CBSE 2024 Science — Set 3

English Medium

Time Allowed: 3 Hours | Maximum Marks: 80

General Instructions:

1. This question paper contains 39 questions. All questions are compulsory.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 6 questions carrying 2 marks each.
4. Section C has 7 questions carrying 3 marks each.
5. Section D has 3 questions carrying 5 marks each.
6. Section E has 3 case-study based questions carrying 4 marks each.
7. Draw neat diagrams wherever required.

Section A

Multiple Choice Questions (1 mark each)

Q.1 [1 mark]

Identify the product 'X' obtained in the following chemical reaction:

$CaCO_3 \rightarrow (\Delta)$ 'X' + CO_2

(a) Quick lime

(b) Gypsum

(c) Lime Stone

(d) Plaster of Paris

Q.2 [1 mark]

Select a pair of natural indicator from the following:

(a) Litmus and methyl orange

(b) Turmeric and Litmus

(c) Phenolphthalein and methyl orange

(d) Methyl orange and Turmeric

Q.3 [1 mark]

A chemical compound used in glass, soap and paper industries is:

(a) Washing Soda

(b) Baking Soda

(c) Bleaching Powder

(d) Common Salt

Q.4 [1 mark]

The structural formula of Cyclohexane is:

(a) A benzene-like ring structure with alternating double bonds and H atoms on each carbon (incorrect — this is benzene)

(b) A six-membered ring with all single bonds, each carbon bonded to two H atoms (chair/ring form of cyclohexane)

(c) A ring structure with triple bonds between carbons

(d) A six-membered ring with alternating double bonds and single H on some carbons

Q.5 [1 mark]

Consider the following Chemical equation:

a Al_2O_3 + b HCl → c $AlCl_3$ + d H_2O

In order to balance this chemical equation, the values of a, b, c and d must be:

(a) 1, 6, 2 and 3

(b) 1, 6, 3 and 2

(c) 2, 6, 2 and 3

(d) 2, 6, 3 and 2

Q.6 [1 mark]

Which one of the following hydrocarbons is different from the others?

(a) C_4H_{10}

(b) C_7H_{14}

(c) C_5H_{12}

(d) C_2H_6

Q.7 [1 mark]

Which one of the following reactions is different from the remaining three?

(a) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(b) $CaO + H_2O \rightarrow Ca(OH)_2$

(c) $KNO_3 + H_2SO_4 \rightarrow KHSO_4 + HNO_3$

(d) $ZnCl_2 + H_2S \rightarrow ZnS + 2HCl$

Q.8 [1 mark]

Select from the following a plant hormone which promotes cell division.

(a) Gibberellins

(b) Auxins
(c) Abscissic Acid
(d) Cytokinins

Q.9 [1 mark]

Part(s) of a flower which attracts insects for pollination is (are):

(a) petals and Sepals
(b) anther and Stigma
(c) petals only
(d) sepals only

Q.10 [1 mark]

In an experiment to study independent inheritance of two separate traits: shape and colour of seeds, the ratio of the different combinations in F_2 progeny would be:

(a) 1 : 3
(b) 1 : 2 : 1
(c) 9 : 3 : 3 : 1
(d) 9 : 1 : 1 : 3

Q.11 [1 mark]

Which of the following statement(s) is (are) true about human heart?

(a) Right atrium receives oxygenated blood from lungs through pulmonary artery.

(b) Left atrium transfers oxygenated blood to left ventricle which sends it to various parts of the body.

(c) Right atrium receives deoxygenated blood from different parts of the body through vena cava.

(d) Left atrium transfers oxygenated blood to aorta which sends it to different parts of the body.

(a) (b) only

(b) (a) and (d)
(c) (b) and (c)
(d) (b) and (d)

Q.12 [1 mark]

A cross between two tall pea plants resulted in offsprings having a few dwarf plants. The gene-combination of the parental plants must be:

(a) Tt and Tt
(b) Tt and tt
(c) TT and tt
(d) TT and Tt

Q.13 [1 mark]

The Phenomena of light involved in the formation of a rainbow in the sky are:

(a) Refraction, dispersion and reflection
(b) Refraction, dispersion and total internal reflection
(c) Dispersion, scattering and reflection
(d) Dispersion, refraction and internal reflection

Q.14 [1 mark]

In case of four wires of same material, the resistance will be minimum if the diameter and length of the wire respectively are:

(a) D/2 and L/4
(b) D/4 and 4L
(c) 2D and L
(d) 4D and 2L

Q.15 [1 mark]

A food chain will be more advantageous in terms of energy if it has:

(a) 2 trophic levels
(b) 3 trophic levels

(c) 4 trophic levels
(d) 5 trophic levels

Q.16 [1 mark]

Consider the following statements about ozone:
(a) Ozone is poisonous gas.
(b) Ozone shields the earth's surface from the infrared radiation from the sun.
(c) Ozone is a product of UV radiations acting on oxygen molecule.
(d) At the lower level of the earth's atmosphere, ozone performs most essential function.
The correct statements are:

(a) (a) and (b)
(b) (a) and (c)
(c) (b) and (c)
(d) (b) and (d)

Q.17 [1 mark]

Assertion (A): A piece of Zinc metal gets reddish brown coating when kept in copper sulphate solution for some time.
Reason (R): Copper is more reactive metal than Zinc.

(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 correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Q.18 [1 mark]

Assertion (A): Offsprings produced by asexual reproduction are genetically similar to the parents.
Reason (R): Asexual reproduction involves a single parent.

(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 correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Q.19 [1 mark]

Assertion (A): Red light signals are used to stop the vehicles on the road.
Reason (R): Red coloured light is scattered the most so as to be visible from a large distance.

(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 correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Q.20 [1 mark]

Assertion (A): The waste we generate daily may be biodegradable or non-biodegradable.
Reason (R): The waste generated, if not disposed off properly may cause serious environmental problems.

(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 correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

When magnesium ribbon is burnt in air, an ash of white colour is produced. Write chemical equation for the reaction giving the chemical name of the ash produced. State the type of chemical reaction giving justification for your answer.

Q.22 [2 marks]

Where are auxins synthesized? How do they promote phototropism?

Q.23 [2 marks]

(a) List any two pairs of visible contrasting characters of garden pea plants used by Mendel for his experiments stating the dominant and recessive characters in each pair.

OR

(b) In human beings, the probability of getting a male or a female child is 50%. Explain with the help of a flow diagram only.

OR

Q.23 [2 marks]

In human beings, the probability of getting a male or a female child is 50%. Explain with the help of a flow diagram only.

Q.24 [2 marks]

When do we say that a particular person is suffering from hypermetropia? List two causes of this defect. Name the type of lens used to correct this defect.

Q.25 [2 marks]

(a) Draw a labelled diagram to show the pattern of magnetic field lines produced due to a current carrying straight conductor. Mark on it the direction of current in the conductor and the direction of magnetic field lines.

OR

(b) Name the device used to magnetise a piece of magnetic material. Draw a

labelled diagram to show the arrangement used for the magnetisation of a cylinder made of soft iron.

OR

Q.25 [2 marks]

Name the device used to magnetise a piece of magnetic material. Draw a labelled diagram to show the arrangement used for the magnetisation of a cylinder made of soft iron.

Q.26 [2 marks]

What are decomposers? List two consequences of their absence in an ecosystem.

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

State reasons for the following:

(a) Zinc oxide is an amphoteric oxide.

(b) Sodium metal is stored in bottle filled with kerosene oil.

(c) In the reactions of nitric acid with metals, generally hydrogen gas is not evolved.

Q.28 [3 marks]

(a) State giving reason the reduction process to obtain the following metals from their compounds:

(i) Mercury

(ii) Copper

(iii) Sodium

OR

(b) State giving reason for the change in appearance observed when each of the following metal is exposed to atmospheric air for some time:
(i) Silver
(ii) Copper
(iii) Iron

OR

Q.28 [3 marks]

State giving reason for the change in appearance observed when each of the following metal is exposed to atmospheric air for some time:
(i) Silver
(ii) Copper
(iii) Iron

Q.29 [3 marks]

We water the soil but it reaches the topmost leaves of the plants. Explain in brief the process involved.

Q.30 [3 marks]

(a) List two constituents of Central Nervous System (CNS). How are these components protected from injuries?
(b) Write two limitations of the use of electrical impulses.

Q.31 [3 marks]

Name and explain the phenomenon of light due to which the path of a beam of light becomes visible when it enters a smoke filled room through a small hole. Also state the dependence of colour of the light we receive on the size of the particle of the medium through which the beam of light passes.

Q.32 [3 marks]

Explain in brief the function of an electric fuse in a domestic circuit. An electric heater of current rating 3 kW; 220 V is to be operated in an electric circuit of rating 5 A. What is likely to happen when the heater is switched 'ON'? Justify your answer with necessary calculation.

Q.33 [3 marks]

(a) State Ohm's law. Write formula for the equivalent resistance R_p of the parallel combination of three resistors of values R_1, R_2 and R_3.

(b) Find the resistance of the following network of resistors:

[A circuit diagram showing three resistors, each of resistance R: one in series on top, and two in parallel (one on top, one on bottom) between points X and Y]

Section D

Long Answer Questions (5 marks each)

Q.34 [5 marks]

(a) (i) Five solutions A, B, C, D and E when tested with pH paper showed pH as 4, 1, 13, 7 and 10 respectively. Which solution is:

(1) Strongly acidic (2) Strongly alkaline (3) Weakly acidic (4) Neutral and (5) Weakly alkaline? Arrange the solutions in increasing order of H^+ ion concentration.

(ii) Write the name and formula of (1) an acidic salt and (2) a basic salt, giving the name of the parent acid and parent base used to form the salt in each case.

OR

(b) Name and state in brief the process which is used to prepare sodium hydroxide from sodium chloride. In this process along with the main product

two gases 'X' and 'Y' are also given off at the two electrodes. Name 'X' and 'Y' specifying the name of their respective electrode at which each gas is obtained. One of these gases when reacts with dry calcium hydroxide produces a compound 'Z' which is widely used in water treatment plants and textile industries. Name Z and write chemical equation for the reaction involved in its formation.

OR

Q.34 [5 marks]

Name and state in brief the process which is used to prepare sodium hydroxide from sodium chloride. In this process along with the main product two gases 'X' and 'Y' are also given off at the two electrodes. Name 'X' and 'Y' specifying the name of their respective electrode at which each gas is obtained. One of these gases when reacts with dry calcium hydroxide produces a compound 'Z' which is widely used in water treatment plants and textile industries. Name Z and write chemical equation for the reaction involved in its formation.

Q.35 [5 marks]

(a) (i) What are spores? On which structures are they formed? How do they overcome unfavourable conditions? Name the organism which multiplies with the help of these structures.

(ii) Give two reasons why some plants are grown by the method of vegetative propagation. List two methods used to grow plants vegetatively.

OR

(b) (i) Study the diagram given below and name the parts marked as A, B and C. What happens when B reaches C in the ovary? Mention its significance.

(ii) Write the post fertilisation changes that occur in a flower.

OR

Q.35 [5 marks]

(i) Study the diagram given below and name the parts marked as A, B and C. What happens when B reaches C in the ovary? Mention its significance.

(ii) Write the post fertilisation changes that occur in a flower.

Q.36 [5 marks]

(a) (i) Draw a ray diagram to show the path of the refracted ray in each of the following cases:

A ray of light incident on a concave lens

(1) parallel to its principal axis, and

(2) is directed towards its principal focus.

(ii) A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 24 cm. The distance of object from the lens is 16 cm. Find the position and size of image formed.

OR

(b) (i) Draw a ray diagram to show the path of the reflected ray in each of the following cases:

A ray of light incident on a convex mirror

(1) parallel to its principal axis, and

(2) is directed towards its principal focus.

(ii) A 1.5 cm tall candle flame is placed perpendicular to the principal axis of a concave mirror of focal length 12 cm. If the distance of the flame from the pole of the mirror is 18 cm, use mirror formula to determine the position and size of the image formed.

OR

Q.36 [5 marks]

(i) Draw a ray diagram to show the path of the reflected ray in each of the

following cases:

A ray of light incident on a convex mirror

(1) parallel to its principal axis, and

(2) is directed towards its principal focus.

(ii) A 1.5 cm tall candle flame is placed perpendicular to the principal axis of a concave mirror of focal length 12 cm. If the distance of the flame from the pole of the mirror is 18 cm, use mirror formula to determine the position and size of the image formed.

Section E

Case Study Based Questions (4 marks each)

Q.37 [4 marks]

Case Study: More than three million carbon compounds have been discovered in the field of chemistry. The diversity of these compounds is due to the capacity of carbon atoms for bonding with one another as well as with other atoms. Most of the carbon compounds are poor conductors of electricity and have low melting and boiling points.

Q.37(a) [4 marks]

(Case Study Q37) Write the molecular formula of first two members of homologous series having functional group –Br.

Q.37(b) [4 marks]

(Case Study Q37) Given below are the formulae of some functional groups:

(i) –C(=O)–H

(ii) –C(=O)–

Write the name of these functional groups.

Q.37(c) [4 marks]

(Case Study Q37) (i) What would be observed on adding a 5% alkaline

potassium permanganate drop by drop to some warm ethanol taken in a test tube? State the role of $KMnO_4$ in the reaction and write the chemical equation for the reaction involved.

OR

(ii) Write the name of the compound formed when ethanol is heated at 443 K temperature with excess of conc. H_2SO_4. What is the role of conc. H_2SO_4 in the reaction? Write chemical equation for the reaction involved.

OR

Q.37(c) [4 marks]

(Case Study Q37) Write the name of the compound formed when ethanol is heated at 443 K temperature with excess of conc. H_2SO_4. What is the role of conc. H_2SO_4 in the reaction? Write chemical equation for the reaction involved.

Q.38 [4 marks]

Case Study: Human digestive system is a tube running from mouth to anus. Its main function is to breakdown complex molecules present in the food which cannot be absorbed as such into smaller molecules. These molecules are absorbed across the walls of the tube and the absorbed food reaches each and every cell of the body where it is utilised for obtaining energy.

Q.38(a) [4 marks]

(Case Study Q38) Name the glands present in the buccal cavity and write the components of food on which the secretion of these glands act upon.

Q.38(b) [4 marks]

(Case Study Q38) Two organs have a sphincter muscle at their exit. Name them.

Q.38(c) [4 marks]

(Case Study Q38) What will happen if:

(i) mucus is not secreted by the gastric glands.

(ii) Villi are absent in the small intestine.

OR

"Bile juice does not contain any enzyme, yet it has important roles in digestion." Justify the statement.

OR

Q.38(c) [4 marks]

(Case Study Q38) "Bile juice does not contain any enzyme, yet it has important roles in digestion." Justify the statement.

Q.39 [4 marks]

Case Study: In a domestic circuit five LED bulbs are arranged as shown. The source voltage is 220 V and the power rating of each bulb is marked in the circuit diagram. Based on the following circuit diagram, answer the following questions:

[Circuit diagram shows: Bulb A (22W, 220V) in series with the mains. After bulb A, the circuit splits into two parallel branches controlled by keys K_1 and K_2. Branch 1 (K_1): Bulbs B (11W, 0.6V) and C (11W, 0.6V) in series. Branch 2 (K_2): Bulbs D (11W, 0.6V) and E (11W, 0.6V) in series.]

Q.39(a) [4 marks]

(Case Study Q39) State what happens when:

(i) key K_1 is closed.

(ii) key K_2 is closed.

Q.39(b) [4 marks]

(Case Study Q39) Find the current drawn by the bulb B when it glows.

Q.39(c) [4 marks]

(Case Study Q39) Calculate:

(i) the resistance of bulb B, and

(ii) total resistance of the combination of four bulbs B, C, D and E.

OR

What would happen to the glow of all the bulbs in the circuit when keys K_1 and K_2 both are closed and the bulb C suddenly get fused? Give reason to justify your answer.

OR

Q.39(c) [4 marks]

(Case Study Q39) What would happen to the glow of all the bulbs in the circuit when keys K_1 and K_2 both are closed and the bulb C suddenly get fused? Give reason to justify your answer.