CBSE 2024 Science — Set 2

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]

Solid Calcium oxide reacts vigorously with water to form Calcium hydroxide accompanied by the liberation of heat. From the information given above it may be concluded that this reaction:

(a) is endothermic and pH of the solution formed is more than 7.
(b) is exothermic and pH of the solution formed is 7.
(c) is endothermic and pH of the solution formed is 7.
(d) is exothermic and pH of the solution formed is more than 7.

Q.2 [1 mark]

Juice of tamarind turns blue litmus to red. It is because of the presence of an acid called:

(a) methanoic acid
(b) acetic acid
(c) tartaric acid
(d) oxalic acid

Q.3 [1 mark]

Select from the following a process in which a combination reaction is involved:

(a) Black and White photography
(b) Burning of coal
(c) Burning of methane
(d) Digestion of food

Q.4 [1 mark]

The oxide which can react with HCl as well as KOH to give corresponding salt and water is:

(a) CuO
(b) Al_2O_3
(c) Na_2O
(d) K_2O

Q.5 [1 mark]

Consider the following cases:
(a) $CaSO_4 + Al \rightarrow$
(b) $CuSO_4 + Ca \rightarrow$
(c) $FeSO_4 + Cu \rightarrow$
(d) $ZnSO_4 + Mg \rightarrow$
The cases in which new products will form are:

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

Q.6 [1 mark]

Identify the correct statement about the following reaction:
$2H_2S + SO_2 \rightarrow 2H_2O + S$

(a) H_2S is oxidising agent and SO_2 is reducing agent.
(b) H_2S is reduced to sulphur.
(c) SO_2 is oxidising agent and H_2S is reducing agent.
(d) SO_2 is reduced to sulphur.

Q.7 [1 mark]

Consider the following statements about homologous series of carbon compounds:
(a) All succeeding members differ by $–CH_2$ unit.
(b) Melting point and boiling point increases with increasing molecular mass.
(c) The difference in molecular masses between two successive members is

16 u.

(d) C_2H_6 and C_3H_4 are NOT the successive members of alkyne series.

The correct statements are:

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

Q.8 [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 through vena cava from upper and lower body.

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

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

Q.9 [1 mark]

Select out of the following a gland which does NOT occur as a pair in the human body:

(a) Pituitary
(b) Ovary
(c) Testis
(d) Adrenal

Q.10 [1 mark]

In human respiratory system, when a person breathes in, the position of ribs and diaphragm will be:

(a) lifted ribs and curvedome shaped diaphragm.
(b) lifted ribs and flattened diaphragm.
(c) relaxed ribs and flattened diaphragm.
(d) relaxed ribs and curvedome shaped diaphragm.

Q.11 [1 mark]

Identify the mode of asexual reproduction in the following organism (Planaria-like organism shown in diagram):

(a) Fragmentation
(b) Multiple fission
(c) Budding
(d) Binary fission

Q.12 [1 mark]

A cross made between two pea plants produces 50% tall and 50% short pea plants. The gene combination of the parental pea plants must be:

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

Q.13 [1 mark]

Consider the following statements in the context of human eye:

(a) The diameter of the eye ball is about 2.3 cm.

(b) Iris is a dark muscular diaphragm that controls the size of the pupil.

(c) Most of the refraction for the light rays entering the eye occurs at the crystalline lens.

(d) While focusing on the objects at different distances the distance between

the crystalline lens and the retina is adjusted by ciliary muscles.

The correct statements are:

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

Q.14 [1 mark]

The maximum resistance of a network of five identical resistors of 1/5 Ω each can be:

(a) 1 Ω
(b) 0.5 Ω
(c) 0.25 Ω
(d) 0.1 Ω

Q.15 [1 mark]

Study the I-V graph for three resistors of resistances R_1, R_2 and R_3, and select the correct statement from the following (R_1 has the steepest slope, R_3 has the least steep slope):

(a) $R_1 = R_2 = R_3$
(b) $R_1 > R_2 > R_3$
(c) $R_3 > R_2 > R_1$
(d) $R_2 > R_3 > R_1$

Q.16 [1 mark]

Strength of magnetic field produced by a current carrying solenoid DOES NOT depend upon:

(a) number of turns in the solenoid
(b) direction of the current flowing through it
(c) radius of solenoid
(d) material of core of the solenoid

Q.17 [1 mark]

Assertion (A): Different metals have different reactivities with water and dilute acids.

Reason (R): Extraction of a metal from its ore depends on its position in the reactivity series.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Q.18 [1 mark]

Assertion (A): Human female has a perfect pair of sex chromosome.

Reason (R): Sex chromosome contributed by the human male in the zygote decides the sex of a child.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Q.19 [1 mark]

Assertion (A): Myopic eye cannot see distant objects distinctly.

Reason (R): For the correction of myopia converging lenses of appropriate power are prescribed by eye-surgeons.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is true, but (R) is false.
(d) (A) is false, but (R) is true.

Q.20 [1 mark]

Assertion (A): The deflection of a compass needle placed near a current carrying wire decreases when the magnitude of an electric current in the wire

is increased.

Reason (R): Strength of the magnetic field at a point due to a current carrying conductor increases on increasing the current in the conductor.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
(c) (A) is 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]

(a) 'No precipitation reaction can occur without exchange of ions between the two reactants.' Justify this statement giving a balanced chemical equation for the reaction.

OR

(b) Giving one example of each, differentiate between a displacement reaction and a double displacement reaction.

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Q.21 [2 marks]

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Q.22 [2 marks]

Photosynthesis takes place in the leaves and the food prepared by it reaches other parts of the plants. Name the process involved and explain it.

Q.23 [2 marks]

'Stability of DNA in a species is ensured during sexual reproduction.' Justify the statement.

Q.24 [2 marks]

(a) State two laws of refraction of light.

OR

(b) Define the term absolute refractive index of a medium. A ray of light enters from vacuum to glass of absolute refractive index 1.5. Find the speed of light in glass. The speed of light in vacuum is 3×10^8 m/s.

OR

Q.24 [2 marks]

Define the term absolute refractive index of a medium. A ray of light enters from vacuum to glass of absolute refractive index 1.5. Find the speed of light in glass. The speed of light in vacuum is 3×10^8 m/s.

Q.25 [2 marks]

Use Ohm's law to determine the potential difference across the 3 Ω resistor in the circuit shown in the following diagram when key is closed:
The circuit has a 2V battery connected to three resistors: 2Ω and 3Ω in parallel, and this combination in series with a 1Ω resistor.

Q.26 [2 marks]

Name the term used for the materials which cannot be broken down by biological processes. Give two ways by which they harm various components of an ecosystem.

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

It is observed that Calcium on reaction with water floats on its surface. Explain why it happens. Also write a balanced chemical equation for the reaction that occurs. What happens when the aqueous solution of the product of this reaction reacts with Carbon dioxide gas? Write a balanced chemical equation for the reaction.

Q.28 [3 marks]

Draw a labelled diagram to show electrolytic refining of copper. State what happens when electric current is passed through the electrolyte taken in this case.

Q.29 [3 marks]

(a) Give reasons for the following:

(i) Alveoli in lungs are richly supplied with blood capillaries.

(ii) Respiratory pigment in the blood takes up oxygen and not carbon dioxide.

(iii) During anaerobic respiration, a 3-carbon molecule is formed as an end product instead of CO_2 in human beings.

OR

(b) (i) Name the movements that occur all along the gut in human digestive system. How do they help in digestion?

(ii) Where is bile juice stored in human body? List two roles of bile juice.

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Q.30 [3 marks]

Explain the events that take place once a sperm reaches the oviduct till it becomes a foetus. Write the role of placenta in pregnancy.

Q.31 [3 marks]

(a) Define the term power of accommodation of human eye. Write the name of the part of eye which plays a major role in the process of accommodation and explain what happens when human eye focuses on (i) nearby objects and (ii) distant objects.

OR

(b) Draw a ray diagram to show the formation of a rainbow in the sky. On this diagram mark A — where dispersion of light occurs, B — where internal reflection of light occurs and C — where refraction of light occurs. List two necessary conditions to observe a rainbow.

OR

Q.31 [3 marks]

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Q.32 [3 marks]

Draw a diagram to show the pattern of magnetic field lines on a horizontal sheet of paper due to a straight conductor passing through its centre and carrying current vertically upwards. Mark on it (i) the direction of current in the conductor and (ii) the corresponding field lines. State right hand thumb

rule and check whether the directions marked by you are in accordance with this rule.

Q.33 [3 marks]

Use of pesticides to protect our crops affect organisms at various trophic levels and eventually humans. Name the phenomenon involved and explain how does it happen.

Section D

Long Answer Questions (5 marks each)

Q.34 [5 marks]

(a) (i) Give reason why carbon can neither form C^{4+} cations nor C^{4-} anions but form covalent compounds.

(ii) What is homologous series of carbon compound? Write the molecular formula of any two consecutive members of homologous series of aldehydes.

(iii) Draw the structure of the molecule of cyclohexane (C_6H_{12}).

OR

(b) (i) Name a commercially important carbon compound having functional group –OH and write its molecular formula.

(ii) Write chemical equation to show its reaction with:

(1) Sodium metal

(2) Excess conc. sulphuric acid

(3) Ethanoic acid in the presence of an acid catalyst

(4) Acidified potassium dichromate

Also write the name of the product formed in each case.

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Q.35 [5 marks]

(a) (i) Distinguish between hormonal co-ordination in plants and animals.

(ii) Which part of the brain is responsible for:

(1) intelligence

(2) riding a bicycle

(3) vomiting

(4) controlling hunger

(iii) How is brain and spinal-cord protected against mechanical injuries?

OR

(b) (i) What are tropic movements? Give an example of a plant hormone which (1) inhibits growth and (2) promotes cell division.

(ii) Explain directional movement of a tendril in pea plant in response to touch. Name the hormone responsible for this movement.

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Q.36 [5 marks]

(a) A concave mirror has a focal length of 15 cm. Find the position of the image when an object is placed:
(i) at a distance equal to the radius of curvature of the mirror, and
(ii) between the focus and the centre of curvature.
In each case, find the nature of the image formed. Also draw the ray diagram.

OR

(b) Upper half of a convex lens is covered with a black paper. Draw a ray diagram to show the formation of image of an object placed at a distance of 2F from such a lens. Mention the position and nature of the image formed. State the observable difference in the image obtained if the lens is uncovered. Give reason to justify your answer.

OR

Q.36 [5 marks]

Upper half of a convex lens is covered with a black paper. Draw a ray diagram to show the formation of image of an object placed at a distance of 2F from such a lens. Mention the position and nature of the image formed. State the observable difference in the image obtained if the lens is uncovered. Give reason to justify your answer.

Section E

Case Study Based Questions (4 marks each)

Q.37 [4 marks]

Case Study: Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them.

Q.37(a) [4 marks]

(Case Study Q37) Identify the acid and base from which Sodium chloride is formed.

Q.37(b) [4 marks]

(Case Study Q37) Find the cation and the anion present in Calcium sulphate.

Q.37(c) [4 marks]

(Case Study Q37) 'Sodium chloride and washing soda both belong to the same family of salts.' Justify this statement.

OR

Define the term pH scale. Name the salt obtained by the reaction of Potassium hydroxide and Sulphuric acid and give the pH value of its aqueous solution.

Q.38 [4 marks]

Case Study: Asexual reproduction involves a single parent to produce offsprings without the formation of gametes. It occurs by the following ways: Fission, Budding, Fragmentation, Spore formation and Regeneration. In one of the methods like regeneration, Planaria A is cut horizontally into three pieces — L, M and N and Planaria B is cut vertically into two equal halves — O and P.

Q.38(a) [4 marks]

(Case Study Q38) Which of the cut pieces of the two Planaria could regenerate to form a complete organism?

Q.38(b) [4 marks]

(Case Study Q38) Give an example of another organism which follows the same mode of reproduction as Planaria.

Q.38(c) [4 marks]

(Case Study Q38) What is the meaning of 'development' in regeneration?

Q.38(d) [4 marks]

(Case Study Q38) Differentiate between regeneration and fragmentation.

OR

What is the meaning of 'development' in regeneration?

Q.39 [4 marks]

Case Study: When electric current flows in a purely resistive circuit, electrical energy gets fully converted into heat energy. The amount of heat produced (H) in the circuit is found to be directly proportional to (i) the square of current (I^2), (ii) the resistance (R) of the conductor and (iii) the time (t) for which current flows. In other words $H = I^2Rt$. Electrical devices such as electric fuse, electric heater, electric iron etc. are all based on this effect called heating effect of electric current.

Q.39(a) [4 marks]

(Case Study Q39) List two properties of heating elements.

Q.39(b) [4 marks]

(Case Study Q39) List two properties of electric fuse.

Q.39(c) [4 marks]

(Case Study Q39) Name the principle on which an electric fuse works. Explain how a fuse wire is capable of saving electrical appliances from getting damaged due to accidentally produced high current.

OR

The power of an electric heater is 1100 W. If the potential difference between the two terminals of the heater is 220 V, find the current flowing in the circuit. What will happen to an electric fuse of rating 5 A connected in this circuit?