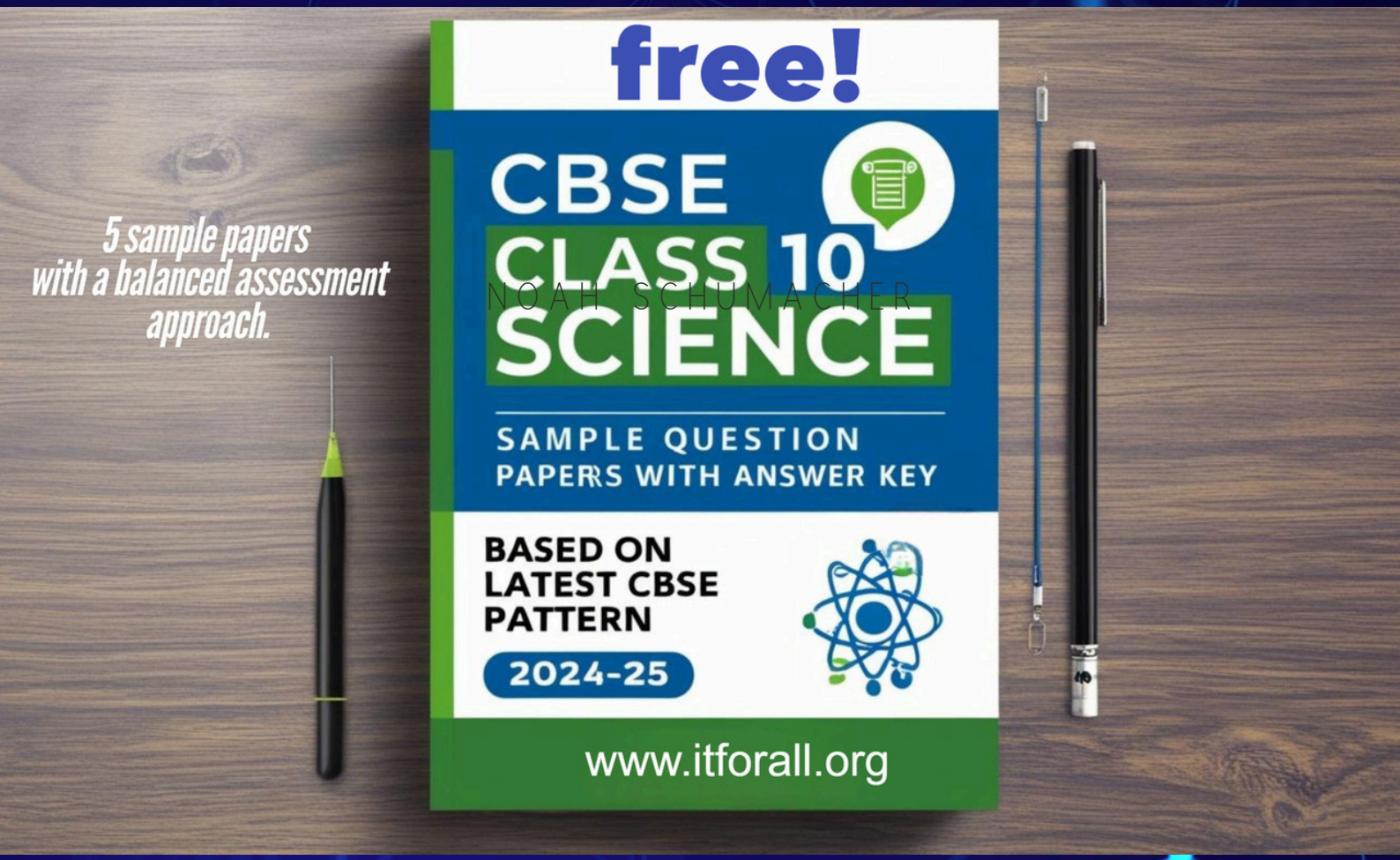
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Warm regards,

Team ITforall.org

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Science Sample Question Paper (2024-25)

Class X (Science 086)

Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

1. All questions are compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

Section-A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. Which of the following is a **strong electrolyte**? A. Dilute acid B. Dilute sugar solution C. Glucose solution D. Ethanol in water
2. What type of reaction is the following: $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$ + heat A. Combination reaction B. Decomposition reaction C. Displacement reaction D. Double displacement reaction
3. The electronic configuration of an element is 2, 8, 7. To which group in the periodic table does this element belong? A. Group 2 B. Group 7 C. Group 15 D. Group 17
4. **Assertion (A):** When dilute sulphuric acid is added to zinc granules, a brisk effervescence is observed. **Reason (R):** Zinc displaces hydrogen from dilute acids.
5. **Assertion (A):** Food chains generally consist of only three or four steps. **Reason (R):** Only 10% of the energy available at each trophic level is passed on to the next trophic level.

Answer questions 6-8 based on the following information:

An element 'X' has an atomic number of 11.

1. What is the valency of 'X'? A. 1 B. 2 C. 3 D. 4
2. To which group in the periodic table does 'X' belong? A. Group 1 B. Group 2 C. Group 13 D. Group 18
3. What type of ion will 'X' form? A. Cation B. Anion C. It will not form an ion D. Cannot be determined
4. Which of the following statements is **incorrect** regarding the process of digestion in humans? A. Salivary amylase breaks down starch into simpler sugars. B. Pepsin digests proteins in the stomach. C. Lipase emulsifies fats in the small intestine. D. Trypsin breaks down proteins in the small intestine.
5. Which of the following correctly describes the function of **nephrons**? A. Exchange of gases B. Filtration of blood C. Production of hormones D. Absorption of nutrients
6. Which of the following is the correct formula for calculating **resistance**? A. R = V/I B. R = I/V C. R = VI D. R = V + I
7. What is the **SI unit of power**? A. Joule B. Watt C. Ampere D. Volt
8. Which of the following describes the process of **binary fission**? A. The parent organism divides into two or more daughter cells. B. The parent organism produces buds that develop into new individuals. C. The parent organism produces spores that germinate into new individuals. D. The parent organism divides into two daughter cells of equal size.
9. Which of the following hormones is responsible for the development of **secondary sexual characteristics in females**? A. Testosterone B. Oestrogen C. Adrenaline D. Insulin
10. **Assertion (A):** Hypermetropia can be corrected using a concave lens. **Reason (R):** A concave lens converges light rays.
11. **Assertion (A):** A magnetic field can be produced by a stationary charge. **Reason (R):** A magnetic field is produced by moving charges.

Section-B

Question No. 17 to 22 are very short answer questions.

1. What is a **balanced chemical equation**? Why is it important to balance chemical equations?

2. Differentiate between **aerobic and anaerobic respiration**.
3. State two **advantages of using a convex mirror as a rear-view mirror in vehicles**.
4. What is **electrolysis**? Give one example of its application.
5. Briefly describe the **process of fertilization in plants**.
6. State the **law of dominance** as proposed by Mendel.

Section-C

Question No. 23 to 29 are short answer questions.

1. Explain the process of **sap ascent in plants**.
2. Describe the **structure of a human heart**.
3. What is a **magnetic field**? How can you determine the direction of a magnetic field around a straight current-carrying conductor?
4. Explain the **causes of ozone depletion**.
5. Differentiate between **sexual and asexual reproduction**.
6. What are **variations**? Explain how variations arise during reproduction.
7. Explain the **process of soap formation** (saponification).

Section-D

Question No. 30 to 32 are long answer questions

1. (A) What are **hydrocarbons**? Classify hydrocarbons based on their saturation and give examples of each. (B) Explain the process of **addition reaction** in unsaturated hydrocarbons with an example.
2. (A) Explain the **process of urine formation** in humans. (B) Describe the role of **ADH** (anti-diuretic hormone) in regulating the water content of urine.
3. (A) Explain **Fleming's Left Hand Rule** for determining the direction of force on a current-carrying conductor in a magnetic field. (B) Describe the **working principle of an electric motor**.

Section – E

Question No. 33 to 35 are case-based/data -based questions.

1. Ethanol (C_2H_5OH) and Ethanoic acid (CH_3COOH) are two important organic compounds. (A) What is the **functional group** present in each of these

compounds? (B) State two **uses of ethanol**. (C) Explain how you would **distinguish between ethanol and ethanoic acid experimentally**.

2. In humans, the sex of the offspring is determined by the sex chromosomes. Females have two X chromosomes (XX) while males have one X and one Y chromosome (XY). (A) Explain the **mechanism of sex determination** in humans. (B) What is the probability of a couple having a male child?
3. A convex lens is an optical device that converges light rays. (A) Define the term **focal length** of a convex lens. (B) State two **applications of a convex lens**. (C) Explain the conditions under which a convex lens can form a **real and inverted image**.

Answer Key

Section-A

1. A
2. C
3. D
4. A (Both A and R are true, and R is the correct explanation of A.)
5. A (Both A and R are true, and R is the correct explanation of A.)
6. A
7. A
8. A
9. C
10. B
11. A
12. B
13. D
14. B
15. D (A is false but R is true.)
16. D (A is false but R is true.)

Section-B

1. A balanced chemical equation is a symbolic representation of a chemical reaction that shows the chemical formulas of the reactants and products of the reaction, with the number of atoms of each element being equal on both sides of the equation. Balancing chemical equations is important because it ensures that the law of conservation of mass is obeyed, which states that matter cannot be created or destroyed in a chemical reaction.
2. **Aerobic respiration** requires oxygen for the breakdown of glucose, producing a large amount of energy (38 ATP). It occurs in the mitochondria of cells. **Anaerobic respiration** occurs in the absence of oxygen, producing much less energy (2 ATP). It occurs in the cytoplasm of cells.
3. Two advantages of using a convex mirror as a rear-view mirror in vehicles are: (i) they provide a wider field of view, allowing the driver to see more of the area behind the vehicle, and (ii) they produce an erect and diminished image, making it easier to judge the distance of vehicles behind.
4. Electrolysis is the process of using an electric current to drive a non-spontaneous chemical reaction. One application is the electroplating of metals, where a thin layer of one metal is deposited onto the surface of another metal.
5. Fertilization in plants is the process of fusion of the male gamete (pollen) with the female gamete (ovule) to form a zygote. Pollen from the anther is transferred to the stigma of a flower, where it germinates and grows a pollen tube that carries the male gamete to the ovule. The fusion of the gametes results in the formation of a zygote, which develops into an embryo within a seed.
6. Mendel's law of dominance states that in a heterozygote, one allele (the dominant allele) will be expressed over the other allele (the recessive allele). The recessive allele will only be expressed if both copies of the gene are recessive.

Section-C

1. Sap ascent in plants is the upward movement of water and minerals from the roots to the leaves. It is driven by a combination of factors: (i) **transpiration pull**, where the loss of water through transpiration from the leaves creates a negative pressure that pulls water upwards, (ii) **cohesion** between water molecules, allowing them to form a continuous column, (iii) **adhesion** of water molecules to the walls of the xylem vessels, and (iv) **root pressure**, which pushes water upwards from the roots.
2. The human heart is a muscular organ located in the chest cavity. It consists of four chambers: two atria (upper chambers) and two ventricles (lower chambers). The right atrium receives deoxygenated blood from the body and pumps it to the right ventricle, which pumps it to the lungs for oxygenation. The left atrium

receives oxygenated blood from the lungs and pumps it to the left ventricle, which pumps it to the rest of the body. The heart is also equipped with valves that prevent the backflow of blood.

3. A magnetic field is a region around a magnet or a moving electric charge where a magnetic force can be detected. To determine the direction of a magnetic field around a straight current-carrying conductor, you can use the **right-hand thumb rule** : point your right thumb in the direction of the current, and the curl of your fingers indicates the direction of the magnetic field lines around the conductor.
4. Ozone depletion is primarily caused by the release of man-made chemicals, such as chlorofluorocarbons (CFCs), halons, and methyl bromide, into the atmosphere. These chemicals break down ozone molecules in the stratosphere, reducing the ozone layer's ability to absorb harmful ultraviolet (UV) radiation from the Sun. Increased UV radiation reaching the Earth's surface can lead to skin cancer, cataracts, and damage to plant and animal life.
5. **Sexual reproduction** involves the fusion of male and female gametes, leading to the formation of offspring that are genetically different from their parents. It promotes genetic diversity and adaptation to changing environments. **Asexual reproduction** involves the production of offspring from a single parent without the involvement of gametes. Offspring are genetically identical to the parent. It is a faster and more efficient mode of reproduction in stable environments.
6. Variations are the differences that exist between individuals of the same species. Variations arise during reproduction due to (i) **genetic recombination** during sexual reproduction, (ii) **mutations**, which are random changes in the DNA sequence, and (iii) **environmental factors** that can influence gene expression.
7. Soap formation, or saponification, is the process of making soap by reacting fats or oils with a strong alkali, such as sodium hydroxide or potassium hydroxide. The reaction breaks down the fat or oil molecules into glycerol and fatty acid salts, which are the main components of soap.

Section-D

1. (A) Hydrocarbons are organic compounds that contain only carbon and hydrogen atoms. They are classified into two main categories based on their saturation: (i) **Saturated hydrocarbons** contain only single bonds between carbon atoms. Examples include alkanes like methane (CH_4), ethane (C_2H_6), and propane (C_3H_8). (ii) **Unsaturated hydrocarbons** contain at least one double or triple bond between carbon atoms. Examples include alkenes like ethene (C_2H_4) and propene (C_3H_6), and alkynes like ethyne (C_2H_2).

2. (B) Addition reactions occur when atoms or groups of atoms are added to the carbon atoms at the double or triple bond in an unsaturated hydrocarbon. For example, the addition of hydrogen to ethene (C2H4) in the presence of a catalyst forms ethane (C2H6).

3. (A) Urine formation in humans occurs in the kidneys through a three-step process: (i) **Filtration:** Blood is filtered in the glomerulus, a network of capillaries in the nephron. Small molecules like water, glucose, amino acids, and urea pass into the Bowman's capsule. (ii) **Reabsorption:** Essential substances like glucose, amino acids, and most of the water are reabsorbed from the filtrate back into the blood. (iii) **Secretion:** Certain substances, such as excess ions and waste products, are actively secreted from the blood into the filtrate. The final product, urine, is collected in the collecting duct and transported to the bladder for excretion.

4. (B) ADH (anti-diuretic hormone) regulates the water content of urine by controlling the permeability of the collecting duct. When ADH levels are high, the collecting duct becomes more permeable to water, allowing more water to be reabsorbed into the blood, resulting in concentrated urine. When ADH levels are low, less water is reabsorbed, resulting in dilute urine.

5. (A) Fleming's Left Hand Rule is used to determine the direction of force on a current-carrying conductor in a magnetic field. To apply the rule, stretch the thumb, forefinger, and middle finger of your left hand mutually perpendicular to each other. If the forefinger points in the direction of the magnetic field and the middle finger points in the direction of the current, then the thumb will point in the direction of the force experienced by the conductor.

6. (B) An electric motor works on the principle that a current-carrying conductor placed in a magnetic field experiences a force. In an electric motor, a coil of wire is placed in a magnetic field. When current flows through the coil, it experiences a force that causes it to rotate. The direction of rotation can be reversed by changing the direction of the current.

Section – E

1. (A) The functional group in ethanol is the hydroxyl group (-OH), and the functional group in ethanoic acid is the carboxyl group (-COOH).

2. (B) Two uses of ethanol are: (i) as a solvent in industries and (ii) as a fuel in some vehicles.

3. (C) Ethanol and ethanoic acid can be distinguished experimentally by reacting them with sodium bicarbonate (NaHCO3). Ethanoic acid reacts with sodium

bicarbonate to produce carbon dioxide gas, which can be observed as effervescence. Ethanol does not react with sodium bicarbonate.

4. (A) The sex of a human offspring is determined by the sex chromosome contributed by the father. Females have two X chromosomes (XX), while males have one X and one Y chromosome (XY). During fertilization, the mother always contributes an X chromosome. If the father contributes an X chromosome, the offspring will be female (XX). If the father contributes a Y chromosome, the offspring will be male (XY).

5. (B) The probability of a couple having a male child is 50% because there is an equal chance of the father contributing an X or a Y chromosome.

6. (A) The focal length of a convex lens is the distance between the optical center of the lens and the point where parallel rays of light converge after passing through the lens.

7. (B) Two applications of a convex lens are: (i) in cameras to focus light onto the film or sensor and (ii) in magnifying glasses to produce enlarged images of objects.

8. (C) A convex lens will form a real and inverted image when the object is placed beyond the focal point of the lens. The size of the image will depend on the distance of the object from the lens. If the object is placed at twice the focal length, the image will be the same size as the object. If the object is placed farther away, the image will be smaller than the object. If the object is placed closer to the lens, the image will be larger than the object.

This sample question paper is based on the provided. The actual question paper may vary in content and difficulty level. Please refer to the prescribed textbooks and syllabus for a comprehensive understanding of the course.

Science Sample Question Paper (2024-25)

Class X (Science 086)

Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

1. **All questions are compulsory.** However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. **Section A** would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. **Section B** would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. **Section C** would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. **Section D** would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. **Section E** would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1, 2, and 3 marks.

Section-A

Questions 1 to 16 are multiple-choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. Which among the following is considered the strongest electrolyte?

- A. Dilute acid
- B. Dilute sugar solution
- C. Glucose solution
- D. Ethanol in water

1. An aqueous solution 'A' turns phenolphthalein solution pink. On adding an aqueous solution 'B' to 'A', the pink colour disappears. Which of the following statements is true for solutions 'A' and 'B'?

- A. A is strongly basic, and B is a weak base.
- B. A is strongly acidic, and B is a weak acid.

- C. A has a pH greater than 7, and B has a pH less than 7.
- D. A has a pH less than 7, and B has a pH greater than 7.

1. When 50g of lead powder is added to 300 ml of blue copper sulphate solution, after a few hours, the solution becomes colourless. This is an example of:

- A. Combination reaction
- B. Decomposition reaction
- C. Displacement reaction
- D. Double displacement reaction

1. Identify the incorrect statement: “The energy available to the producers is maximum” because:

- A. It is the first trophic level which absorbs 1% of light energy directly from the source.
- B. It utilises most of the chemical energy for its respiration, growth, reproduction, movement etc.
- C. It utilises 10% of light energy and transfers the rest to the next trophic level.
- D. It transfers only 10% of light energy to the next trophic level.

1. Which of the following is *not* a role of decomposers in the ecosystem?

- A. Natural replenishment of soil.
- B. Enrichment of oxygen in the atmosphere.
- C. Waste decomposition.
- D. Break-down of dead remains.

Questions 6 to 10 are multiple-choice questions based on the following text.

A student is performing an experiment to study the properties of different types of solutions. She prepares a sugar solution, a salt solution, and a milk solution. She then shines a beam of light through each solution and observes the results.

1. Which of the following solutions is a true solution?

- A. Sugar solution
- B. Salt solution
- C. Milk solution
- D. Both A and B

1. What happens when a beam of light is passed through a true solution?

- A. The path of light becomes visible.
- B. The path of light does not become visible.
- C. The solution scatters light.
- D. The solution appears cloudy.

1. Which of the following solutions is a colloid?

- A. Sugar solution
- B. Salt solution
- C. Milk solution
- D. None of the above

1. What property of colloids causes the light beam to be visible when passed through them?

- A. Absorption of light
- B. Reflection of light
- C. Scattering of light
- D. Refraction of light

1. Based on her observations, the student concludes that true solutions are [blank] and colloids are [blank]. Choose the correct pair of words to complete the sentence.

- A. homogeneous, heterogeneous
- B. heterogeneous, homogeneous
- C. transparent, opaque
- D. opaque, transparent

Question No. 11 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, and R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true

1. Assertion (A): If lions are removed from a food chain, it will not affect the food chain; however, if plants are removed from a food chain, it will disturb the ecosystem. Reason (R): Plants are producers who can make food using sunlight, while lions are consumers.
2. Assertion (A): Ethanol and ethanoic acid can be differentiated on the basis of their reaction with sodium bicarbonate. [6, 7] Reason (R): Ethanoic acid reacts with sodium bicarbonate to evolve carbon dioxide gas, while ethanol does not.
3. Assertion (A): When dilute hydrochloric acid is added to a reactive metal, hydrogen gas is produced. [8] Reason (R): Acids react with metals to form salt and water.
4. Assertion (A): The image formed by a concave lens is always virtual and erect. [9] Reason (R): A concave lens diverges the light rays passing through it.
5. Assertion (A): In domestic electric circuits, different appliances are connected in parallel. [10] Reason (R): Connecting appliances in parallel ensures that each appliance gets the same voltage.
6. Assertion (A): The sex of a child is determined by the type of chromosome inherited from the father. [11] Reason (R): The father can contribute either an X or a Y chromosome, while the mother only contributes an X chromosome.

Section-B

Question No. 17 to 22 are very short answer questions.

1. Differentiate between alveoli and nephron based on their function. [12]
2. State the relationship between the resistance R of a wire to its length *l* and cross-sectional area A. Use the mathematical symbols to arrive at the final formula. [13]
3. A student is given 2 fuse wires, A and B, with current ratings of 2A and 5A, respectively. Justify with reason which of the two she would use with a 1000W, 220V room heater. [14]
4. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed. [15]
5. What is the fundamental difference between hypermetropia and myopia in terms of the optical experience of a person? [16]
6. List two methods of producing magnetic fields. [17]

Section-C

Question No. 23 to 29 are short answer questions.

1. Explain the role of salivary amylase and pepsin in the process of digestion of food in humans. [12]
2. A student performs an experiment to study the reaction between baking soda and vinegar.

- a) What type of reaction is this? Write the balanced chemical equation for this reaction. [12, 18]
- b) What is observed when the gas produced is passed through lime water? Write the balanced chemical equation for this observation. [19]

1. Comment on the following statements: [20]

- a) Bee sting is treated with baking soda paste whereas wasp sting is treated with dilute vinegar.
- b) Farmers treat soil with quicklime when tilling.

1. Water is used by the leaves of plants for photosynthesis but rather than watering the leaves, we water the plant through the soil. How does this water reach the leaves of the plant? [21]
2. What is the difference between displacement and double displacement reactions? Write equations for these reactions. [22]
3. A ray of light is incident on a rectangular glass slab.

- a) Draw a labelled diagram showing the path of the ray of light through the glass slab.
- b) What is the relationship between the angle of incidence and the angle of emergence in this case? [23]

1. State the rule to determine the direction of the force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it. [24]

Section-D

Question No. 30 to 32 are long answer questions.

1. Justify the following statements with valid reasoning: [25]

- a) Substitution reactions occur in saturated hydrocarbons.
- b) A mixture of ethyne and air is not used for welding.

1. Explain the process of the cleansing action of soap. [26]
2. Explain sexual reproduction in plants. [27]

Section-E

Question No. 33 to 35 are case-based/data -based questions.

1. A student is studying the reaction between iron nails and copper sulphate solution. She takes two iron nails and cleans them with sandpaper. She then places one nail in a test tube containing copper sulphate solution and the other nail in a test tube containing distilled water. After some time, she observes that the nail placed in copper sulphate solution has turned reddish-brown, while the nail placed in distilled water remains unchanged. [28-30]

- a) Why did the iron nail turn reddish-brown in copper sulphate solution? Write the balanced chemical equation for the reaction.
- b) What type of reaction is this?
- c) Why was the iron nail cleaned with sandpaper before placing it in the copper sulphate solution?

1. A student is studying the different types of plant movements. She observes that the shoots of a plant bend towards light, the roots of a plant grow downwards, and the leaves of a Mimosa plant fold when touched. [7, 31]

- a) What are these three types of plant movements called?
- b) Explain the cause of each type of movement.

1. A student is performing an experiment to study the magnetic field around a current-carrying conductor. He takes a long straight wire and connects it to a battery through a switch. He then places a magnetic compass near the wire. When he closes the switch, he observes that the compass needle deflects. [32]

- a) What causes the deflection of the compass needle?
- b) State the rule that can be used to determine the direction of the magnetic field around a straight current-carrying conductor.
- c) What will happen to the deflection of the compass needle if the direction of current in the wire is reversed?

Answer Key

Section A

1. A
2. C
3. C

4. C
5. B
6. D
7. B
8. C
9. C
10. A
11. A
12. A
13. C
14. A
15. A
16. A

Section B

1. Alveoli are involved in the exchange of gases (oxygen and carbon dioxide) between the lungs and the blood, while nephrons are involved in filtering waste products from the blood and forming urine.
2. The resistance R of a wire is directly proportional to its length (l) and inversely proportional to its cross-sectional area (A). Mathematically, this can be expressed as $R = \rho l/A$, where ρ is the resistivity of the material of the wire.
3. The student should use the 5A fuse wire. The current drawn by the heater can be calculated using the formula P = VI, where P is the power, V is the voltage, and I is the current. In this case, I = P/V = 1000W/220V = 4.54A. Since the current drawn by the heater is greater than the current rating of the 2A fuse wire, it will blow. Therefore, the 5A fuse wire should be used.
4. The element 'X' is copper (Cu). The black coloured compound formed is copper oxide (CuO).
5. In hypermetropia, the person has difficulty seeing nearby objects clearly, while in myopia, the person has difficulty seeing distant objects clearly.
6. Two methods of producing magnetic fields are:

- Passing an electric current through a conductor

- Using permanent magnets.

Section C

1. Salivary amylase, present in saliva, breaks down starch into simpler sugars. Pepsin, an enzyme present in gastric juice, breaks down proteins into smaller peptides.

- a) The reaction between baking soda (sodium bicarbonate) and vinegar (acetic acid) is a neutralization reaction. The balanced chemical equation is: $NaHCO_3$ (s) + CH_3COOH (aq) → CH_3COONa (aq) + H_2O (l) + CO_2 (g).
- b) When carbon dioxide gas is passed through lime water (calcium hydroxide solution), it turns milky due to the formation of calcium carbonate. The balanced chemical equation is: $Ca(OH)_2$ (aq) + CO_2 (g) → $CaCO_3$ (s) + H_2O (l).
- a) Bee stings are acidic in nature, so applying a basic baking soda paste neutralizes the acid and provides relief. Wasp stings are alkaline, so applying dilute vinegar, which is acidic, helps neutralize the sting.
- b) Soil can become acidic due to various factors. Farmers treat soil with quicklime (calcium oxide), which is basic, to neutralize the acidity and improve soil quality.

1. Water absorbed by the roots is transported upwards through the xylem vessels in the stem to the leaves. This process is driven by transpiration, which creates a pull on the water column in the xylem.
2. In a displacement reaction, a more reactive element displaces a less reactive element from its compound. For example: Zn (s) + $CuSO_4$ (aq) → $ZnSO_4$ (aq) + Cu (s). In a double displacement reaction, ions are exchanged between two compounds. For example: $BaCl_2$ (aq) + Na_2SO_4 (aq) → $BaSO_4$ (s) + 2NaCl (aq).

- a) (Refer to Figure 9.6 in source "jesc109.pdf")
- b) The angle of incidence is equal to the angle of emergence.

1. Fleming's left-hand rule: Stretch the thumb, forefinger, and middle finger of your left hand such that they are mutually perpendicular. If the forefinger points in the direction of the magnetic field and the middle finger in the direction of the current, then the thumb will point in the direction of the force on the conductor.

Section D

- a) Substitution reactions occur in saturated hydrocarbons because they have only single bonds between carbon atoms, making them less reactive. Therefore, they undergo substitution reactions where one or more hydrogen atoms are replaced by other atoms or groups.

- b) Ethyne is an unsaturated hydrocarbon, and it requires a pure oxygen supply for complete combustion to produce a high-temperature flame needed for welding. Air contains nitrogen, which does not support combustion, and it would lower the flame temperature, making it unsuitable for welding.

1. The cleansing action of soap is based on the structure of soap molecules. They have a hydrophilic (water-loving) head and a hydrophobic (water-repelling) tail. When soap is added to water, the hydrophobic tails attach to the dirt particles, while the hydrophilic heads remain in the water. This forms micelles, tiny clusters of soap molecules surrounding the dirt particles. The micelles then get washed away with water, removing the dirt.
2. Sexual reproduction in plants involves the fusion of male and female gametes, resulting in the formation of a zygote. The male gametes are produced in the anther of the flower, while the female gametes are produced in the ovary. Pollination is the transfer of pollen grains from the anther to the stigma of the same or another flower. After pollination, the male gamete fuses with the female gamete in a process called fertilization, which occurs inside the ovary. The fertilized egg develops into a zygote, which then develops into an embryo. The ovary develops into the fruit, which contains the seeds.

Section-E

- a) The iron nail turned reddish-brown because iron is more reactive than copper and displaces copper from copper sulphate solution, forming iron sulphate and depositing copper on the nail. The balanced chemical equation is: Fe (s) + $CuSO_4$ (aq) → $FeSO_4$ (aq) + Cu (s).
- b) This is a displacement reaction.
- c) The iron nail was cleaned with sandpaper to remove any rust or impurities that could have interfered with the reaction.
- a) The three types of plant movements are:
- Phototropism (bending of shoots towards light)
- Geotropism (growth of roots downwards)
- Thigmotropism (folding of Mimosa leaves when touched).
- b) Phototropism is caused by the hormone auxin, which accumulates on the shaded side of the shoot, promoting cell elongation and bending towards the light source. Geotropism is caused by the hormone auxin, which accumulates on the lower side of the root, inhibiting cell elongation and causing downward growth. Thigmotropism is a rapid response to touch, caused by changes in water pressure within specific cells, leading to leaf folding.

- a) The deflection of the compass needle is caused by the magnetic field produced around the current-carrying wire.
- b) The right-hand thumb rule: Imagine gripping the wire with your right hand, with your thumb pointing in the direction of the current. Then, the direction in which your fingers curl around the wire indicates the direction of the magnetic field.
- c) If the direction of current in the wire is reversed, the direction of the magnetic field will also reverse, and the compass needle will deflect in the opposite direction.

This sample question paper is based on the provided syllabus. The actual question paper may vary in content and difficulty level. Please refer to the prescribed textbooks and syllabus for a comprehensive understanding of the course.

SCIENCE SAMPLE QUESTION PAPER (2024-25)

CLASS X

(Science 086)

Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

1. All questions are compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. **Section A** would have **16 simple/complex MCQs** and **04 Assertion-Reasoning type questions carrying 1 mark each**.
3. **Section B** would have **6 Short Answer (SA) type questions carrying 02 marks each.**
4. **Section C** would have **7 Short Answer (SA) type questions carrying 03 marks each.**
5. **Section D** would have **3 Long Answer (LA) type questions carrying 05 marks each.**
6. **Section E** would have **3 source-based/case-based/passage-based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.**

Section-A

Question 1 to 16 are multiple-choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. Which of the following is an example of a chemical change?

- (a) Sublimation of camphor
- (b) Dissolving sugar in water
- (c) Formation of slaked lime from quicklime
- (d) Melting of wax

1. Which of the following is a displacement reaction?

- (a) $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2 (aq) + Heat$
- (b) $NaOH(aq) + Zn(s) \rightarrow Na_2ZnO_2 (s) + H_2 (g)$
- (c) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

- (d) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

1. Which of the following statements is **incorrect** about the reaction represented by the equation below?

2. $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

- (a) Zinc is oxidised.
- (b) Copper ion is reduced.
- (c) This is a double displacement reaction.
- (d) Copper is displaced by zinc.

1. A student adds a few drops of universal indicator to a solution and observes that it turns violet. What is the approximate pH of the solution?

- (a) 2
- (b) 5
- (c) 7
- (d) 10

1. Which of the following is **not** a property of an acid?

- (a) Turns blue litmus red
- (b) Tastes sour
- (c) Conducts electricity in an aqueous solution
- (d) Has a pH greater than 7

1. Which of the following is the correct arrangement of metals in the decreasing order of their reactivity?

- (a) Copper > Zinc > Iron > Magnesium
- (b) Magnesium > Zinc > Iron > Copper
- (c) Iron > Magnesium > Copper > Zinc
- (d) Zinc > Iron > Copper > Magnesium

1. Which of the following is a property of ionic compounds?

- (a) Low melting point
- (b) Conduct electricity in solid state
- (c) Exist as liquids at room temperature

- (d) Conduct electricity in a molten state

1. Which of the following is the general formula for alkynes?

- (a) CnH2n+2
- (b) CnH2n
- (c) CnH2n-2
- (d) CnHn

1. Which of the following functional groups is present in ketones?

- (a) -OH
- (b) -CHO
- (c) -COOH
- (d) -CO-

1. Which of the following is an example of an ester?

- (a) CH3COOH
- (b) CH3OH
- (c) CH3COOC2H5
- (d) C2H5CHO

1. The process of breakdown of food in the cell with the release of energy is called:

- (a) Digestion
- (b) Nutrition
- (c) Respiration
- (d) Excretion

1. Which of the following blood vessels carries deoxygenated blood from the heart to the lungs?

- (a) Aorta
- (b) Pulmonary artery
- (c) Pulmonary vein
- (d) Vena cava

1. The hormone responsible for the development of secondary sexual characteristics in females is:

- (a) Oestrogen
- (b) Testosterone
- (c) Insulin
- (d) Growth hormone

1. The mode of reproduction in which the offspring is genetically identical to the parent is

- (a) Sexual reproduction
- (b) Asexual reproduction
- (c) Both (a) and (b)
- (d) None of the above

1. The transfer of pollen grains from the anther of a flower to the stigma of the same flower is called:

- (a) Self-pollination
- (b) Cross-pollination
- (c) Fertilisation
- (d) None of the above

1. The genetic makeup of an organism is called:

- (a) Phenotype
- (b) Genotype
- (c) Allele
- (d) Trait

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

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

B. Both A and R are true, and R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

1. **Assertion (A):** When dilute hydrochloric acid is added to zinc granules, a colourless and odourless gas is evolved.

Reason (R): The gas evolved is hydrogen, which is colourless and odourless.

1. **Assertion (A):** Sodium is a very reactive metal.

Reason (R): Sodium reacts vigorously with water to form sodium hydroxide and hydrogen gas. [20] 1

1. **Assertion (A):** Respiration is an exothermic reaction.

Reason (R): Energy is released during the process of respiration.

1. **Assertion (A):** A concave lens always forms a virtual and erect image.

Reason (R): The rays of light diverge after passing through a concave lens.

Section-B

Question No. 21 to 26 are very short answer questions.

1. Balance the following chemical equations:

(a) Fe + H₂O → Fe₃O₄ + H₂

(b) MnO₂ + HCl → MnCl₂ + H₂O + Cl₂

2

1. Give two examples each of:

(a) Metals that are good conductors of electricity

(b) Non-metals that are brittle

2

1. Differentiate between homologous and analogous organs.
2. Draw a ray diagram to show the formation of an image by a convex lens when the object is placed at 2F1.
3. A wire of resistance 10 Ω is connected to a battery of 6 V. Calculate the current flowing through the wire.
4. (a) What is the function of a fuse in an electric circuit?

(b) What material is usually used for making fuse wires?

2

Section-C

Question No. 27 to 33 are short answer questions.

1. (a) What is meant by the term 'rancidity'?

(b) Suggest two methods to prevent rancidity.

1. A student dips a blue litmus paper in a solution. The litmus paper turns red.

(a) What type of solution is it?

(b) What would be the effect of this solution on phenolphthalein?

(c) Give an example of such a solution.

3

1. Explain the following terms:

(a) Minerals

(b) Ores

(c) Gangue

3

1. Draw a labelled diagram of the human respiratory system. [14] 3
2. State the functions of the following in the human digestive system: [29]

(a) Salivary amylase

(b) Pepsin

(c) Pancreatic lipase

3

1. (a) What is meant by 'dispersion of light'?

(b) Draw a labelled diagram to show the dispersion of white light by a glass prism.

3

1. Explain the underlying principle and working of an electric generator.

Section-D

Question No. 34 to 36 are long answer questions.

1. (a) Define the following terms:
2. (i) Neutralisation reaction (ii) pH scale

(b) Write a balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

(c) What is the pH of a solution obtained by dissolving 1 gram of sodium hydroxide in 100 ml of water?

5

1. (a) Describe the process of nutrition in *Amoeba* with the help of a diagram.

(b) Explain the process of transportation of water and minerals in plants.

5

1. (a) State Ohm's law.

(b) Derive an expression for the equivalent resistance of three resistors connected in parallel.

(c) Three resistors of 10 Ω, 15 Ω and 5 Ω are connected in parallel. Calculate their equivalent resistance.

5

Section – E

Question No. 37 to 39 are case-based/data-based questions.

1. Read the following passage and answer the questions that follow:

Metals are electropositive elements that lose electrons and form positive ions. The reactivity of metals depends on their tendency to lose electrons. The more readily a metal loses electrons, the more reactive it is. The reactivity series of metals arranges metals in the decreasing order of their reactivity.

(a) Name two metals that are more reactive than zinc.

1

(b) Name two metals that are less reactive than zinc.

1

(c) Why are metals like potassium and sodium stored under kerosene?

2

1. A student performs an experiment to study the process of photosynthesis. She takes two potted plants and keeps them in the dark for three days. Then, she covers one of the plants with a bell jar and places a burning candle under it. She places both the plants in sunlight.

(a) What is the purpose of keeping the plants in the dark for three days?

1

(b) Why is a burning candle placed under the bell jar?

1

(c) What will happen to the plant that is covered with the bell jar? Explain your answer.

2

1. The following diagram shows a ray of light incident on a concave mirror:

main2.jpg (600×310)

(a) Identify the points F and C in the diagram.

1

(b) Draw the path of the reflected ray.

1

(c) State two characteristics of the image formed. \

2

Answer Key:

1. (c)
2. (c)
3. (c)
4. (d)
5. (d)
6. (b)
7. (d)
8. (c)
9. (d)
10. (c)
11. (c)
12. (b)
13. (a)
14. (b)
15. (a)
16. (b)
17. (a)
18. (a)
19. (a)
20. (a)
21. (a) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
22. (b) $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
23. (a) Copper, Aluminium

(b) Sulphur, Carbon

1. **Homologous organs:** Organs with the same basic structure but different functions. They suggest a common ancestry. Example: the forelimbs of humans, bats, and whales.

Analogous organs: Organs with different basic structures but similar functions. They suggest convergent evolution. Example: the wings of birds and bats. 24. [Image of a ray diagram showing the formation of an image by a convex lens when the object is placed at 2F1. The image should be real, inverted and of the same size as the object.] 25. I = V/R = 6V/10Ω = **0.6 A** [25] 26. (a) A fuse is a safety device that protects electrical circuits from overload or short circuits. It melts and breaks the circuit when the current exceeds a safe limit.

(b) Fuse wires are typically made of materials with a **low melting point, such as alloys of tin and lead**. 27. (a) **Rancidity** is the spoilage of food containing fats and oils, characterized by an unpleasant taste and odour. It is caused by the oxidation of fats and oils in the presence of air, light, or moisture.

(b) **Methods to prevent rancidity:**

- Store food in airtight containers.
- Refrigerate food.
- Add antioxidants.
- Package food in nitrogen gas. [Outside sources]

1. (a) The solution is **acidic**. (b) The solution would turn **colourless** in the presence of phenolphthalein.

(c) An example of such a solution is **hydrochloric acid (HCl)**. 29. (a) **Minerals** are naturally occurring substances with a definite chemical composition and crystal structure.

(b) **Ores** are minerals from which metals can be extracted economically.

(c) **Gangue** is the unwanted impurities present in an ore. 30. [Image of a labelled diagram of the human respiratory system. The diagram should include labels for the following parts: nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, alveoli, diaphragm.] 31. (a) **Salivary amylase** initiates the digestion of carbohydrates in the mouth by breaking down starch into maltose.

(b) **Pepsin** is an enzyme that digests proteins in the stomach into smaller peptides.

(c) **Pancreatic lipase** breaks down fats into fatty acids and glycerol in the small intestine. \

1. (a) **Dispersion of light** is the phenomenon of splitting white light into its constituent colours when it passes through a prism.

(b) [Image of a labelled diagram showing the dispersion of white light by a glass prism. The diagram should include labels for: white light, prism, spectrum, colours (violet, indigo, blue, green, yellow, orange, red).] 33. **Principle of an electric generator:** Electric generators work on the principle of electromagnetic induction, which states that when a conductor is moved in a magnetic field, an electromotive force (EMF) is induced across the conductor.

Working: An electric generator consists of a rotating coil of wire placed in a magnetic field. As the coil rotates, the magnetic flux linked with the coil changes, inducing an EMF. This EMF drives a current through an external circuit 34. (a) (i) **Neutralisation reaction:** A reaction in which an acid reacts with a base to form salt and water.

(ii) **pH scale:** A scale that measures the acidity or basicity of a solution. It ranges from 0 to 14, with 7 being neutral, values less than 7 being acidic and values greater than 7 being basic. (b) NaOH + HCl → NaCl + H2O

(c) 1 gram of sodium hydroxide in 100 ml of water gives a concentration of 0.25 M. **pH = -log\[H+]= -log(0.25) = 0.6.** \

1. (a) **Nutrition in *Amoeba*:**

- *Amoeba* engulfs food particles by extending its pseudopodia.
- The food is enclosed in a food vacuole.
- Digestive enzymes are secreted into the food vacuole, breaking down the food into simpler substances.
- The digested food is absorbed into the cytoplasm.
- The undigested food is expelled out.

[Image of a labelled diagram showing the process of nutrition in *Amoeba*.]

(b) **Transportation of water and minerals in plants:**

- Water and minerals are absorbed by the roots from the soil.
- The xylem vessels transport water and minerals upwards from the roots to the leaves.
- The transpiration pull, created by the loss of water from the leaves, helps in the upward movement of water.

1. (a) **Ohm's law:** The current flowing through a conductor is directly proportional to the potential difference across its ends, provided the temperature and other physical conditions remain constant.

(b) **Derivation of equivalent resistance for resistors in parallel:**

[Derivation of the expression for the equivalent resistance (1/Rp = 1/R1 + 1/R2 + 1/R3) of three resistors connected in parallel.]

(c) 1/Rp = 1/R1 + 1/R2 + 1/R3 = 1/10 + 1/15 + 1/5 = 11/30

Therefore, Rp = **30/11 Ω** or **2.73 Ω**. 37. (a) Potassium, Sodium

(b) Copper, Silver \

(c) Potassium and sodium are highly reactive metals that react vigorously with air and water. Therefore, they are stored under kerosene to prevent contact with air and moisture. \

1. (a) Keeping the plants in the dark for three days ensures that any starch present in the leaves is used up.

(b) The burning candle placed under the bell jar consumes oxygen and releases carbon dioxide. \

(c) The plant covered with the bell jar will not be able to perform photosynthesis as it lacks carbon dioxide. As a result, it will not produce starch. The plant kept in the open will be able to perform photosynthesis as it has access to carbon dioxide and sunlight. \[36]

1. (a) F: Principal Focus, C: Centre of curvature

(b) [Image of a concave mirror with a ray of light incident on it parallel to the principal axis. The reflected ray should pass through the principal focus.]

(c) Real, inverted \

Please note that this sample paper is based on NCERT syllabus. Other question papers may include questions from other parts of the syllabus. You may need to refer to outside sources to answer some of the questions.

Science Sample Question Paper (2024-25)

Class X (Science 086)

Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

- All questions are compulsory. However, an internal choice of approximately 33% would be provided.
- Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
- Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
- Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
- Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
- Section E would have 3 source-based/case-based/passage-based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

Section-A

Question 1 to 16 are multiple-choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. **Identify the type of reaction:** A + B → AB
    - A. Combination reaction
    - B. Decomposition reaction
    - C. Displacement reaction
    - D. Double displacement reaction
2. **Which among the following is considered the strongest electrolyte?**
    - A. Dilute acid
    - B. Dilute sugar solution
    - C. Glucose solution
    - D. Ethanol in water

3. **An aqueous solution ‘A’ turns the phenolphthalein solution pink. On addition of an aqueous solution ‘B’ to ‘A’, the pink colour disappears. Which of the following statements is true for solutions ‘A’ and ‘B’?**
    - A. A is strongly basic, and B is a weak base.
    - B. A is strongly acidic, and B is a weak acid.
    - C. A has a pH greater than 7, and B has a pH less than 7.
    - D. A has a pH less than 7, and B has a pH greater than 7.
4. **The electronic configuration of an element is 2, 8, 2. What is the valency of this element?**
    - A. 1
    - B. 2
    - C. 6
    - D. 8
5. **Which of the following is NOT a role of decomposers in the ecosystem?**
    - A. Natural replenishment of soil.
    - B. Enrichment of oxygen in the atmosphere.
    - C. Waste decomposition.
    - D. Break-down of dead remains.
6. **When ethanoic acid reacts with sodium carbonate, which gas is evolved?**
    - A. Hydrogen
    - B. Oxygen
    - C. Carbon dioxide
    - D. Nitrogen
7. **Which of the following is a characteristic of ionic compounds?**
    - A. They have low melting points.
    - B. They are generally soluble in organic solvents.
    - C. They conduct electricity in the solid state.
    - D. They conduct electricity when dissolved in water.
8. **What is the function of nephrons in the human body?**

- A. Gas exchange
- B. Digestion
- C. Excretion
- D. Reproduction

9. **Which plant hormone is responsible for the ripening of fruits?**
   - A. Auxin
   - B. Gibberellin
   - C. Cytokinin
   - D. Ethylene
10. **What is the function of the ciliary muscles in the human eye?**
   - A. Control the amount of light entering the eye.
   - B. Change the shape of the eye lens.
   - C. Focus light on the retina.
   - D. Transmit nerve impulses to the brain.
11. **Which of the following is the correct expression for calculating electric power?**
   - A. P = I/V
   - B. P = V/I
   - C. P = VI
   - D. P = I2R
12. **What is the SI unit of resistance?**
   - A. Ampere
   - B. Volt
   - C. Ohm
   - D. Watt
13. **What happens to the resistance of a conductor when its temperature increases?**
   - A. Increases
   - B. Decreases

- C. Remains the same
- D. Becomes zero

14. **Which rule is used to determine the direction of the force experienced by a current-carrying conductor in a magnetic field?**
    - A. Right-hand thumb rule
    - B. Fleming's left-hand rule
    - C. Fleming's right-hand rule
    - D. Ohm's law
15. **In a domestic electric circuit, appliances are connected in which configuration?**
    - A. Series
    - B. Parallel
    - C. A combination of series and parallel
    - D. None of the above
16. **Which of the following is NOT a consequence of ozone layer depletion?**
    - A. Increased incidence of skin cancer
    - B. Damage to plants
    - C. Global warming
    - D. Acid rain

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, and R is not the correct explanation of A.
- C. A is true but R is false.
- D. A is false but R is true.

17. **Assertion (A):** When a metal reacts with an acid, hydrogen gas is evolved. **Reason (R):** Acids contain hydrogen ions (H+) which are replaced by the metal ions.
18. **Assertion (A):** The sex of a child is determined by the mother. **Reason (R):** Females have two X chromosomes.

19. **Assertion (A):** A convex lens always forms a real image. **Reason (R):** A convex lens converges light rays.
20. **Assertion (A):** A current-carrying conductor experiences a force when placed in a magnetic field. **Reason (R):** A magnetic field exerts a force on moving charges.

Section-B

Question No. 21 to 26 are very short answer questions.

21. Differentiate between an ore and a mineral.
22. Why is it important to clean magnesium ribbon before burning in air?
23. What is the role of saliva in the digestion of food?
24. What is the difference between the movement of leaves in a sensitive plant and the movement in our legs?
25. Define electric potential difference. What is its SI unit?
26. Why is it important to connect electrical appliances in parallel in a domestic circuit?

Section-C

Question No. 27 to 33 are short answer questions.

27. Explain the process of saponification with a chemical equation.
28. What are the different methods of contraception?
29. Why is DNA copying important in reproduction?
30. Explain the phenomenon of dispersion of light.
31. What is the difference between a real image and a virtual image?
32. State Ohm's law. Explain how it can be verified experimentally.
33. Explain the working of an electric motor.

Section-D

Question No. 34 to 36 are long answer questions.

34. Explain the process of digestion of food in humans.
35. Explain Mendel's laws of inheritance with suitable examples.
36. Explain the construction and working of an electric generator.

Section – E

Question No. 37 to 39 are case-based/data-based questions.

Certainly, here is the fine-tuned version of the question paper and answer key, formatted properly:

Science Sample Question Paper (2024-25)

Class X (Science 086)

Max. Marks: 80 Time Allowed: 3 hours

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Section-A

Question 1 to 16 are multiple-choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. **Identify the type of reaction:** A + B → AB
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    - D. Double displacement reaction
2. **Which among the following is considered the strongest electrolyte?**
    - A. Dilute acid
    - B. Dilute sugar solution
    - C. Glucose solution

- D. Ethanol in water

3. **An aqueous solution 'A' turns the phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. Which of the following statements is true for solutions 'A' and 'B'?**
    - A. A is strongly basic, and B is a weak base.
    - B. A is strongly acidic, and B is a weak acid.
    - C. A has a pH greater than 7, and B has a pH less than 7.
    - D. A has a pH less than 7, and B has a pH greater than 7.
4. **The electronic configuration of an element is 2, 8, 2. What is the valency of this element?**
    - A. 1
    - B. 2
    - C. 6
    - D. 8
5. **Which of the following is NOT a role of decomposers in the ecosystem?**
    - A. Natural replenishment of soil.
    - B. Enrichment of oxygen in the atmosphere.
    - C. Waste decomposition.
    - D. Break-down of dead remains.
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    - C. Carbon dioxide
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    - A. Control the amount of light entering the eye.
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    - A. P = I/V
    - B. P = V/I
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    - A. Ampere
    - B. Volt
    - C. Ohm
    - D. Watt
13. **What happens to the resistance of a conductor when its temperature increases?**
    - A. Increases

- B. Decreases
- C. Remains the same
- D. Becomes zero

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    - A. Right-hand thumb rule
    - B. Fleming's left-hand rule
    - C. Fleming's right-hand rule
    - D. Ohm's law
15. **In a domestic electric circuit, appliances are connected in which configuration?**
    - A. Series
    - B. Parallel
    - C. A combination of series and parallel
    - D. None of the above
16. **Which of the following is NOT a consequence of ozone layer depletion?**
    - A. Increased incidence of skin cancer
    - B. Damage to plants
    - C. Global warming
    - D. Acid rain

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, and R is not the correct explanation of A.
- C. A is true but R is false.
- D. A is false but R is true.

17. **Assertion (A):** When a metal reacts with an acid, hydrogen gas is evolved.
    Reason (R): Acids contain hydrogen ions (H+) which are replaced by the metal ions.

18. **Assertion (A):** The sex of a child is determined by the mother. **Reason (R):** Females have two X chromosomes.
19. **Assertion (A):** A convex lens always forms a real image. **Reason (R):** A convex lens converges light rays.
20. **Assertion (A):** A current-carrying conductor experiences a force when placed in a magnetic field. **Reason (R):** A magnetic field exerts a force on moving charges.

Section-B

Question No. 21 to 26 are very short answer questions.

21. Differentiate between an ore and a mineral.
22. Why is it important to clean magnesium ribbon before burning in air?
23. What is the role of saliva in the digestion of food?
24. What is the difference between the movement of leaves in a sensitive plant and the movement in our legs?
25. Define electric potential difference. What is its SI unit?
26. Why is it important to connect electrical appliances in parallel in a domestic circuit?

Section-C

Question No. 27 to 33 are short answer questions.

27. Explain the process of saponification with a chemical equation.
28. What are the different methods of contraception?
29. Why is DNA copying important in reproduction?
30. Explain the phenomenon of dispersion of light.
31. What is the difference between a real image and a virtual image?
32. State Ohm's law. Explain how it can be verified experimentally.
33. Explain the working of an electric motor.

Section-D

Question No. 34 to 36 are long answer questions.

34. Explain the process of digestion of food in humans.
35. Explain Mendel's laws of inheritance with suitable examples.

36. Explain the construction and working of an electric generator.

Section – E

Question No. 37 to 39 are case-based/data-based questions.

37. **A student performed an experiment to study the properties of ethanoic acid. The student observed that ethanoic acid:**
    - Turns blue litmus paper red.
    - Reacts with sodium carbonate to produce carbon dioxide gas.
    - Reacts with ethanol in the presence of concentrated sulphuric acid to produce a sweet-smelling ester.

Based on the above information, answer the following questions: (a) What type of compound is ethanoic acid? (b) Write the chemical equation for the reaction between ethanoic acid and sodium carbonate. (c) What is the name of the process involved in the reaction between ethanoic acid and ethanol? (d) What is the role of concentrated sulphuric acid in this reaction?

38. **A person is suffering from hypermetropia. The person can see distant objects clearly but has difficulty in seeing nearby objects.**

Answer the following questions: (a) What is the cause of hypermetropia? (b) What type of lens is used to correct hypermetropia? (c) Draw a ray diagram to show how hypermetropia is corrected.

39. **A student sets up an electric circuit consisting of a battery, a resistor, and an ammeter connected in series. The student observes that the ammeter reading increases when the resistance of the resistor is decreased.**

Answer the following questions: (a) What is the relationship between current and resistance according to Ohm's law? (b) Explain why the ammeter reading increases when the resistance is decreased. (c) What will happen to the ammeter reading if an additional resistor is connected in series with the existing resistor?

Answer Key

Section-A

1. **A**
2. **A**
3. **C**

4. **B**
5. **B**
6. **C**
7. **D**
8. **C**
9. **D**
10. **B**
11. **C**
12. **C**
13. **A**
14. **B**
15. **B**
16. **D**
17. **A**
18. **C**
19. **C**
20. **A**

Section-B

21. **An ore is a mineral that contains a high enough concentration of a metal to make it economically feasible to extract the metal. A mineral is a naturally occurring solid substance with a definite chemical composition and crystal structure.**
22. **Magnesium ribbon is cleaned before burning in the air to remove the layer of magnesium oxide that forms on its surface. This oxide layer can prevent the magnesium from reacting properly with oxygen in the air.**
23. **Saliva contains an enzyme called salivary amylase, which breaks down starch into simpler sugars. This process starts the digestion of carbohydrates in the mouth.**
24. **The movement of leaves in a sensitive plant is a nastic movement, which is a non-directional response to a stimulus. The movement in our legs is a**

locomotory movement, which is a directional response controlled by the nervous system.

25. **Electric potential difference is the work done per unit charge in moving a positive test charge from one point to another in an electric field. Its SI unit is volt (V).**
26. **Electrical appliances are connected in parallel in a domestic circuit to ensure that each appliance receives the same voltage. This also allows appliances to operate independently of each other.**

Section-C

27. **Saponification is the process of making soap by the hydrolysis of fats or oils with an alkali. The chemical equation for saponification is:**
    - Fat/Oil + Alkali → Soap + Glycerol
28. **The different methods of contraception are:**
    - Barrier methods: These methods prevent sperm from reaching the egg. Examples include condoms, diaphragms, and cervical caps.
    - Hormonal methods: These methods use hormones to prevent ovulation or thicken cervical mucus, making it difficult for sperm to reach the egg. Examples include oral contraceptive pills, patches, and injections.
    - Intrauterine devices (IUDs): These devices are inserted into the uterus and prevent fertilization or implantation.
    - Sterilization: These methods permanently prevent pregnancy. Examples include vasectomy for men and tubal ligation for women.
    - Natural methods: These methods rely on avoiding intercourse during the fertile period of a woman's cycle.
29. **DNA copying is important in reproduction because it ensures that genetic information is passed from the parent to the offspring. This process allows for the continuation of species and the inheritance of traits.**
30. **Dispersion of light is the phenomenon of splitting white light into its constituent colors when it passes through a prism. This happens because different colors of light have different wavelengths and are refracted by different amounts.**
31. **A real image is formed when light rays actually converge at a point. A real image can be projected onto a screen. A virtual image is formed when light**

rays appear to diverge from a point. A virtual image cannot be projected onto a screen.

32. **Ohm's law states that the current flowing through a conductor is directly proportional to the potential difference across its ends, provided the temperature and other physical conditions remain constant.**

Ohm's law can be verified experimentally by setting up a circuit with a resistor, a battery, an ammeter, and a voltmeter. By varying the voltage and measuring the current, a graph of voltage versus current can be plotted. If the graph is a straight line passing through the origin, it verifies Ohm's law.

33. **An electric motor converts electrical energy into mechanical energy. It works on the principle that a current-carrying conductor experiences a force when placed in a magnetic field.**

The motor consists of a coil of wire (armature) placed between the poles of a magnet. When current flows through the coil, it experiences a force and rotates. A commutator and brushes are used to reverse the direction of current in the coil every half rotation, ensuring continuous rotation.

Section-D

34. **The process of digestion of food in humans involves several steps:**
    - Mouth: Chewing breaks down food into smaller pieces, and saliva moistens it. Salivary amylase begins the digestion of carbohydrates.
    - Oesophagus: Muscular contractions move food down to the stomach.
    - Stomach: Gastric juices containing hydrochloric acid and pepsin break down proteins.
    - Small intestine: Bile from the liver emulsifies fats, and pancreatic juices containing enzymes like trypsin, lipase, and amylase further break down proteins, fats, and carbohydrates.
    - Large intestine: Water is absorbed from undigested food, forming faeces.
35. **Mendel's laws of inheritance:**
    - Law of Segregation: This law states that during gamete formation, the two alleles for a trait separate from each other so that each gamete receives only one allele.
    - Law of Independent Assortment: This law states that the inheritance of one trait is independent of the inheritance of another trait. For example,

the inheritance of seed color in pea plants is independent of the inheritance of seed shape.

36. **An electric generator converts mechanical energy into electrical energy. It works on the principle of electromagnetic induction.**

The generator consists of a coil of wire that rotates in a magnetic field. When the coil rotates, the magnetic flux through it changes, inducing an electromotive force (EMF) in the coil. This EMF drives a current through an external circuit.

Section – E

37. **(a) Ethanoic acid is a carboxylic acid. (b) The chemical equation for the reaction between ethanoic acid and sodium carbonate is:** * $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$ **(c) The process involved in the reaction between ethanoic acid and ethanol is called esterification. (d) Concentrated sulphuric acid acts as a catalyst and dehydrating agent in the esterification reaction.**

38. **(a) Hypermetropia is caused by the eyeball being too short or the lens being too weak. (b) A convex lens is used to correct hypermetropia. (c) A ray diagram for hypermetropia correction shows parallel rays of light from a distant object being converged by the convex lens to form a sharp image on the retina.**

39. **(a) According to Ohm's law, current is inversely proportional to resistance, meaning that as resistance increases, current decreases, and vice versa. (b) The ammeter reading increases when the resistance is decreased because the lower resistance allows more current to flow through the circuit for a given voltage. (c) If an additional resistor is connected in series with the existing resistor, the total resistance of the circuit will increase, leading to a decrease in the ammeter reading.**

SCIENCE SQP (2024-25)

CLASS X

(Science 086)

Max. Marks: 80 Time Allowed: 3 hours

General Instructions:

1. All questions are compulsory. However, an internal choice of approximately 33% will be provided. 50% marks are to be allotted to competency-based questions.
2. **Section A** will have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. **Section B** will have 6 Short Answer (SA) type questions carrying 02 marks each.
4. **Section C** will have 7 Short Answer (SA) type questions carrying 03 marks each.
5. **Section D** will have 3 Long Answer (LA) type questions carrying 05 marks each.
6. **Section E** will have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1, 2, and 3 marks.

Section-A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1. Which of the following is considered the strongest electrolyte? A. Dilute acid B. Dilute sugar solution C. Glucose solution D. Ethanol in water
2. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. Which of the following statements is true for solutions 'A' and 'B'? A. A is strongly basic and B is a weak base. B. A is strongly acidic and B is a weak acid. C. A has a pH greater than 7 and B has a pH less than 7. D. A has a pH less than 7 and B has a pH greater than 7.
3. When 50g of lead powder is added to 300 ml of blue copper sulphate solution, after a few hours, the solution becomes colourless. This is an example of: A. Combination reaction B. Decomposition reaction C. Displacement reaction D. Double displacement reaction
4. Which of the following is **not** a role of decomposers in the ecosystem? A. Natural replenishment of soil B. Enrichment of oxygen in atmosphere C. Waste decomposition D. Break-down of dead remains

5. The radius of curvature of a spherical mirror is 20 cm. What is its focal length? A. 10 cm B. 20 cm C. 40 cm D. 80 cm
6. What does an electric circuit mean? A. A closed loop through which negative charge can continuously flow. B. A closed loop through which positive charge can continuously flow. C. An open loop through which negative charge can continuously flow. D. An open loop through which positive charge can continuously flow.
7. A compass needle is a small magnet. Its one end, which points towards north, is called a north pole, and the other end, which points towards south, is called a south pole. Which of the following statements about compass needles is correct? A. The south pole of a compass needle is attracted to the south pole of a bar magnet. B. The north pole of a compass needle is attracted to the south pole of a bar magnet. C. The south pole of a compass needle is attracted to the north pole of a bar magnet. D. A compass needle will spin continuously when placed next to a bar magnet.
8. Which one of the following materials cannot be used to make a lens? A. Water B. Glass C. Plastic D. Clay
9. What is the far point and near point of the human eye with normal vision? A. Far point is at 25 cm and near point is at infinity. B. Far point is at 0 cm and near point is at 25 cm. C. Far point is at infinity and near point is at 25 cm. D. Far point and near point do not exist for a human eye.
10. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of corrective lens used to restore proper vision? A. Bifocal lens B. Convex lens C. Concave lens D. Plano-concave lens

Question No. 11 to 14 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below: A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true

1. Assertion (A): On adding dilute HCl to a test tube containing a substance ‘X’, a colourless gas is produced which gives a pop sound when a burning match stick is brought near it. Reason (R): In this reaction metal ‘X’ is displaced by Hydrogen.
2. Assertion (A): Generally, the number of chromosomes in a cell and in a germ cell is not the same in species. Reason (R): When two germ cells combine, they restore the normal number of chromosomes in a species.
3. Assertion (A): A convex mirror always forms an image behind it and the image formed is virtual. Reason (R): According to the sign convention, the focal length of a convex mirror is positive.

4. Assertion (A): If the lions are removed from a food chain it will not affect the food chain, however if the plants are removed from a food chain it will disturb the ecosystem. Reason (R): Plants are producers who can make food using sunlight, while lions are consumers.

Section-B

Question No. 15 to 20 are very short answer questions.

1. Differentiate between alveoli and nephron on the basis of structure and location.
2. We have four resistors A, B, C and D of resistance 3 Ω, 6 Ω, 9 Ω and 12 Ω respectively. Find out the lowest resistance which can be obtained by combining these four resistors.
3. Create a food chain with more than 2 trophic levels that exists in the cabbage farm. If humans occupy the last trophic level, then how would spraying pesticide affect the humans? Explain.
4. Give reasons for the following: i. Certain metals are used for making cooking utensils. ii. Hydrogen gas does not evolve when certain metals except Mg & Mn react with nitric acid.
5. A mixture of oxygen and ethyne is burnt for welding. Can you predict why a mixture of ethyne and air is not used?
6. What is the fundamental difference between hypermetropia and myopia in terms of the optical experience of a person?

Section-C

Question No. 21 to 27 are short answer questions.

1. In the given series of reactions, name the compounds X and Z.

$CH_3 CH_2 OH \xrightarrow{Alkaline KMnO_4 + Heat} X \xrightarrow{Conc. H_2SO_4}Y \xrightarrow{Hot Conc. H_2SO_4}Z$

1. Comment on the following statements: i. Bee sting is treated with baking soda paste whereas wasp sting is treated with dilute vinegar. ii. Farmers treat soil with quicklime when tilling. iii. Ancient sculptures and marble structures are conserved by treating them with certain chemicals."
2. Water is used by the leaves of the plants for photosynthesis but rather than watering the leaves, we water the plant through the soil. How does this water reach the leaves of the plant?
3. In a family of four individuals, the father possessed long ears and the mother possessed short ears. If the parents had pure dominant and recessive traits

respectively and the F1 individual is married to an unrelated individual of the same genotype, then calculate the ratio of genetic makeup of the F2 generation. Show a suitable cross.

4. What are the causes of myopia in the human eye?
5. A. State the relationship between the resistance R of a wire to its length *l* and cross-sectional area *A*. Use the mathematical symbols to arrive at the final formula. B. Using the formula, define the resistivity of a material.
6. Mona was doing an experiment with a magnetic compass and a straight current-carrying wire. She observed that as she moved the compass away from the current-carrying wire, the deflection of the compass needle reduced. A. Explain why the deflection of the compass needle reduced as Mona moved the compass away from the wire. B. Mention one thing that could have changed in the circuit of the wire that could increase the deflection of the needle. C. Explain with reason how the direction of the magnetic field associated with the wire changes if the polarity of battery reversed.

Section-D

Question No. 28 to 30 are long answer questions.

1. (i) "Keerthi thinks that Substitution reaction occurs in saturated hydrocarbons, on the contrary Krishi thinks it occurs in unsaturated hydrocarbons." Justify with valid reasoning whose thinking is correct. (ii) "Methane and Propane and their isomers are used as fuels" Comment. Give any two characteristics of homologues of a given homologous series. (iii) A mixture of oxygen and ethyne is burnt for welding. Can you predict why a mixture of ethyne and air is not used?
2. (i) 'A' & 'B' are sodium salts of long-chain carboxylic acid and long-chain sulphonic acid respectively. Which one of A or B will you prefer as a cleansing agent while using underground water (hand pump water)? Give the reason for your answer. (ii) Elaborate on the process of cleansing action. (iii) Write the chemical equation of the preparation of soap from an ester CH_3COOCH_3. What is the name of this process?
3. The image below shows a banana plant which is growing with the help of suckers. These suckers are small plant stem outgrowths which can be separated from the main plant and planted separately, and they will grow into a new plant subsequently. (i) What is the mode of reproduction in the above plant? (ii) Name any other plant that can reproduce by the same mode of reproduction mentioned above. (iii) The above plant produces only male flowers. Explain how this plant will be involved in the process of pollination. (iv) Why is the offspring of this banana plant not absolutely identical to its parent plant?

Section – E

Question No. 31 to 33 are case-based/data-based questions.

1. Distinguish between ethanol and ethanoic acid experimentally. “All combustion reactions are oxidation but all oxidation reactions are not combustion.” Justify.
2. During a field trip, Mohan and Rohit observed that shoots of sunflower plants bend towards the sunlight. Whereas, leaves of ‘Touch me not’ plant begin to fold and droop soon after touching even during the day. They were curious to know how these movements occur in plants. What causes the bending of shoots in the sunflower plants towards sunlight?
3. Which lens can be used to create fire? What property of the lens helps in creating the fire? List two more uses of this kind of lens.

Answer Key

Section A

1. A
2. C
3. C
4. B
5. A
6. B
7. B
8. D
9. C
10. C
11. C
12. A
13. B
14. D

Section B

1. **Alveoli** are tiny air sacs located in the lungs, responsible for gas exchange. **Nephrons** are microscopic filtering units found in the kidneys, responsible for filtering waste products from the blood.

2. The lowest resistance can be obtained by connecting all four resistors in parallel. $\frac{1}{R_{Total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$ The total resistance will be 1.5 Ω.

3. A possible food chain in a cabbage farm is: Cabbage → Caterpillar → Bird → Human. If pesticides are sprayed on the cabbage, they will accumulate in the bodies of the caterpillars. When birds eat the caterpillars, the pesticides will be passed on to them. As humans are at the top of the food chain, consuming birds that have ingested pesticides will lead to the accumulation of harmful chemicals in their bodies, potentially causing health problems. This process is known as biomagnification.

4. i. Certain metals are used for making cooking utensils because they are good conductors of heat. This allows for even distribution of heat during cooking. ii. Metals like Mg and Mn react with very dilute HNO_3 to liberate H_2 gas. However, other metals do not react with HNO_3 to liberate H_2 gas because HNO_3 is a strong oxidising agent.

5. A mixture of oxygen and ethyne is burnt for welding because this mixture produces a very hot flame due to complete combustion. Air is not used because the presence of nitrogen and other gases in the air will lower the temperature of the flame.

6. **Hypermetropia** is a condition where a person can see distant objects clearly but has difficulty focusing on nearby objects. This is because the image of near objects is focused behind the retina. **Myopia** is a condition where a person can see near objects clearly but has difficulty focusing on distant objects. This is because the image of distant objects is focused in front of the retina.

Section C

1. In the given series of reactions:

$CH_3 CH_2 OH \xrightarrow{Alkaline KMnO_4 + Heat} X \xrightarrow{Conc. H_2SO_4}Y \xrightarrow{Hot Conc. H_2SO_4}Z$

Compound X is ethanoic acid (CH_3COOH). Compound Z is ethene (C_2H_4).

1. i. Bee stings are acidic in nature, which is why baking soda, a mild base, is used to neutralize the venom and reduce pain and swelling. Wasp stings, on the other hand, are alkaline, so dilute vinegar, a weak acid, is used for neutralization. ii. Quicklime (calcium oxide) is used to treat acidic soil. When quicklime reacts

with water, it forms slaked lime (calcium hydroxide), which neutralizes the acidity of the soil, making it suitable for plant growth. iii. Ancient sculptures and marble structures are often made from calcium carbonate ($CaCO_3$). Acid rain, which contains sulphuric and nitric acids, can react with the calcium carbonate, causing damage to the structures. To prevent this, these structures are treated with weak bases, such as calcium hydroxide, to neutralize the acid and protect the surfaces.

2. Water is absorbed by the roots of the plants from the soil and transported upwards to the leaves through a network of vessels called xylem. This process is driven by transpiration, where water evaporates from the leaves through small pores called stomata, creating a suction force that pulls water upwards from the roots.

3. Let "L" represent the dominant allele for long ears and "l" represent the recessive allele for short ears.

Parent Generation: Father (LL) x Mother (ll)

F1 Generation: All offspring will have the genotype Ll (long ears).

F2 Generation:

If an F1 individual (Ll) is crossed with another individual of the same genotype (Ll), the following Punnett square can be used to determine the F2 generation's genotypic ratio:

Ll**L**LLL**l**LlllThe genotypic ratio of the F2 generation is **1 LL: 2 Ll: 1 ll**. This means that 25% will have long ears and be homozygous dominant (LL), 50% will have long ears and be heterozygous (Ll), and 25% will have short ears and be homozygous recessive (ll).

1. Myopia, or short-sightedness, can be caused by: **a. Elongation of the eyeball:** If the eyeball is longer than normal, the image of distant objects is focused in front of the retina, making them appear blurry. **b. Excessive curvature of the cornea:** If the cornea is too curved, it bends light rays too much, leading to the image being focused in front of the retina. **c. Genetic factors:** Myopia often runs in families, suggesting a genetic predisposition.

2. A. The resistance (R) of a wire is directly proportional to its length (l) and inversely proportional to its cross-sectional area (A). This relationship can be expressed as: $R \propto l/A$. To convert this proportionality into an equation, a constant of proportionality (ρ), known as resistivity, is introduced: $R = \rho l/A$.

B. **Resistivity (ρ)** is a property of a material that quantifies how strongly it resists the flow of electric current. It is defined as the resistance of a wire of that material having unit length and unit cross-sectional area. Its SI unit is ohm-metre (Ωm).

1. A. The strength of the magnetic field produced by a straight current-carrying wire decreases as the distance from the wire increases. Therefore, as Mona moved the compass away from the wire, the magnetic field strength experienced by the compass needle decreased, leading to a reduced deflection. B. Increasing the current flowing through the wire would increase the magnetic field strength around it, which would result in a larger deflection of the compass needle. C. If the polarity of the battery connected to the wire is reversed, the direction of the current flow in the wire will also reverse. As a result, the direction of the magnetic field around the wire will also reverse, according to the right-hand thumb rule.

Section D

1. (i) **Krishi's thinking is correct.** Substitution reactions occur in saturated hydrocarbons. In substitution reactions, one or more hydrogen atoms in a saturated hydrocarbon are replaced by another atom or group of atoms. For example, methane (CH_4) can undergo a substitution reaction with chlorine (Cl_2) to form chloromethane (CH_3Cl) and hydrogen chloride (HCl). Unsaturated hydrocarbons, on the other hand, primarily undergo addition reactions, where atoms or groups of atoms are added to the molecule without the replacement of hydrogen atoms. (ii) Methane (CH_4) and propane (C_3H_8), along with their isomers, are commonly used as fuels because they release a significant amount of energy when they burn in the presence of oxygen. This is due to the strong carbon-hydrogen bonds present in these compounds. Two characteristics of homologues of a given homologous series are: a. They have the same general formula. b. They differ by a $-CH_2$ group in their molecular formula. (iii) A mixture of oxygen and ethyne is used for welding because it produces a very hot flame (around 3300°C) due to complete combustion. Air is not used for welding because the presence of nitrogen in air results in an incomplete combustion of ethyne, which produces a cooler flame that is not suitable for welding.

2. (i) **'B' (sodium salt of long-chain sulphonic acid) would be preferred as a cleansing agent while using underground water.** Hard water contains dissolved salts of calcium and magnesium. When soap (sodium salt of long-chain carboxylic acid) is used with hard water, it reacts with these salts to form insoluble scum, which reduces its cleansing ability. Detergents (sodium salts of long-chain sulphonic acids) do not form scum with hard water and are therefore more effective cleansing agents in hard water areas. (ii) **Cleansing action of soap:** The cleansing action of soap is due to the formation of micelles. A soap molecule has two parts: a hydrophilic head and a hydrophobic tail. The hydrophilic head is attracted to water, while the hydrophobic tail is attracted to oil and grease. When soap is added to water, the hydrophobic tails of soap

molecules cluster together to form micelles, with the hydrophilic heads facing outwards. The hydrophobic tails trap dirt, oil, and grease, while the hydrophilic heads allow the micelles to dissolve in water. This allows the dirt and grime to be washed away. (iii) The chemical equation for the preparation of soap from the ester CH_3COOCH_3 (methyl acetate) is:

$CH_3COOCH_3 + NaOH → CH_3COONa + CH_3OH$.

This process is called **saponification**.

1. (i) The mode of reproduction in the banana plant shown in the image is **vegetative propagation**. This method involves the production of new plants from vegetative parts of the parent plant, such as stems, roots, or leaves. (ii) Another plant that can reproduce by vegetative propagation is the **potato**. Potatoes reproduce through underground stems called tubers, which have buds or "eyes" that can sprout into new plants. (iii) Even though the banana plant in the image produces only male flowers, it can still be involved in pollination through **cross-pollination**. In this process, pollen from the male flowers of this plant can be carried by wind or insects to the female flowers of other banana plants, leading to fertilization and the production of fruit. (iv) The offspring produced through vegetative propagation are not absolutely identical to their parent plant because **mutations** can occur during the growth and development of the new plants. Mutations are random changes in the DNA sequence that can introduce new genetic variations. These variations might result in slight differences in the offspring's characteristics compared to the parent plant.

Section E

1. Ethanol and ethanoic acid can be distinguished experimentally by:

- **Smell test**: Ethanoic acid has a characteristic pungent smell (like vinegar), while ethanol has a pleasant, alcoholic smell.
- **Sodium bicarbonate test**: Ethanoic acid reacts with sodium bicarbonate ($NaHCO_3$) to produce carbon dioxide gas, which can be observed as effervescence. Ethanol does not react with sodium bicarbonate.

"All combustion reactions are oxidation reactions, but all oxidation reactions are not combustion reactions." This statement is true because: * **Combustion** is a specific type of oxidation reaction that involves the rapid reaction between a substance with an oxidant, usually oxygen, to produce heat and light. For example, the burning of methane in oxygen is a combustion reaction. * **Oxidation**, in a broader sense, refers to a reaction where a substance loses electrons or gains oxygen. Many oxidation reactions do not involve burning or the production of heat and light. For example, the rusting of iron is a slow oxidation reaction that does not involve combustion.

1. The bending of shoots of sunflower plants towards sunlight is due to a phenomenon called **phototropism**. This is a growth response in plants where the direction of growth is determined by the direction of light. When sunlight falls on the sunflower shoot, the hormone auxin is produced on the shaded side of the shoot. Auxin promotes cell elongation, causing the shaded side of the shoot to grow faster than the side exposed to light. This differential growth results in the bending of the shoot towards the light source.
2. A **convex lens** can be used to create fire. A convex lens converges light rays passing through it to a single point called the focus. When sunlight is focused on a combustible material like paper or dry leaves, the concentrated heat energy at the focus can ignite the material, causing it to burn.

Two more uses of a convex lens are:

- **Magnifying glass:** A convex lens can be used as a magnifying glass to enlarge the image of small objects.
- **Camera lens:** Convex lenses are used in cameras to focus the image of the scene onto the film or sensor.

This sample question paper is based on the provided syllabus. The actual question paper may vary in content and difficulty level. Please refer to the prescribed textbooks and syllabus for a comprehensive understanding of the course.

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- Expert insights and practical demonstrations.
- Each participant will create their own question papers using AI tools by the end of the workshop.

No subject expertise is needed! All you need is the **willingness to embrace new digital tools** to support your child/student's success

Requirements to Participate:

- A good-performing laptop or desktop computer.
- A stable internet connection.
- Zoom software installed and ready to use.
- Basic computer skills and curiosity to explore new tools.

Disclaimer: The workshop will provide training on how to use AI tools effectively. Participants are responsible for ensuring the final outputs are accurate and meet their specific requirements.

Limited Seats Available!
Reserve your spot today and take the first step toward revolutionising how you support your students' learning journey.

Click Here to Register Now: https://forms.gle/HMJQoJrBqqWMMxGh7
For inquiries, contact:

Empower yourself with the knowledge to shape brighter futures. We look forward to welcoming you to the workshop! Email: learn@itforall.org