CBSE EXAMINATION PAPER-2024

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 90

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 39** are short answer

vii. **Section E** – questions number **40 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. The metals produced by various reduction processes are not very pure. They contain impurities, which must be removed to obtain pure metals. The most widely used method for refining impure metals is electrolytic refining.

> **(1) What is the cathode and anode made of in the refining of copper by this process?**
>
> [1 Marks]

(2) Name the solution used in the above process and write its formula.

[1 Marks]

(3)

How copper get refined when electric current is passed in the electrolytic cell?

[2 Marks]

(4) You have two beakers 'A' and 'B' containing copper sulfate solution. What would you observe after about 2 hours if you dip a strip of zinc in beaker 'A' and a strip of silver in beaker 'B'? Give reason for your observations in each case.

[2 Marks]

Question 2.

Mendel worked out the rules of heredity by working on garden pea using a number of visible contrasting characters. He conducted several experiments by making a cross with one or two pairs of contrasting characters of pea plant. On the basis of his observations he gave some interpretations which helped to study the mechanism of inheritance.

(1)

When Mendel crossed pea plants with pure tall and pure short characteristics to produce F_1 progeny, which two observations were made by him in F_1 plants?

[1 Marks]

(2) Write one difference between dominant and recessive trait.

[1 Marks]

(3)

In a cross with two pairs of contrasting characters

Mendel observed 4 types of combinations in F_2 generation. By which method did he obtain F_2 generation? Write the ratio of the parental combinations obtained and what conclusions were drawn from this experiment.

RRYY	×	rryy
(Round Yellow)		(Wrinkled Green)

[2 Marks]

(4)

Justify the statement:

"It is possible that a trait is inherited but may not be expressed."

[2 Marks]

Question 3. Study the data showing the focal length of three concave mirrors A, B, and C and the respective distances of objects placed in front of the mirrors.

Case	Mirror	Focal Length (cm)	Object Distance (cm)
1	A	20	45
2	B	15	30
3	C	30	20

(1) List two properties of the image formed in case 2.

[1 Marks]

(2) In which one of the above cases will the mirror form a diminished image of the object? Justify your answer.

[1 Marks]

(3) What is the nature and size of the image formed by mirror C? Draw a ray diagram to justify your answer.

[2 Marks]

(4)

An object is placed at a distance of 18 cm from the pole of a concave mirror of focal length 12 cm. Find the position of the image formed in this case.

[2 Marks]

Section B

Question 4.

When 2 mL of sodium hydroxide solution is added to a few pieces of granulated zinc in a test tube and then warmed, the reaction that occurs can be written in the form of a balanced chemical equation as:

[1 Marks]

(A) $NaOH + Zn \rightarrow NaZnO_2 + H_2O$

(B) $2NaOH + Zn \rightarrow Na2ZnO_2 + H_2O$

(C) $2NaOH + Zn \rightarrow NaZnO_2 + H_2$

(D) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

Question 5.

Select from the following a decomposition reaction in which the source of energy for decomposition is light:

[1 Marks]

(A) $2AgBr \rightarrow 2Ag + Br_2$

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

(C) $CaCO_3 \rightarrow CaO + CO_2$

(D) $2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_2$

Question 6.

A metal and a non-metal that exists in liquid state at the room temperature are respectively:

[1 Marks]

(A) Bromine and Mercury

(B) Mercury and Bromine

(C) Iodine and Mercury

(D) Mercury and Iodine

Question 7.

Carbon compounds:

(i) are good conductors of electricity.

(ii) are bad conductors of electricity.

(iii) have strong forces of attraction between their molecules.

(iv) have weak forces of attraction between their molecules.

The correct statements are:

[1 Marks]

(A) (i) and (ii)

(B) (ii) and (iii)

(C) (i) and (iii)

(D) (ii) and (iv)

Question 8.

Consider the following compounds:

$FeSO_4$, $CuSO_4$, $CaSO_4$, Na_2CO_3

The compound having maximum number of waters of crystallization in its crystalline form in one molecule is:

[1 Marks]

(A) Na_2CO_3

(B) $CuSO_4$

(C) $CaSO_4$

(D) $FeSO_4$

Question 9. Oxides of aluminium and zinc are:

[1 Marks]

(A) basic

(B) acidic

(C) amphoteric

(D) neutral

Question 10.

$MnO_2+4HCl \rightarrow MnCl_2+2H_2O+ Cl_2$.

The reaction given above is a redox reaction because in this case:

[1 Marks]

(A) MnO_2 is reduced and HCl is oxidised.

(B) HCl is oxidised.

(C) MnO_2 is reduced.

(D) MnO_2 is oxidised and HCl is reduced.

Question 11.

Consider the following statements:

(i) The sex of a child is determined by what it inherits from the mother.

(ii) The sex of a child is determined by what it inherits from the father.

(iii) The probability of having a male child is more than that of a female child.

(iv) The sex of a child is determined at the time of fertilization when male and female gametes fuse to form a zygote. The correct statements are:

[1 Marks]

(A) (i) and (iii)

(B) (iii) and (iv)

(C) (ii) and (iv)

(D) (i), (ii), and (iv)

Question 12.

Chromosomes:

(i) carry hereditary information from parents to the next generation.

(ii) are thread-like structures located inside the nucleus of an animal cell.

(iii) always exist in pairs in human reproductive cells.

(iv) are involved in the process of cell division. The correct statements are:

[1 Marks]

(A) (i) and (ii)

(B) (iii) and (iv)

(C) (i), (ii) and (iv)

(D) (i) and (iv)

Question 13. In a nerve cell, the site where the electrical impulse is converted into a chemical signal is known as:

[1 Marks]

(A) Axon

(B) Dendrites

(C) Neuromuscular junction

(D) Cell body

Question 14.

A stomata closes when:

(i) it needs carbon dioxide for photosynthesis.

(ii) it does not need carbon dioxide for photosynthesis.

(iii) water flows out of the guard cells.

(iv) water flows into the guard cells.

The correct reason(s) in this process is/are:

[1 Marks]

(A) (ii) and (iv)

(B) (i) only

(C) (i) and (iii)

(D) (ii) and (iii)

Question 15. At what distance from a convex lens should an object be placed to get an image of the same size as that of the object on a screen?

[1 Marks]

(A) Beyond twice the focal length of the lens.

(B) At twice the focal length of the lens.

(C) At the principal focus of the lens

(D) Between the optical centre of the lens and its principal focus.

Question 16. The lens system of human eye forms an image on a light sensitive screen, which is called as:

[1 Marks]

(A) Cornea

(B) Ciliary muscles

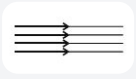
(C) Optic nerves

(D) Retina

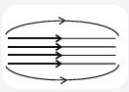
Question 17. The pattern of the magnetic field produced inside a current carrying solenoid is:

[1 Marks]

(A)



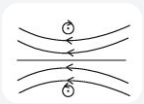
(B)



(C)



(D)



Question 18. Identify the food chain in which the organisms of the second trophic level are missing:

[1 Marks]

(A) Grass, goat, lion

(B) Zooplankton, Phytoplankton, small fish, large fish

(C) Grasshopper, grass, snake, frog, eagle

(D) Tiger, grass, snake, frog

Question 19. In which of the following organisms, multiple fission is a means of asexual reproduction? a) (b) (c) (d)

[1 Marks]

(A) Yeast

(B) Paramoecium

(C) Leishmania

(D) Plasmodium

Question 20.

Assertion (A) Hydrogen gas is not evolved when zinc reacts with nitric acid.

Reason (R) Nitric acid oxidises the hydrogen gas produced to water and itself gets reduced.

[1 Marks]

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

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

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

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

Question 21.

Assertion (A): Accumulation of harmful chemicals is maximum in the organisms at the highest trophic level of a food chain.

Reason (R): Harmful chemicals are sprayed on the crops to protect them from diseases and pests

[1 Marks]

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

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

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

(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 rate of breathing in aquatic organisms is much faster than in terrestrial organisms.

Reason (R): The amount of oxygen dissolved in water is very high as compared to the amount of oxygen in air.

[1 Marks]

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not 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): The rainbow is a natural spectrum of sunlight in the sky.

Reason (R): Rainbow is formed in the sky when the sun is overhead and water droplets are also present in air.

[1 Marks]

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

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

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

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

Section C

Question 24. Name the type of chemical reaction in which calcium oxide reacts with water. Justify your answer by giving balanced chemical equation for the chemical reaction.

[2 Marks]

Question 25.

State one role of each of the following in human digestive system:

(i) Hydrochloric acid

(ii) Vill

(iii) Anal Sphincter

(iv) Lipase.

[2 Marks]

Question 26. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position of the image formed by the mirror.

[2 Marks]

Question 27.

How is the movement of leaves of a sensitive plant different from the downward movement of the roots?

[2 Marks]

Question 28.

There is a hormone which regulates carbohydrate, protein and fat metabolism in our body. Name the hormone and the gland which secretes it. Why is it important for us to have iodised salt in our diet?

[2 Marks]

Question 29.

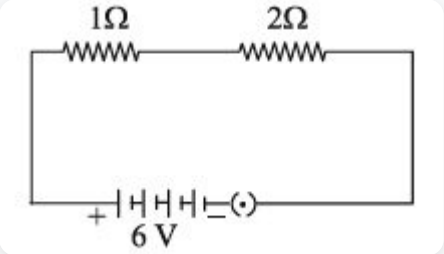
Show how you would connect three resistors each of resistance 6 Ω, so that the combination has a resistance of 9 Ω. Also justify your answer.

[2 Marks]

Question 30.

In the given circuit calculate the power consumed in watts in the resistor of 2 Ω:

[2 Marks]



Question 31.

(i) Two magnetic field lines do not intersect each other. Why?

(ii) How is a uniform magnetic field in a given region represented? Draw a diagram in support of your answer.

[2 Marks]

Section D

Question 32.

Write one chemical equation each for the chemical reaction in which the following have taken place:

(i) Change in colour

(ii) Change in temperature

(iii) Formation of precipitate.

Mention colour change/temperature change (rise/fall)/compound precipitated along with equation.

[3 Marks]

Question 33.

(i) The pH of a sample of tomato juice is 4.6. How is this juice likely to be in taste? Give reason to justify your answer.

(ii) How do we differentiate between a strong acid and a weak base in terms of ion-formation in aqueous solutions ?
(iii) The acid rain can make the survival of aquatic animals difficult. How?

[3 Marks]

Question 34.

(i) Why is respiratory pigment needed in multicellular organisms with large body size?

(ii) Give reasons for the following:

(a) Rings of cartilage are present in the throat,

(b) Lungs always contain a residual volume of air,

(c) The diaphragm flattens and ribs are lifted up when we breathe,

(d) Walls of alveoli contain an extensive network of blood vessels.

[3 Marks]

Question 35. Define reflex action. With the help of a flow chart, show the path of a reflex action such as sneezing.

[3 Marks]

Question 36.

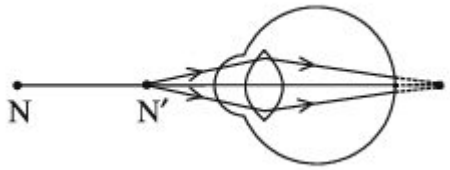
Study the diagram given below and answer the questions that follow:

(i) Name the defect of vision represented in the diagram. Give reason for your answer.

(ii) List two causes of this defect.

(iii) With the help of a diagram, show how this defect of vision is corrected.

[3 Marks]



Question 37.

Plants → Deer → Lion.

In the given food chain, what will be the impact of removing all the organisms of the second trophic level on the first and third trophic levels? Will the impact be the same for the organisms of the third trophic level in the above food chain if they were present in a food web? Justify.

[3 Marks]

Question 38.

A gas 'X' which is a deadly poison is found at the higher levels of the atmosphere and performs an essential function.

Name the gas and write the function performed by this gas in the atmosphere. Which chemical is linked to the decrease in the level of this gas? What measures have been taken by an international organization to check the depletion of the layer containing this gas?

[3 Marks]

Question 39.

Name and state the rule to determine the direction of a:

(i) magnetic field produced around a current carrying straight conductor.
(ii) force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it.

[3 Marks]

Section E

Question 40.

(i) Define a homologous series of carbon compounds.

(ii) Why is the melting and boiling points of C_4H_8 higher than that of C_3H_6 or C_2H_4?

(iii) Why do we NOT see any gradation in chemical properties of a homologous series compound?

(iv) Write the name and structures of (i) aldehyde and (ii) ketone with molecular form C_3H_6O.

[5 Marks]

Question 41.

(i) Write the name and structure of an organic compound 'X' having two carbon atoms in its molecule and its name is suffixed with '-ol'. 5

(ii) What happens when 'X' is heated with excess concentrated sulphuric acid at 443 K? Write chemical equation for the reaction stating the conditions for the reaction. Also state the role played by concentrated sulphuric acid in the reaction.

(iii) Name and draw the electron dot structure of hydrocarbon produced in the above reaction.

[5 Marks]

Question 42.

(i) Name three techniques/devices used by human females to avoid 5pregnancy. Mention the side effects caused by each.
(ii) What will happen if in a human female (a) fertilisation takes place, (b) an egg is not fertilised?

[5 Marks]

Question 43.

(i) Draw a diagram showing spore formation in Rhizopus and label the (a) reproductive and (b) non reproductive parts. Why does Rhizopus not multiply on a dry slice of bread?

(ii) Name and explain the process by which reproduction takes place in Hydra.

[5 Marks]

Question 44.

(i) Define electric power. Express it in terms of potential difference (V) and resistance (R).

(ii)An electric oven is designed to work on the mains voltage of 220 V. This oven consumes 11 units of electrical energy in 5 hours. Calculate:
(a) power rating of the oven
(b) current drawn by the oven
(c) resistance of the oven when it is red hot

[5 Marks]

Question 45.

(i) Write the relation between resistance R and electrical 5 resistivity ρ of the material of a conductor in the shape of cylinder of length l and area of cross-section A. Hence derive the SI unit of electrical resistivity.

(ii) The resistance of a metal wire of length 3 m is 60 Ω. If the area of cross-section of the wire is $4\times10-7m^2$, calculate the electrical resistivity of the wire.

(iii) State how would electrical resistivity be affected if the wire (of part 'ii') is stretched so that its length is doubled. Justify your answer.

[5 Marks]