CBSE EXAMINATION PAPER-2023

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 88

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **45 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 3** are case based questions

iv. **Section B** – questions number **4 to 23** are multiple choice questions

v. **Section C** – questions number **24 to 31** are very short answer

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

vii. **Section E** – questions number **41 to 45** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1.

Metals are required for a variety of purposes. For this, we need their extraction from their ores. Ores mined from the earth are usually contaminated with many impurities which must be removed prior to the extraction of metals. The extraction of pure metal involves the following steps:

(1) Concentration of ore

(2) Extraction of the metal from the concentrated ore

(3) Refining of the metal.

(1) Name an ore of Mercury and state the form in which Mercury is present in it.

[1 Marks]

(2) What happens to zinc carbonate when it is heated strongly in a limited supply of air?

[1 Marks]

(3)

The reaction of a metal A with (Fe_2O_3) is highly exothermic and is used to join railway tracks.

(i) Identify the metal A and name the reaction taking place.

(ii) Write the chemical equation for the reaction of metal A with (Fe_2O_3).

[2 Marks]

(4)

We cannot use carbon to obtain sodium from sodium oxide. Why ? State the reactions taking place at cathode and anode during electrolytic reduction of sodium chloride.

[2 Marks]

Question 2. In some families, either rural or urban, females are tortured for giving birth to a female child. They do not understand the scientific reason behind the birth of a boy or a girl. In fact, the mother is not responsible for the sex of the child and it has been genetically proved that the sex of a newborn is determined by what the child inherits from the father.

(1) State the basis on which the sex of a newborn baby is determined in humans.

[1 Marks]

(2) Why is the pair of sex chromosomes called a mismatched pair in males?

[1 Marks]

(3) How is the original number of chromosomes present in the parents restored in the progeny?

[2 Marks]

(4)

Explain by giving two examples of the organisms in which the sex is not genetically determined.

[2 Marks]

Question 3.

Many optical instruments consist of a number of lenses. They are combined to increase the magnification and sharpness of the image. The net power (P) of the lenses placed in contact is given by the algebraic sum of the powers of the individual lenses P_1, P_2, P_3 … as

$P = P_1 + P_2 + P_3 \ldots$

This is also termed as the simple additive property of the power of lens, widely used to design lens systems of cameras, microscopes and telescopes. These lens systems can have a combination of convex lenses and also concave lenses.

(1)

What is the nature (convergent / divergent) of the combination of a convex lens of power +4 D and a concave lens of power −2 D?

[1 Marks]

(2)

Calculate the focal length of a lens of power −2.5 D.

[1 Marks]

(3)

Draw a ray diagram to show the nature and position of an image formed by a convex lens of power +0.1 D, when an object is placed at a distance of 20 cm from its optical centre.

[2 Marks]

(4)

How is a virtual image formed by a convex lens different from that formed by a concave lens ? Under what conditions do a convex and a concave lens form virtual images ?

[2 Marks]

Section B

Question 4. Select a pair of olfactory indicators from the following:

[1 Marks]

(A) Clove oil and litmus solution

(B) Onion and turmeric

(C) Clove oil and vanilla essence

(D) Vanilla and methyl orange

Question 5.

The balanced chemical equation showing reaction between quicklime and water is:

[1 Marks]

(A) $CaO + H_2O \rightarrow Ca(OH)_2 + H_2 + Heat$

(B) $CaO + H_2O \rightarrow Ca(OH)_2 + Heat$

(C) $2\ CaO + 3\ H_2O \rightarrow 2\ Ca(OH)_3 + O_2 + Heat$

(D) $2\ CaO + H_2O \rightarrow 2\ CaOH + H_2 + Heat$

Question 6.

Study the following chemical reaction: $2\ Na\ (s) + 2\ H_2O\ (l) \rightarrow 2\ NaOH\ (aq) + H_2\ (g)\uparrow$. The reducing agent in this reaction is:

[1 Marks]

(A) H_2

(B) NaOH

(C) H_2O

(D) Na

Question 7. Fresh milk has a pH of 6. To delay its curdling, a chemical substance is added to it, which is:

[1 Marks]

(A) Sodium carbonate

(B) Baking powder

(C) Sodium hydroxide (Caustic soda)

(D) Baking soda (Sodium hydrogen carbonate)

Question 8. Which of the following statements is true for an amphoteric oxide?

[1 Marks]

(A) It reacts only with acid and does not form water.

(B) It reacts with acid as well as base to form salt and hydrogen gas.

(C) It reacts only with base and does not form water.

(D) It reacts with both acid as well as base to form salt and water.

Question 9. Hydronium ions are formed by the reaction between:

[1 Marks]

(A) Sodium hydroxide and water

(B) Calcium chloride and water

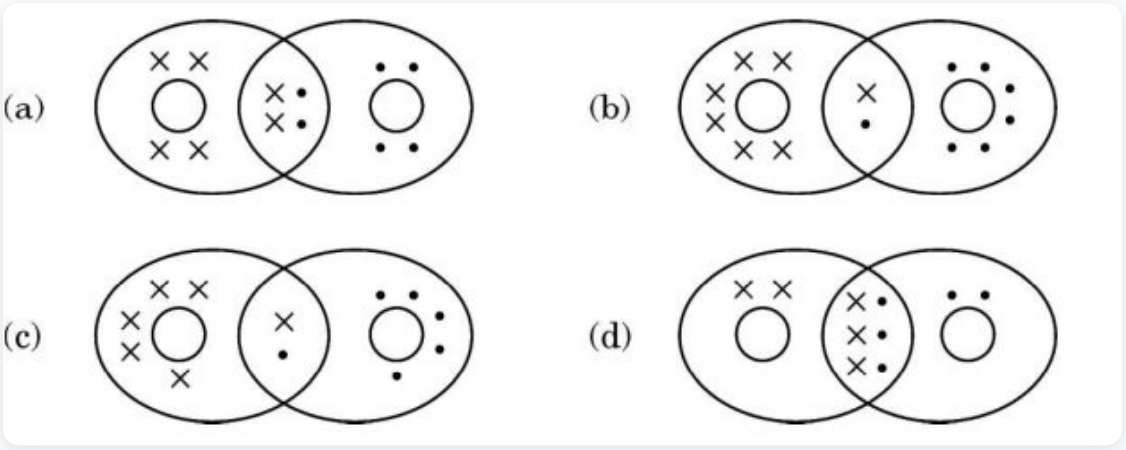
(C) Hydrogen chloride gas and water

(D) Ethanol and water

Question 10.

The correct representation of covalent bonding in an oxygen molecule is:

[1 Marks]



(A) B

(B) D

(C) A

(D) C

Question 11. The process in which loss of water in the form of vapours from the aerial parts of plants takes place is X, which helps in Y. Here X and Y respectively are:

[1 Marks]

(A) transpiration and photosynthesis

(B) transpiration and temperature regulation

(C) translocation and movement of soluble products of photosynthesis in phloem

(D) translocation and absorption of water and minerals from soil by roots

Question 12. As compared to terrestrial organisms, the rate of breathing in aquatic organisms is:

[1 Marks]

(A) faster because they need more oxygen for their survival

(B) faster because the amount of dissolved oxygen in water is fairly low

(C) slower because the amount of dissolved oxygen in water is fairly low

(D) slower because the capacity of water of dissolving atmospheric air is limited

Question 13.

Consider the following two statements:

(i) The trait that expresses itself in F_1 generation.

(ii) The trait that keeps on passing from one generation to another.

The appropriate terms for the statements (i) and (ii) respectively are:

[1 Marks]

(A) Dominant trait, Recessive trait

(B) Dominant trait, Inherited trait

(C) Recessive trait, Inherited trait

(D) Recessive trait, Dominant trait

Question 14. The part in which gustatory receptors are present in our body is:

[1 Marks]

(A) inner lining of nose

(B) skin

(C) inner ear

(D) tongue

Question 15.

The bacterial and the viral infections that may be caused due to unsafe sex respectively are:

[1 Marks]

(A) Gonorrhoea and Syphilis

(B) HIV-AIDS and Warts

(C) Syphilis and Warts

(D) Warts and HIV-AIDS

Question 16.

The expressions that relate (i) Q, I and t and (ii) Q, V and W respectively are (Here the symbols have their usual meanings):

[1 Marks]

(A) (i) I = Q/t (ii) W = V/Q

(B) (i) Q = I/T (ii) V = W/Q

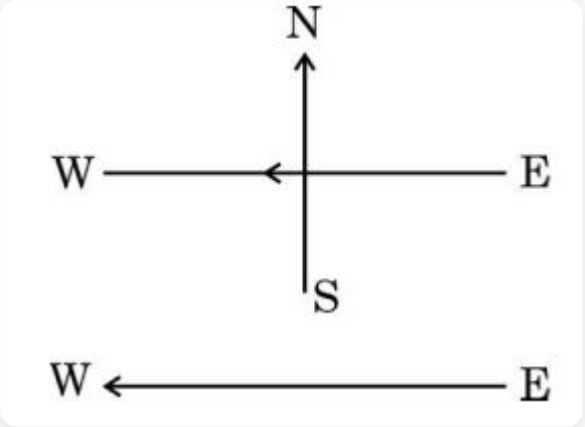
(C) (i) I = Q/t (ii) Q = V/W

(D) (i) Q = I × t (ii) W = V × Q

Question 17.

A constant current flows in a horizontal wire in the plane of the paper from east to west as shown in the figure. The direction of the magnetic field will be north to south at a point:

[1 Marks]



(A) directly below the wire

(B) directly above the wire

(C) located in the plane of the paper on the south side of the wire

(D) located in the plane of the paper on the north side of the wire

Question 18. An electric kettle consumes 1 kW of electric power when operated at 220 V. The minimum rating of the fuse wire to be used for it is:

[1 Marks]

(A) 1 A

(B) 2 A

(C) 4 A

(D) 5 A

Question 19. For a current in a long straight solenoid, N and S poles are created at the two ends. Among the following statements, the incorrect statement is:

[1 Marks]

(A) The magnetic field lines inside the solenoid are in the form of straight lines, which indicates that the magnetic field is uniform at all points inside the solenoid.

(B) The N and S poles exchange positions when the direction of current through the solenoid is reversed.

(C) The strong magnetic field produced inside the solenoid can magnetize the soft iron placed inside it.

(D) The pattern of the magnetic field associated with a current carrying solenoid is different from the pattern of the magnetic field around a bar magnet.

Question 20.

Assertion (A): In the reaction $ZnO + C \rightarrow Zn + CO$,

ZnO undergoes reduction.

Reason (R): Carbon is a reducing agent that reduces ZnO to Zn.

[1 Marks]

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

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

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Question 21.

Assertion (A): Human populations show a great deal of variations in traits.

Reason (R): All variations in a species have equal chances of surviving in the environment in which they live.

[1 Marks]

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

(B) Assertion (A) is false, but Reason (R) is true.

(C) Assertion (A) is true, but Reason (R) is false.

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

Question 22.

Assertion (A): The walls of atria are thicker than those of the ventricles.

Reason (R): Ventricles have to pump blood into various organs at high pressure.

[1 Marks]

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

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

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Question 23.

Assertion (A): Two magnetic field lines around a current carrying straight wire do not intersect each other.

Reason (R): The magnitude of the magnetic field produced at a given point increases as the current through the wire increases.

[1 Marks]

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

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

(C) Assertion (A) is false, but Reason (R) is true.

(D) Assertion (A) is true, but Reason (R) is false.

Section C

Question 24.

On heating 'X' at 373 K, it loses water molecules and becomes 'Y'. 'Y' is a substance which doctors use for supporting fractured bones in the right position.

(i) Identify 'X' and 'Y'.

(ii) How can 'X' be reobtained from 'Y'?

[2 Marks]

Question 25.

Two solutions M and N give Red and Blue colour respectively with a universal indicator.

(i) In which solution will the hydrogen ion concentration be more? Justify your answer.

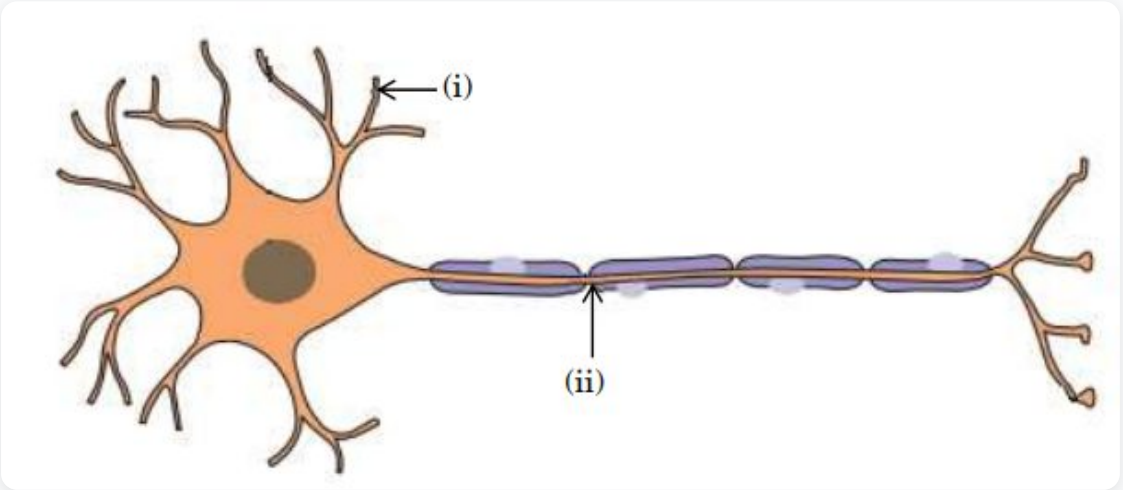
(ii) If both M and N solutions are mixed and the resultant mixture is tested with a universal indicator, it turns green. What is the nature of the salt formed? Justify your answer.

[2 Marks]

Question 26.

Write the name and function of parts (i) and (ii) in the diagram of a neuron given below.

[2 Marks]



Question 27.

List the events in proper sequence that take place during the process of photosynthesis.

[2 Marks]

Question 28.

Explain in brief two ways by which leaves of a plant help in excretion.

[2 Marks]

Question 29.

In the process of digestion of food in human beings, two protein-digesting enzymes are secreted. Name the enzymes along with the glands that secrete them.

[2 Marks]

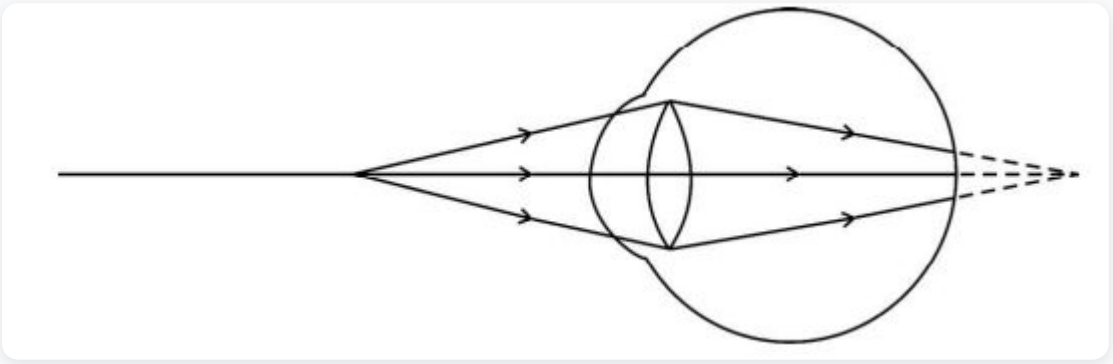
Question 30.

Observe the following diagram showing an image formation in an eye :

(a) Identify the defect of vision shown in the figure.

(b) List its two causes and suggest a suitable corrective lens to overcome this defect.

[2 Marks]



Question 31.

In the given food chain, if 50 J of energy is available to the hawk, how much energy is present at the first and third trophic levels? Justify your answer.

Grass → Grasshopper → Frog → Snake → Hawk

[2 Marks]

Section D

Question 32.

(a) Define a double displacement reaction.

(b) Write the chemical equation of a double displacement reaction which is also a

(i) Neutralization reaction and

(ii) Precipitation reaction. Give justification for your answer.

[3 Marks]

Question 33.

(a) Sometimes the pH of our mouth gets lower than 5.5. Why?

(b) A basic salt X' is obtained by heating baking soda followed by crystallisation. Identify 'X' and state its two industrial uses.

(c) Why do copper sulphate crystals turn white on heating?

[3 Marks]

Question 34.

(i) An object of 5 cm height is placed at a distance of 20 cm from the optical centre of a concave lens of focal length 18 cm. Calculate

(1) image distance and

(2) the magnification in this case.

(ii) Compare the values of magnification obtained by a concave lens and a convex lens when both the lenses form virtual images.

[3 Marks]

Question 35.

A convex lens can form a

(i) real, inverted and magnified image as well as

(ii) virtual, erect and magnified image of an object. If the focal length of the lens is 10 cm, what should be the range of the object distance in both cases ? Draw ray diagrams to justify your answer.

[3 Marks]

Question 36.

(a) State one important function of the following parts of the human eye :

(i) Retina

(ii) Pupil

(b) State the role of ciliary muscles in focussing objects at varying distances from the eye.

[3 Marks]

Question 37.

(i) A straight cylindrical conductor is suspended with its axis perpendicular to the magnetic field of a horse-shoe magnet. The conductor gets displaced towards left when a current is passed through it. What will happen to the displacement of the conductor if the

(1) current through it is increased ?

(2) horse-shoe magnet is replaced by another stronger horse-shoe magnet ?

(3) direction of current through it is reversed?

(ii) Name and state the rule for determining the direction of force on a current carrying conductor in a magnetic field.

[3 Marks]

Question 38.

Draw the pattern of the magnetic field produced around a vertical current carrying straight conductor passing through a horizontal cardboard. Mark the direction of current and the magnetic field lines. Name and state the rule which is used to determine the direction of magnetic field associated with a current carrying conductor.

[3 Marks]

Question 39.

How is ozone formed in the higher levels of the atmosphere? "Damage to the ozone layer is a cause of concern." Justify this statement.

[3 Marks]

Question 40.

(a) With the help of an activity, explain the action of saliva on the food we eat.

(b) Why is bile juice important in the process of digestion ?

[3 Marks]

Section E

Question 41.

A neutral organic compound 'X' (Molecular formula C_2H_6O) on reacting with acidified $K_2Cr_2O_7$ gives an organic compound 'Y' which is acidic in nature. 'X' reacts with 'Y' on warming in the presence of conc. H_2SO_4 to give a sweet smelling compound 'Z'.

(i) Identify 'X', 'Y' and 'Z'.

(ii) Write the chemical equations for the reactions in the conversion of (1) 'X' to 'Y' and (2) 'X' to 'Z'.

(iii) State the role of (1) acidified $K_2Cr_2O_7$ in the conversion of 'X' to 'Y' and (2) conc. H_2SO_4 in the reaction of 'X' and 'Y'.

(iv) Name the reaction which occurs when 'Z' reacts with an alkali.

[5 Marks]

Question 42.

Carry out the following conversions, stating the condition(s) for each:

(i) Ethanol ⟶ Ethene

(ii) Ethene ⟶ Ethane

(iii) Ethane ⟶ Chloroethane

(iv) Ethanol ⟶ Ethanoic acid

(v) Ethanoic acid ⟶ Ethyl ethanoate

[5 Marks]

Question 43.

(i) Where are testes located in the human males and why ? State two function of the testes.

(ii) In the human female, one of the ovaries releases an egg every month. State the changes that take place if

(1) the egg is fertilized, and

(2) the egg is not fertilized.

(iii) What is done during the surgical method in males and females to prevent pregnancy ?

[5 Marks]

Question 44.

(i) What happens when :

(1) Leaves of Bryophyllum fall on the soil ?

(2) Planaria is cut into many pieces ?

(3) Sporangia of Rhizopus on maturation liberate spores ? Mention the modes of reproduction in each of the above three cases.

(ii) Write the changes that occur in a flower once the fertilisation has taken place.

[5 Marks]

Question 45.

(a) State Ohm's Law.

(b) Name and define the physical quantity determined by the slope of V–I curve given in the diagram. Use this graph to find the value of this physical quantity in SI units.

(c) Establish the relationship between 1 kWh and 1 joule.

[5 Marks]

