CBSE 2023 Science — Set 1

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]

In the experimental setup given below, it is observed that on passing the gas produced in the reaction in the solution 'X', the solution 'X' first turns milky and then colourless. The option that justifies the above stated observation is that 'X' is aqueous calcium hydroxide and

(a) it turns milky due to carbon dioxide gas liberated in the reaction and after sometime it becomes colourless due to formation of calcium carbonate which is soluble in water.

(b) it turns milky due to formation of calcium carbonate and on passing excess of carbon dioxide it becomes colourless due to formation of calcium hydrogen carbonate which is soluble in water.

(c) it turns milky due to passing of carbon dioxide through it. It turns colourless as on further passing carbon dioxide, sodium hydrogen carbonate is formed which is soluble in water.

(d) the carbon dioxide liberated during the reaction turns lime water milky due to formation of calcium hydrogen carbonate and after some time it turns colourless due to formation of calcium carbonate which is soluble in water.

Q.2 [1 mark]

The emission of brown fumes in the given experimental set-up is due to

(a) thermal decomposition of lead nitrate which produces brown fumes of nitrogen dioxide.

(b) thermal decomposition of lead nitrate which produces brown fumes of lead oxide.

(c) oxidation of lead nitrate forming lead oxide and nitrogen dioxide.

(d) oxidation of lead nitrate forming lead oxide and oxygen.

Q.3 [1 mark]

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$. In order to balance the above chemical equation, the values of x, y and z respectively are:

(a) 6, 2, 2
(b) 4, 1, 2
(c) 4, 2, 1
(d) 2, 2, 1

Q.4 [1 mark]

The table below has information regarding pH and the nature (acidic/basic) of four different solutions. Which one of the options in the table is correct?

(a) Lemon juice | Orange pH paper | pH 3 | Basic
(b) Milk of magnesia | Blue pH paper | pH 10 | Basic
(c) Gastric juice | Red pH paper | pH 6 | Acidic
(d) Pure water | Yellow pH paper | pH 7 | Neutral

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(c) Gastric juice, Red pH paper, pH 6, Acidic
(d) Pure water, Yellow pH paper, pH 7, Neutral

Q.5 [1 mark]

A metal 'X' is used in thermite process. When X is burnt in air it gives an amphoteric oxide 'Y'. 'X' and 'Y' are respectively:

(a) Fe and Fe_2O_3
(b) Al and Al_2O_3
(c) Fe and Fe_3O_4
(d) Al and Al_3O_4

Q.6 [1 mark]

Select washing soda from the following:

(a) $NaHCO_3$
(b) $Na_2CO_3.5H_2O$
(c) $Na_2CO_3.10H_2O$
(d) NaOH

Q.7 [1 mark]

Consider the structures of the three cyclic carbon compounds A, B and C given below and select the correct option from the following:

(a) A and C are isomers of hexane and B is benzene.
(b) A is an isomer of hexane, B is benzene and C is an isomer of hexene.
(c) A is a saturated cyclic hydrocarbon and B and C are unsaturated cyclic hydrocarbons.
(d) A is cyclohexane and B and C are the isomers of benzene.

Q.8 [1 mark]

An organism which breaks down the food material outside the body and then absorbs it is

(a) a plant parasite, Cuscuta
(b) an animal parasite, Tapeworm
(c) a bacteria, Rhizobium
(d) a fungi, Rhizopus

Q.9 [1 mark]

Consider the following statements about small intestine and select the one which is NOT correct:

(a) The length of the small intestine in animals differs as it depends on the type of food they eat.
(b) The small intestine is the site of complete digestion of food.
(c) The small intestine receives secretions from liver and pancreas.
(d) The villi of the small intestine absorb water from the unabsorbed food before it gets removed from the body via the anus.

Q.10 [1 mark]

The statement that correctly describes the characteristic(s) of a gene is:

(a) In individuals of a given species, a specific gene is located on a particular chromosome.
(b) A gene is not the information source for making proteins in the cell.
(c) Each chromosome has only one gene located all along its length.
(d) All the inherited traits in human beings are not controlled by genes.

Q.11 [1 mark]

Select from the following the correct statement about tropic movement in plants:

(a) It is due to stimulus of touch and temperature.
(b) It does not depend upon the direction of stimulus received.
(c) It is observed only in roots and not in stems.
(d) It is a growth related movement.

Q.12 [1 mark]

Select the INCORRECT match (between the plant and its vegetative part) from the following:

(a) Bryophyllum, leaf
(b) Potato, stem
(c) Money-plant, stem
(d) Rose, root

Q.13 [1 mark]

If four identical resistors, of resistance 8 ohm, are first connected in series so as to give an effective resistance Rs, and then connected in parallel so as to give an effective resistance Rp, then the ratio Rs/Rp is

(a) 32
(b) 2
(c) 0.5

(d) 16

Q.14 [1 mark]

In domestic electric circuits the wiring with 15 A current rating is for the electric devices which have

(a) higher power ratings such as geyser.
(b) lower power ratings such as fan.
(c) metallic bodies and low power ratings.
(d) non-metallic bodies and low power ratings.

Q.15 [1 mark]

In the following diagram, the position of the needle is shown on the scale of a voltmeter. The least count of the voltmeter and the reading shown by it respectively are:

(a) 0.15 V and 1.6 V
(b) 0.05 V and 1.6 V
(c) 0.15 V and 1.8 V
(d) 0.05 V and 1.8 V

Q.16 [1 mark]

The resultant magnetic field at point 'P' situated midway between two parallel wires (placed horizontally) each carrying a steady current I is

(a) in the same direction as the current in the wires.
(b) in the vertically upward direction.
(c) zero
(d) in the vertically downward direction.

Q.17 [1 mark]

Assertion (A): The colour of aqueous solution of copper sulphate turns colourless when a piece of lead is added to it.

Reason (R): Lead is more reactive than copper, and hence displaces copper

from its salt solution.

(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.

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Q.18 [1 mark]

Assertion (A): Genes inherited from the parents decide the sex of a child.
Reason (R): X chromosome in a male child is inherited from his father.

(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).
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Q.19 [1 mark]

Assertion (A): Blood clotting prevents excessive loss of blood.
Reason (R): Blood clotting is due to blood plasma and white blood cells present in the blood.

(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.
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Q.20 [1 mark]

Assertion (A): The strength of the magnetic field produced at the centre of a current carrying circular coil increases on increasing the number of turns in it.
Reason (R): The current in each circular turn has the same direction and the magnetic field due to each turn then just adds up.

(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.
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Q.21(a) [2 marks]

(a) (i) A compound 'X' which is prepared from gypsum has the property of hardening when mixed with proper quantity of water. Identify 'X' and write its chemical formula.
(ii) State the difference in chemical composition between baking soda and baking powder.

OR

Q.21(a) [2 marks]

(OR) Write balanced chemical equation for the reaction that occurs when:

(i) blue coloured copper sulphate crystals are heated and

(ii) Sodium hydrogen carbonate is heated during cooking.

Q.22(a) [2 marks]

(a) Write the role of insulin in regulating blood sugar levels in human body. Mention the disease caused due to it.

Q.22(b) [2 marks]

(b) How is the timing and the amount of release of insulin in the blood regulated?

Q.23(a) [2 marks]

(a) Name the type of blood (oxygenated / deoxygenated) transported by each of the following mentioning the path (i.e. from one organ (which place) to another (which place)).

(i) Vena cava

(ii) Pulmonary artery

OR

Q.23(a) [2 marks]

(OR) With the help of a schematic flow chart, show the breakdown of glucose in a cell to provide energy -

(i) in the presence of oxygen

(ii) in lack of oxygen

Section B

Very Short Answer Questions (2 marks each)

Q.24 [2 marks]

Name the part of the human excretory system where nephrons are found. Write the structure and function of nephrons.

Q.25(a) [2 marks]

(a) A narrow beam XY of white light is passing through a glass prism ABC as shown in the diagram. Trace it on your answer sheet and show the path of the emergent beam as observed on the screen PQ. Name the phenomenon observed and state its cause.

OR

Q.25(a) [2 marks]

(OR) (b) It is observed that the power of an eye to see nearby objects as well as far off objects diminishes with age.

(i) Give reason for the above statement.

(ii) Name the defect that is likely to arise in the eyes in such a condition.

(iii) Draw a labelled ray diagram to show the type of corrective lens used for restoring the vision of such an eye.

Q.26 [2 marks]

How do harmful chemicals get accumulated progressively at each trophic level in a food chain?

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

(a) Identify the oxidising agent in the following reactions:

(i) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

(ii) $H_2O + F_2 \rightarrow HF + HOF$

(iii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

(iv) $2H_2 + O_2 \rightarrow 2H_2O$

(b) Define a redox reaction in terms of gain or loss of oxygen.

Q.28 [3 marks]

(a) Suggest one remedial measure each to counteract the change in pH in human beings in following cases:

(i) Production of too much acid in stomach during indigestion

(ii) Sting by a honey bee / nettle leaves

(b) Fresh milk has a pH of 6. When it changes into curd will its pH increase or decrease? Why?

Q.29(a) [3 marks]

(a) (i) State the role of ATP in cellular respiration.

(ii) What ensures sufficient exchange of gases in plants?

(iii) State the conditions on which the direction of diffusion of gases in plant depend upon.

OR

Q.29(a) [3 marks]

(OR) (a) (i) What is the internal energy reserve in plants and animals?

(ii) How do desert plants perform photosynthesis if their stomata remain closed during the day?

Q.30 [3 marks]

(a) Complete the following ray diagram to show the formation of image. (Two rays from an object placed between F and 2F of a concave mirror are shown.)

(b) Mention the nature, position, and size of the image formed in this case.

(c) State the sign of the image distance in this case using the Cartesian sign convention.

Q.31 [3 marks]

Give reasons for the following:

(a) Danger signals installed at airports and at the top of tall buildings are of red colour.

(b) The sky appears dark to the passengers flying at very high altitudes.

(c) The path of a beam of light passing through a colloidal solution is visible.

Q.32(a) [3 marks]

(a) (i) State the rule used to find the force acting on a current carrying conductor placed in a magnetic field.

(ii) Given below are three diagrams showing entry of an electron in a magnetic field. Identify the case in which the force will be (1) maximum and (2) minimum respectively. Give reason for your answer.

[Diagram (i) shows electron entering perpendicular to field, (ii) at an angle, (iii) parallel to field]

OR

Q.32(a) [3 marks]

(OR) (a) Draw the pattern of magnetic field lines of

(i) a current carrying solenoid

(ii) a bar magnet

(b) List two distinguishing features between the two fields.

Q.33(a) [3 marks]

(a) (i) Why does a kitchen garden called an artificial ecosystem while a forest is considered to be a natural ecosystem?

(ii) While designing an artificial ecosystem at home, write any two things to be kept in mind to convert it into a self-sustaining system. Give reason to justify your answer.

OR

Q.33(a) [3 marks]

(OR) (b) Construct a food chain of four trophic levels comprising the following: Hawk, snake, plants, rat.

(c) 20,000 J of energy was transferred by the producers to the organisms of second trophic level. Calculate the amount of energy that will be transferred by organisms of the third trophic level to the organisms of the fourth trophic level.

Q.34(a) [5 marks]

(a) A saturated organic compound 'A' belongs to the homologous series of alcohols. On heating 'A' with concentrated sulphuric acid at 443 K, it forms an unsaturated compound 'B' with molecular mass 28 u. The compound 'B' on addition of one mole of hydrogen in the presence of Nickel, changes to a saturated hydrocarbon 'C'.

(i) Identify A, B and C.

(ii) Write the chemical equations showing the conversion of A into B.

(iii) What happens when compound C undergoes combustion?

(iv) State one industrial application of hydrogenation reaction.

(v) Name the products formed when compound A reacts with sodium.

OR

Q.34(a) [5 marks]

(OR) (b) (i) With the help of diagram, show the formation of micelles, when soap is applied on oily dirt.

(ii) Take two test tubes X and Y with 10 mL of hard water in each. In test tube 'X', add few drops of soap solution and in test tube 'Y' add a few drops of detergent solution. Shake both the test tubes for the same period.

(1) In which test tube the formation of foam will be more? Why?

(2) In which test tube is a curdy solid formed? Why?

Section D

Long Answer Questions (5 marks each)

Q.35 [5 marks]

(a) Name the parts of a bisexual flower that are not directly involved in reproduction.

(b) Differentiate between self pollination and cross pollination. List any two significance of pollination.

(c) What is the fate of ovules and ovary after fertilization in a flower?

Q.36 [5 marks]

(a) An electric iron consumes energy at a rate of 880 W when heating is at the maximum rate and 330 W when the heating is at the minimum. If the source voltage is 220 V, calculate the current and resistance in each case.

(b) What is heating effect of electric current?

(c) Find an expression for the amount of heat produced when a current passes through a resistor for some time.

Section E

Case Study Based Questions (4 marks each)

Q.37 [4 marks]

Almost all metals combine with oxygen to form metal oxides. Metal oxides are generally basic in nature. But some metal oxides show both basic as well as acidic behaviour. Different metals show different reactivities towards oxygen. Some react vigorously while some do not react at all.

(a) What happens when copper is heated in air? (Give the equation of the reaction involved.)

(b) Why are some metal oxides categorized as amphoteric? Give one example.

(c) Complete the following equations:

(i) $Na_2O(s) + H_2O(l) \rightarrow$

(ii) $Al_2O_3 + 2NaOH \rightarrow$

OR

Q.37 [4 marks]

(OR)

(c) On burning Sulphur in oxygen a colourless gas is produced.

(i) Write chemical equation for the reaction.

(ii) Name the gas formed.

(iii) State the nature of the gas.

(iv) What will be the action of this on a dry litmus paper?

Q.38(a) [4 marks]

In order to trace the inheritance of traits Mendel crossed pea plants having one contrasting character or a pair of contrasting characters. When he crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds, he observed that no plants with wrinkled and green seeds were obtained in the F1 generation. When the F1 generation pea plants were cross-bred by self-pollination, the F2 generation had seeds with different combinations of shape and colour also.

(a) Write any two pairs of contrasting characteristics of pea plant used by Mendel other than those mentioned above.

(b) Differentiate between dominant and recessive traits.

(c) State the ratio of the combinations observed in the seeds of F2 generation (in the above case). What do you interpret from this result?

OR

Q.38(a) [4 marks]

(OR) (c) Given below is a cross between a pure violet flowered pea plant (V) and a pure white flowered pea plant (v). Diagrammatically explain what type of progeny is obtained in F1 generation and F2 generation:

Pure violet flowered plant x Pure white flowered plant

(VV) (vv)

Q.39(a) [4 marks]

Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as 'Principal Focus' of the concave mirror.

(a) List two applications of concave mirror.

(b) If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror.

(c) Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror.

OR

Q.39(a) [4 marks]

(OR) (c) An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find:

(i) focal length of the mirror, and

(ii) magnification of the image formed with sign as per Cartesian sign convention.