CBSE
Class-X
SCIENCE

Previous Year
SOLVED PAPERS

CONTENT

CBSE QUESTION PAPER-2024
Class-x Session : 2023-24
[Delhi]
SCIENCE (086)

Time allowed : 3 hours | **Maximum Marks : 80**

GENERAL INSTRUCTIONS :
Read the following instructions very carefully and strictly following them.
(i) The question paper comprises three section A, B and C. There are 30 question in the question paper : AH question are compulsory.
(ii) **Section A -** all questions/ or parts (question no. 1 to 14) thereof in this section are one marks questions comprising MCQ. VSA type and Assertion - Reason type questions. They are to be answered in one word or in one sentence.
(iii) **Section B-** Question no. 15 to 24 are short answer type questions, carrying three marks each. Answer to these questions should not exceed 50 to 60 words.
(iv) **Section C-** question no. 25 to 30 are long answer type questions, carrying five marks each. Answer to these questions should not exceed 80 to 90 words.
(v) Answer should be brief and to the point. Also the above mentioned word limit be adhered to as far as possible.
(vi) There is no overall choice in the question paper. However, an internal choice has been provided in some questions in each section. Only one of the choices in such questions have to be attempted.
(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

Section-A

Select the write the most appropriate option out of the four options given for each of the question 1-20. There is no negative mark for the incorrect response.

1. What 2 mL of sodium hydroxide solution is added to 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 Mark]**
(a) $NaOH + Zn \rightarrow NaZnO_2 + H_2O$
(b) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$
(c) $2NaOH + Zn \rightarrow NaZnO_2 + H_2$
(d) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2O$

2. Select from the following a decomposition reaction in which source of energy for decomposition is light **[1 Mark]**
(a) $2FeSO_4 + Fe_2O_3 + SO_2 + SO_3$
(b) $2H_2O + 2H_2 + O_2$
(c) $2AgBr \rightarrow 2Ag + Br_2$
(d) $CaCO_3 \rightarrow CaO + CO_2$

3. A metal and a non-metal that exists in liquid state at the room temperature are respectively: **[1 Mark]**
(a) Bromine and Mercury
(b) Mercury and Iodine
(c) Mercury and Bromine
(d) Iodine and Mercury

4. Carbon compounds:
(i) are good conductors of electricity.
(ii) are bad conduction 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 Mark]**
(a) (i) and (ii)
(b) (ii) and (iii)
(c) (ii) and (iv)
(d) (i) and (iii)

5. Consider the following compounds:
$FeSO_4$; $CuSO_4$; $CaSO_4$; Na_2CO_3
The compound having maximum number of water of crystallisation in its crystalline form in one molecule is : **[1 Mark]**
(a) $FeSO_4$
(b) $CuSO_4$
(c) $CaSO_4$
(d) Na_2CO_3

6. Oxides of aluminum and zinc are : **[1 Mark]**
(a) acidic
(b) basic
(c) amphoteric
(d) neutral

7. $MnO_2 + 4 HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$
The reaction given below above is a redox reaction because in this case. **[1 Mark]**
(a) MnO_2 is oxidized and HCl is reduced
(b) HCl is oxidized
(c) MnO_2 is reduced
(d) MnO_2 is reduced and HCl is oxidized

8. 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 determine at the time of fertilisation when male and female gameters fuse to form a zygote.

The correct statements are : **[1 Mark]**

(a) (i) and (iii)　　　(b) (ii) and (iv)

(c) (iii) and (iv)　　　(d) (i), (iii) and (iv)

9. **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 Mark]**

(a) (i) and (ii)　　　(b) (iii) and (iv)

(c) (i), (ii) and (iv)　　(d) (i) and (iv)

10. In a nerve cell, the site where the electrical impulse is converted into a chemical signal is known as : **[1 Mark]**

(a) Axon

(b) Dendrites

(c) Neuromuscular junction

(d) Cell body

11. **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 corect reason(s) in this process is/are :

[1 Mark]

(a) (i) only　　　(b) (i) and (iii)

(c) (ii) and (iii)　　(d) (ii) and (iv)

12. 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 Mark]**

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

(b) At the principal focus of the lens

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

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

13. The lens system of human eye forms an image on a light sensitive screen, which is called as: **[1 Mark]**

(a) Cornea　　　(b) Ciliary muscles

(c) Optic nerves　　(d) Retina

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

[1 Mark]
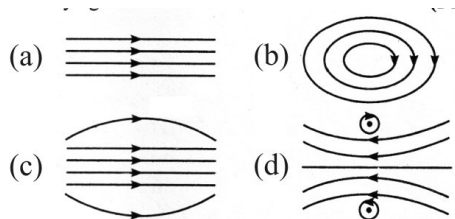
15. Identify the food chain in which the organisms of the second trophic level are missing :

[1 Mark]

(a) Grass, goat, lion

(b) Zooplankton, Phytoplankton, Small fish, large fish

(c) Tiger, grass, snake, frog

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

16. In which of the following organisms, multiple fission is a means of asexual reproduction?

[1 Mark]

(a) Yeast　　　(b) Leishmania

(c) Paramoecium　　(d) Plasmodium

For Q Nos. 17 to 20, two statements are given-One labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

(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 and 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.

17. **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 Mark]

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

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

[1 Mark]

19. **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 Mark]**

20. **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 Mark]**
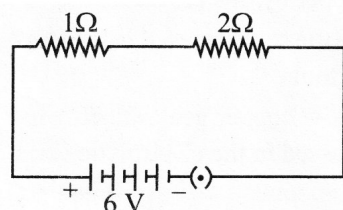
Section-B

21. 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]**

22. State one role of each of the following in human digestive system. **[2 Marks]**
(i) Hydrochloric acid (ii) Villi
(iii) Anal Sphincter (iv) Lipase

23. (A) How is the movement of leaves of a sensitive plant different from the downward movement of the roots? **[2 Marks]**

Or

(B) 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]**

24. 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]**

25. (A) 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]**

Or

(B) In the given circuit calculate the power consumed in watts in the resistor of 2 Ω.

[2 Marks]

26. (i) Two magnetic field lines do not intersect each other. Why? **[2 Marks]**

Or

(ii) How is a uniform magnetic field in a given region represented? Draw a diagram in support of your answer. **[2 Marks]**

Section-C

27. **Write one chemical equation each for the chemical reaction in which the following have taken place.** **[3 Marks]**
(i) Change in colour
(ii) Change in temperature
(iii) Formation of precipitates
Mention colour change/temperature change (rise/fall)/compound precipitated along with equation.

28. (i) The pH of a sample of tomato juice is 4.6. How is the juice likely to be in taste? Give reason to justify your answer. **[1 Mark]**
(ii) How do we differentiate between a strong acid and a weak base in terms of ion-formation in aqueous solutions? **[1 Mark]**
(iii) The acid rain can make the survival of aquatic animals difficult. How? **[1 Mark]**

29. (i) Why is respiratory pigment needed in multicellular organisms with large body size? **[1 Mark]**
(ii) Give reasons for the followings- **[2 Marks]**
(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 in.
(d) Walls of alveoli contain an extensive network of blood vessels.

30. Define reflex action. With the help of a flow chart show the path of a reflex action such as sneezing. **[3 Marks]**

31. Study the diagram given below and answer the questions that follow: **[3 Marks]**
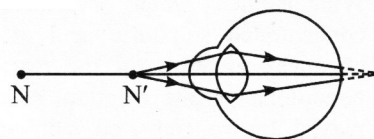
(a) Name the defect of vision represented in the diagram. Give reason for your answer.
(b) List two causes of this defect
(c) With the help of a diagram show how this defect of vision is corrected.

32. **Name and state the rule to determine the direction of a :** **[3 Marks]**
(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.

33. (A) **Plant → Deer →Lion**
In the given food chain, what will be the impact of removing all the organisms of second trophic level on the first and third tropic level? 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.

OR

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

5 YCT

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]**

Section-D

34.(A)(i) Define a homologous series of carbon compounds. **[5 Marks]**

(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 compounds?

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

Or

(B)(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 Marks]

(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.

35.(A)(i) Name three techniques/devices used by human females to avoid pregnancy. Mention the side effect caused by each. **[5 Marks]**

(ii) What will happen if in a human female (a) fertilisation takes place, (b) an egg is not fertilised.

OR

(B)(i) Draw a diagram shown 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?
[5 Marks]

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

36.(A)(i) Define electric power. Express it in terms of potential difference (V) and resistance (R).
[5 Marks]

(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 : **[5 Marks]**
(a) power rating of the oven
(b) current drawn by the oven
(c) resistance of the oven when it is red hot

OR

(B)(i) Write the relation between resistance R and electrical 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. **[5 Marks]**

(ii) The resistance of a metal wire of length 3 m is 60 Ω. If the area of cross-section of the wire is 4×10^{-7} m^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.

Section-E

Q. Nos. 37-39 are source-based/case-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. **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.**

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

(ii) Name the solution used in the above process and write its formula. **[1 Mark]**

(iii) (A) How copper gets refined when electric current is passed in the electrolytic cell?
[2 Mark]

OR

(iii) (B) You have two beakers 'A' and 'B' containing copper sulphate 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 observation in each case.
[2 Marks]

38. **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 Mark]

(i) 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?

(ii) Write on difference between dominated and recessive trait.

(iii)(A) In a cross with two pairs of contrasting characters

RRYY   ×   rryy
(Round Yellow)   (Wrinkled green)

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.

[2 Marks]

OR

(iii)(B) Justify the statement :

"It is possible that a trait is inherited but may not be expressed." **[2 Marks]**

39. **Study the data give below 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

(i) In which one of the above cases the mirror will form a diminished image of the object? Justify your answer. **[1 Mark]**

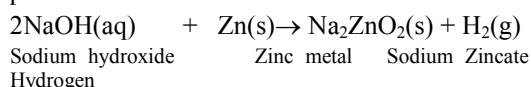**(ii)** List two properties of the image formed in case 2. **[1 Mark]**

(iii) (A) What is the nature and size of the image formed by mirror C? Draw ray diagram to justify your answer. **[2 Marks]**
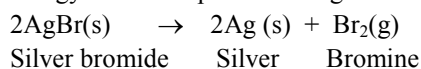
OR

(iii) (B) 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]**

Explanation

1.(b) When sodium hydroxide (NaOH) is added to small pieces of granulated zinc metal in a test tube and heated, the chemical reaction that takes place is as follows:

$2NaOH(aq) + Zn(s) \rightarrow Na_2ZnO_2(s) + H_2(g)$
Sodium hydroxide   Zinc metal   Sodium Zincate Hydrogen

2.(c) A decomposition reaction in which source of energy for decomposition is light is

$2AgBr(s) \rightarrow 2Ag(s) + Br_2(g)$
Silver bromide   Silver   Bromine

3.(c) A metal and a non-metal that exists in liquid state at the room temperature are respectively mercury (Hg) and Bromine (Br)

4.(c) Carbon compounds, in general, are poor conductors of electricity (bad conduction of electricity), and they typically have weak forces of attraction between their molecules (such as in covalent bonds, where the molecules don't have strong inter-molecular forces).

Hence, statement (ii) and statement (iv) are correct.

5.(d) Na_2CO_3 is the compound which has maximum number of water of crystallization in its crystalline form and it exists as $Na_2CO_3.10H_2O$.

6.(c) The oxide which behave as both acidic and basic oxide are called amphoteric oxides. Ex – aluminium oxide (Al_2O_3) Zinc oxide (ZnO).

7.(d) Oxidation is the loss of electrons while reduction is the gain of electrons. The substance which helps other species to get reduce and itself get oxidized is known as a reducing agent.

8.(b) The sex of child is determined by the chromosomes inherited from the father, with the presence of a Y chromosome typically resulting in a male child and at the time of fertilization.

A male has XY Chromosomes and a female has XX chromosomes.

9.(c) The correct statement for chromosomes.

- Chromosomes are thread like structures located inside the nucleus of an animal cell.
- Chromosomes carry hereditary information from parents to the next generation.
- Chromosomes are involved in the process of cell division.
- The two alleles of a gene pair are located on homologous sites on homologous chromosomes.

10.(c) In a nerve cell, the site where the electrical impulse is converted into a chemical signal is known as neuromuscular junction.

11.(c) A stomata closes when it does not need carbon dioxide for photosynthesis and when water flows out f the guard cells.

Hence, statement (ii) and statement (iii) are correct.

12.(c) To obtain an image of the same size as the object with a convex lens, the object should be placed at twice the focal length of the lens.
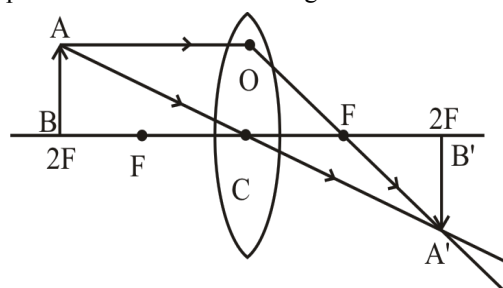
13.(d) The lens system of human eye forms an image on a light sensitive screen, which is called as retina.
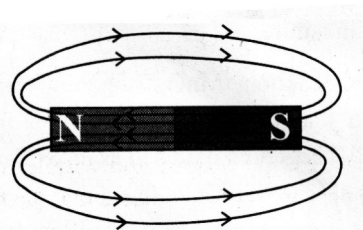
14.(a) The magnetic field pattern created by a current-carrying solenoid resembles the field produced by a bar magnet. One end of the solenoid behaves like the north pole of a magnet, while the other end acts as the south pole. Inside the solenoid, the magnetic field lines are arranged as parallel straight lines.

For bar magnet

15.(c) The food chain in which the organisms of the second trophic level are missing is tiger, grass, snake, frog.

16.(d) Plasmodium organisms, multiple fission is a means of asexual reproduction.

17.(a) Hydrogen gas is not produced when a metal like zinc reacts with nitric acid because HNO_3 is a powerful oxidizing agent. It oxidizes the hydrogen gas (H_2) to water, while it gets reduced to one of the nitrogen oxides, such as (N_2O, NO, NO_2).

18.(b) The buildup of harmful chemicals is greatest in organisms at the highest trophic levels due to biological magnification, where these chemicals progressively concentrate as they move up the food chain, not just from crop spraying.

19.(c) The concentration of oxygen dissolved in water is significantly lower than that in air, which requires aquatic organisms to breathe more rapidly to take in the oxygen they need.

20.(a) A rainbow is indeed a natural spectrum of sunlight that occurs in the sky. It is formed when sunlight interacts with tiny water droplets in the atmosphere. The process involves both refraction and reflection of light.

21. Calcium oxide (CaO) reacts strongly with water to form slaked lime (calcium hydroxide, $Ca(OH)_2$, releasing a significant amount of heat. The balanced chemical equation for this reaction is:

$$\underset{\text{Quick lime}}{CaO(s)} + H_2O(\ell) \rightarrow \underset{\text{Slaked lime}}{Ca(OH)_2(aq)} + \text{Heat}$$
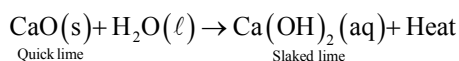
In this reaction, CaO and water combine to form a single product, calcium hydroxide, $Ca(OH)_2$, such a reaction in which a single product is formed from two or more reactants is known as a combination reaction.

22. The role of the following in human digestive system are :
(i) Hydrochloric acid : Provides an acidic environment that aids in the activity of the enzyme pepsin
(ii) Villi : Finger-like projections that are extensively supplied with blood vessels.
(iii) Anal sphincter : Regulates the release of feces from the body.
(iv) Lipase : An enzyme that breaks down emulsified fats.

23. The table outlining the differences in the movement mechanisms of the leaves of a sensitive plant compared to the downward movement of its roots.

Feature	Leaves of a sensitive plant	Downward movement of roots
Mechanism	Facilitated by changes in water content within cells	Influenced by environmental triggers
Trigger	Physical stimulus	Environmental stimulus (gravity).
Type of movement	Rapid folding and drooping in response to touch	Geotropism
Dependency	Independent of growth	Dependent on growth

OR

- The hormone that regulates carbohydrate, protein, and fat metabolism in our body is thyroxin.
- It is secreted by the thyroid glamd.
- Importance of Iodised Salt : Iodised salt is crucial because iodine is required for the thyroid gland to synthesize thyroxine.
- A hormone called thyroxine is released into the circulation by the thyroid gland.

24.
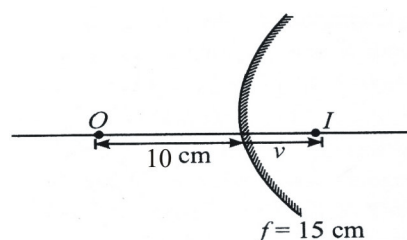
Given that,
u = –10 cm, f = +15 cm, v = ?

According to the mirror formula, $\dfrac{1}{f} = \dfrac{1}{v} + \dfrac{1}{u}$

where, v = image distance, u = object distance, f = focal length.

$\Rightarrow \dfrac{1}{v} = \dfrac{1}{f} - \dfrac{1}{u}$

$\Rightarrow \dfrac{1}{v} = \dfrac{1}{15} - \dfrac{1}{-10} \Rightarrow \dfrac{1}{v} = \dfrac{1}{15} + \dfrac{1}{10}$

$\Rightarrow \dfrac{1}{v} = \dfrac{2+3}{30} = \dfrac{5}{30}$

$\Rightarrow v = \dfrac{30}{5} \Rightarrow v = 6 \text{ cm}$

The image will be formed at a distance of 6 cm from the mirror behind it. The image will be formed erect and virtual.

25.(A) If resistor is connected in series $6\Omega + 6\ \Omega + 6\ \Omega = 18\ \Omega$ This is not correct.

When they are connected in parallel

$\dfrac{1}{6} + \dfrac{1}{6} + \dfrac{1}{6} = 2\Omega$ This is also wrong

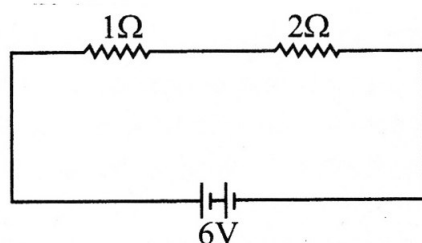Two 6Ω resistors are connected to parallel.

Resistance = $\dfrac{1}{\dfrac{1}{6} + \dfrac{1}{6}} = \dfrac{6 \times 6}{6 + 6} = 3\Omega$

If the 3rd resister of 6Ω and 3Ω are connected in series, then the resultant resistance

$= 6\Omega + 3\Omega\ = 9\Omega$

OR

(B) The circuit diagram is shown in fig.


Total resistance, R = 1 + 2 = 3Ω

Potential difference, V = 6V

Current I = $\dfrac{V}{R} = \dfrac{6V}{3\Omega} = 2A$

Power used in 2 Ω Resistor = $(I)^2 R = (2)^2 \times 3 =$ 12 W.

26.(i) Two magnetic field lines do not intersect because if they did, it would suggest that at the point of intersection, the magnetic field would have two different directions, which contradicts the basic principle that magnetic field lines.

(ii) A uniform magnetic field in a region is represented by evenly spaced and parallel magnetic field lines. These field lines indicate that the magnetic field has the same strength and direction throughout the entire region.
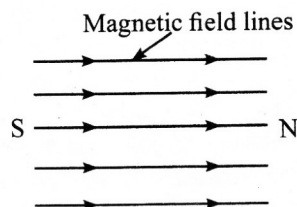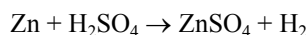

In this diagram, the lines represent evenly spaced and parallel magnetic field lines, indicating a uniform magnetic field.

27.(i) In the below reaction, the colour changes from colourless (Pb(NO$_3$)$_2$) to yellow (PbI$_2$)

$Pb(NO_3)_2\ (aq) + 2KI \rightarrow PbI_2(s) + 2KNO_3(aq)$
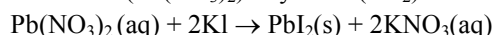
(ii) The action of diluter sulfuric acid on zinc releases heat, thus, results in temperature will increase

$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

(iii) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Sodium hydroxide is reacted with sulphuric acid to give sodium sulphate as a precipitated product in water.

28.(i) As we know, a pH less than 7 indicates acidity, while a pH greater than 7 indicates basicity. Since the pH of tomato juice is 4.6, it is considered acidic.

(ii)

Strong acid	Weak Base
1. A strong acid is the one that will furnish more (H) ions in the aqueous solution	1. A weak base is the one that will furnish less [OH⁻] ions in the aqueous solutions.
Example: Hydrochloric acid.	Example: Ammonium hydroxide

(iii) Rainwater with a pH lower than 5.6 is referred to as acid rain. When this acidic rain enters rivers, it lowers the pH of the water, making it challenging for aquatic life to survive.

29.(i) Multicellular organisms with large body sizes require respiratory pigments to help transport oxygen to all parts of the body, as diffusion alone is insufficient for this purpose.

(ii) Reasons:

(a) a $\rightarrow$ Rings of cartilage are present in the throat. These ensure that the air-passage does not collapse.

(b) The lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be relaased.

(c) When we inhale, our ribs rise and our diaphragm flatters, causing the chest cavity to expand. This expansions draws air into the lungs, filling the expanded alveoili.

(d) Walls of aiveoli contain an extensive network of blood vessels to facilitate efficient oxygen uptake and carbon dioxide removed.

30. Reflex action is an immediate response to environmental stimuli that occurs without conscious thought or control.

The reflex action involved in sneezing follows this path:

Detect irritants in the Nose $\rightarrow$ Signal sent through sensory Nerves $\rightarrow$ Signal reaches spinal cord $\rightarrow$ Reflex Arc triggers motor response $\rightarrow$ Expel irritant through sneezing.
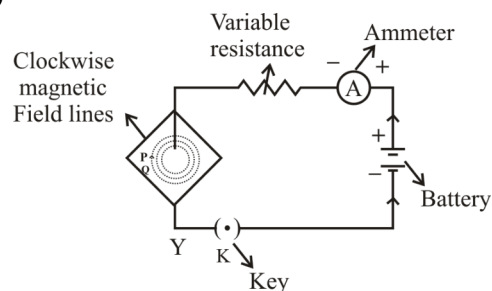
31.(a) Hypermetropia occurs when the image is formed beyond the retina.

(b) This is caused by: (i) The lens having a longer focal length, and (ii) The eyeball being smaller in size.

(c) It can be corrected by using a convex lens of suitable focal length as shown below.

O' Virtual image formed at N
N Nearby object
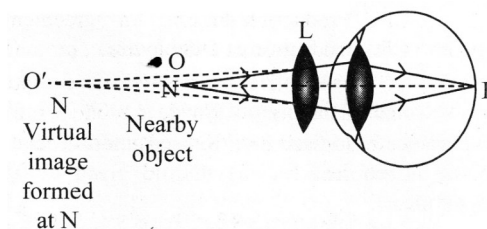
32.(i)

We can conclude that the magnetic field lines around a current carrying straight conductor are concentric circles whose centres lie on the conductor.

(ii) The rule used to determine the direction of the force acting on a current-carrying straight conductor placed in a magnetic field perpendicular to it is called Fleming's Left-Hand Rule.

According to this rule, if you extend your left hand such that your thumb points in the direction of the current flow and your index finger points in the direction of the magnetic field, then the direction in which your middle finger points represent the direction of the force experienced by the conduction.

The direction of current induced in a straight conductor moving in magnetic field is determined by Fleming's right hand rule.

33.(A) If all organisms of the second trophic level (deer) are removed:

● First trophic level (plant): Their population will increase uncontrollably due to the absence of herbivores to feed on them

● Third tropic level (lion): Their population will decline as they lose their primary food source.

● In a food web, the impact on the third tropic level (lion) may be less severe because lions can have alternative prey, maintain their population to some extent. This illustrates the stability provided by food webs compared to simple food chains.

(B) **Gas X: Ozone (O3)**

● Essential function: Protects the Earth from harmful ultraviolet (UV) radiation from the sun.

● Decrease in ozone levels caused by a chemical called chlorofluorocarbons (CFCs).

● Actions taken by the United Nations Environment Programme (UNEP) in 1987:

● CFC production freeze: An agreement to stop CFC production at 1986 levels.

● CFC-free refrigerators: Manufacturers worldwide are required to produce refrigerators without using CFCs, promoting environmentally friendly practices.

34.(A) (i) A series of compounds with similar chemical properties, in which members differ from one another by additional CH_2 group, is called a homologous series.

(ii) The melting point is influenced by the shape and size of the molecule, as well as how the molecules are packed. Butane, with its longer carbon chain, allows for better packing efficiency, resulting in a higher melting point compared to the shorter chains of propane and ethane.

The boiling point is determined by molecular mass—larger molecular mass leads to a higher boiling point. Since butane has a greater molecular mass, its boiling point is higher.

(iii) We do not observe any gradual change in the chemical properties of a homologous series of compounds because all members of a homologous series share the same functional group, which is responsible for their similar chemical properties.

(iv) The name and structure of aldehyde and ketene with molecular formula C_3H_6O is given below respectively :

(i) **Name propanal**

Structure:

```
        H   H   O
        |   |  //
    H — C — C — C
        |   |   \
        H   H    H
```
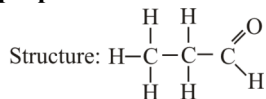
(ii) **Name : Propanone**

```
         O
         ||
         C
        /  \
     CH_3   CH_3
```
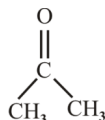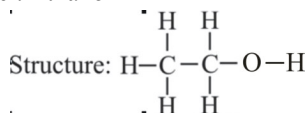
Or

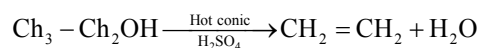**(B)** The name and structure of organic compound 'D' having two carbon atoms in its molecules are given below:

(i) Name : Ethanol

Structure:

```
        H   H
        |   |
    H — C — C — O — H
        |   |
        H   H
```

(ii) When the organic compound X is heated with an excess of concentrated sulfuric acid at 443 K, ethane is produced.

The chemical equation for the reaction that occurs is :

$$Ch_3 - Ch_2OH \xrightarrow[\text{H}_2\text{SO}_4]{\text{Hot conic}} CH_2 = CH_2 + H_2O$$

Concentrated sulphuric acid dehydrates alcohol molecules by eliminating water (H_2O) and stimulating the removal of a hydroxyl group (−OH) and hydrogen atom (H), resulting in thee formation of water.

(iii) The hydrocarbon is named ethene. The electron dot structure of ethene, produced in the above reaction, is as follows:
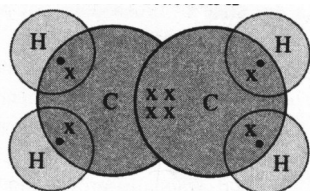
35.(A) (i) Three contraceptive methods/devices are:

- **Surgical methods**: The fallopian tubes in females are surgically blocked. Potential side effects include infections if the procedure is not performed correctly.

- **Hormonal contraceptives**: Oral contraceptive pills modify hormonal levels to prevent ovulation. Side effects may include nausea, weight gain, mood swings, and hormonal imbalances.

- **Intrauterine devices (IUDs)**: Devices such as the copper-T are inserted into the uterus. They may cause side effects like uterine irritation.

(ii) **What will happen if:**

(a) **Fertilization occurs**: The fertilized egg (zygote) starts dividing to form an embryo, which then implants into the uterine lining that has thickened to support the developing embryo.

(b) **If the egg is not fertilized**: The unfertilized egg survives for about a day. If fertilization does not occur, the thickened uterine lining is discarded through menstruation.

Or

(B) **(i)Spore formation in Rhizopus involves :**

(a) **Reproductive parts**: Sporangia, which are sac-like structures on stalks that hold spores.

(b) **Non-reproductive parts**: Hyphae, which are thread-like structures.
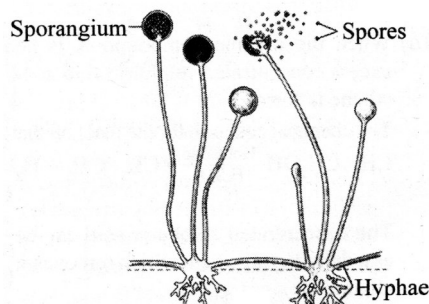
Rhizopus, as a fungus, needs moisture to grow and reproduce. Dry bread inhibits the growth of hyphae and the absorption of nutrients, preventing multiplication.

(ii) Budding such as hydra use regenerative cells for reproduction in the process of budding.

In this process, a small bud develops are an outgrowth on the side of its body.

This bud gradually grows and develops into a new individual. Eventually, the bud detaches from the parent body to live independently.

36.(A) **(i)**Electric power is defined as the rate at which electrical energy is transferred or transformed in an electrical circuit.

Power, $P = \dfrac{V^2}{R}$

Where,

P is the electric power

V is the potential difference (voltage), and R is the resistance.

(ii) (a) To calculate the power rating of the oven we can use the formula:

Given,

Energy (E) = 11 units

Time (t) = 5 hours

Power rating (P) = $\dfrac{E}{t}$

$P = \dfrac{11\,unit}{5\,hours}$

P = 2.2 unit/ hour

(b) To find the current drawn by the oven, we can use the formula.

Given,

Power rating (P) = 2.2

Voltage (V) = 220 V

P = VI

$I = \dfrac{P}{V}$

Substituting the give values :

$I = \dfrac{2.2\,units/hour}{220V}$, I = 0.01A

(c) To find the resistance of the oven when it is red hot, we can rearranges the power formula:

$P = \dfrac{V^2}{R}$

to solve for R :

$R = \dfrac{V^2}{P}$

Substituting the given values :

$R = \dfrac{(220V)^2}{2.2\,units/hour} R = \dfrac{48400V^2}{2.2\,units/hour}$

R = 22000 Ω

So, the resistance of the oven when it is red hot is approximately 22000 ohms.

OR

(B) (i) The relationship between resistance (R) and the electrical resistivity (ρ) of a cylindrical conductor with length lll and cross-sectional area A is given by:

$R = \dfrac{\rho\ell}{A}$

To derive the SI unit of electrical resistivity, rearrange the equation:

$\rho = \dfrac{RA}{\ell}$

$\rho = \dfrac{\Omega \times m^2}{m} = \Omega \cdot m$

Therefore, the SI unit of electrical resistivity (ρ) is ohm-meters (Ω.m)

(ii) Given,

Length of the wire (l) = 3 m

Resistance (R) = 60Ω

Area of cross-section (A) = 4×10^{-7} m²

Using the formula R = $\dfrac{\rho\ell}{A}$, we rearrange it to solve for ρ :

$\rho = \dfrac{(60\Omega) \times (4 \times 10^{-7}\,m^2)}{3\,m}$

$\rho = \dfrac{240 \times 10^{-7}}{3} \Omega.m$

$\rho = 80 \times 10^{-7}$ Ωm

$\rho = 8 \times 10^{-6}$ Ωm

(B) **(iii)** According to question –

a wire is stretched to double its length, its electrical resistivity (ρ) remains constant a materials electrical resistivity is intrinsic and does not alter its dimensions (length, cross-sectional area). Therefore, doubling the length of the wire will not affect its electrical resistance.

37.(i) In the electro refining of copper, the anode is made of impure copper and the cathode is made of pure copper.

(ii) A solution of the metal salt is used as an electrolyte. In this case, the metal salt is acidified copper sulphate solution.

(iii) (A) When electric current is passed through the cell, copper from the impure anode dissolves into the electrolyte as copper ions.

These ions then migrate towards the cathode, where they gain electrons and deposit as pure copper.

OR

(iii) (B) In breaker 'A'

Observation: The zinc strip will undergo a reaction with the copper sulfate solution. The copper metal will be displaced from the solution and will deposit onto the zinc strip.

Reason: Zinc is more reactive than copper. When

zinc is dipped into copper sulfate solution, zinc displaces copper from its compound (copper sulfate). This is a type of redox reaction:

$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$
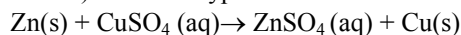
In beaker 'B', since, the strip of silver in speed, and

silver being less reactive than copper, therefore, will not displace is from its salt solution and no reaction will occur.

38. (i) **The two observations made by Mendel in F_1 progeny were :**

All the F1 progeny plants were tall, demonstrating that the tall trait is dominant over the short trait. Additionally, no plants exhibited intermediate height, indicating that the traits are inherited independently.

(ii) Difference between dominant and recessive trait :

Character	Dominant trait	Recessive trait
Seed shape	Round	Wrinkled
Seed colour	Yellow	Green
Flower colour	Violet	White
Pod shape	Inflated	Constricted
Pod colour	Green	Yellow
Flower position	Axial	Terminal
Stem height	Tall	Dwarf

(iii) (A) Mendel' F_2 generation method and conclusions :

- Mendel employed self-pollination of F1 plants to produce the F2 generation.
- The F2 generation exhibited a ratio of about 9:3:3:1 for the traits.
- Conclusion: This experiment concluded that each trait is governed by two alleles, and these alleles separate independently during gamete formation, a principle known as the Law of Independent Assortment.

OR

(iii) A trait may be inherited but not expressed due to the presence of a dominant allele that masks the expression of a recessive allele. For example, in a heterozygous individual (e.g., Tt), the dominant allele (T) will be expressed, while the recessive allele (t) is inherited but not visible in the phenotype. Additionally, environmental factors or epigenetic changes can influence whether a trait is expressed despite being inherited.

39.(i) In case (1), where mirror (A) has a focal length of 20 cm and an abject distance of 45 cm, the mirror will form a diminished image of the object. This is because the object distance (u) is greater than twice the focal length (2f). According to the mirror formula –

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v},$$ When u > 2f, then image formed is diminished.

(ii)

concave mirror
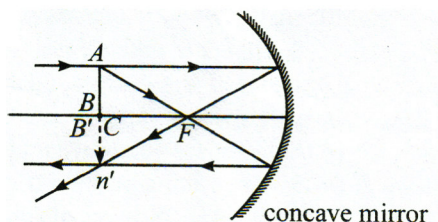
In case (2) (mirror B with a focal length of 15 cm and on object distance of 30 cm) shows to properties:

(a) The image is formed beyond 2f (twice the focal length).

(b) The image is real.

(iii) (A) We are aware that a virtual and expanded picture is created when an object to positioned between P and F of a concave mirror.

In case (3), the object distance (20 m) is less than the focal length (30 cm). Therefore, the object is located between the mirror and the focal point. In such a case, the image formed will be virtual, erect, and larger than the object.
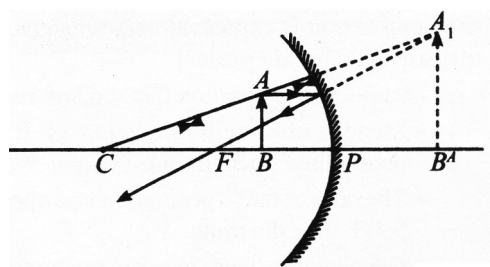
(iii) (B)
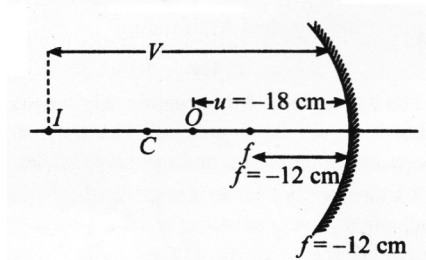
Given,

Focal length of concave mirror, f = −12 cm

Distance of object from the mirror, u = −18 cm

Now, put his value in mirror formula.

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{-12} - \frac{1}{-18}$$

$$\frac{1}{v} = \frac{1}{18} - \frac{1}{12} = \frac{2-3}{36}$$

$$\frac{1}{v} = \frac{-1}{36}$$

$$v = -36\,cm$$

Hence, image position is the 36 cm left side from the pole of the concave mirror

CBSE QUESTION PAPER-2024
Class-x Session : 2023-24
[Outside Delhi]
SCIENCE (086)

Time allowed : 3 hours   **Maximum Marks : 80**

GENERAL INSTRUCTIONS :

Read the following instructions very carefully and strictly following them.

(i) The question paper comprises three section A, B and C. There are 30 question in the question paper : AH question are compulsory.

(ii) Section A - all questions/ or parts (question no. 1 to 14) thereof in this section are one marks questions comprising MCQ. VSA type and Assertion - Reason type questions. They are to be answered in one word or in one sentence.

(iii) Section B- Question no. 15 to 24 are short answer type questions, carrying three marks each. Answer to these questions should not exceed 50 to 60 words.

(iv) Section C- question no. 25 to 30 are long answer type questions, carrying five marks each. Answer to these questions should not exceed 80 to 90 words.

(v) Answer should be brief and to the point. Also the above mentioned word limit be adhered to as far as possible.

(vi) There is no overall choice in the question paper. However, an internal choice has been provided in some questions in each section. Only one of the choices in such questions have to be attempted.

(vii) In addition to this, separate instructions are given with each section and question, wherever necessary.

Section-A

Select and write one most appropriate option out of the four options given for each of the questions 1 to 20.

1. Consider the following statements about homologous series of carbon compounds. **[1 Mark]**

(A) All succeeding members defect by $-CH_2$ unit.

(B) Melting point and boiling point increases with increasing molecular mass.

(C) The difference is molecular masses between two successive members is 16 u.

(D) C_2H_2 and C_3H_4 are NOT the successive members of alkyne secrets.

The correct statements are-

(a) (A) and (B)   (b) (B) and (C)

(c) (A) and (C)   (d) (C) and (D)

2. The number of shells required to write the electronic configuration of potassium (At No. 19) **[1 Mark]**

(a) 1   (b) 2

(c) 3   (d) 4

3. Select from the following a process in which a combination reaction is involved : **[1 Mark]**

(a) Black and White photography

(b) Burning of coal

(c) Burning of methane

(d) Digestion of food

4. The oxides which can react with HCl as well as KOH to give corresponding salt and water is **[1 Mark]**

(a) CaO   (b) Al_2O_3

(c) Na_2O (d) K_2O

5. Which of the following is an alloy of copper and tin? **[1 Mark]**

(a) Nichrome   (b) Bras

(c) Constantan   (d) Bronze

6. Tooth decay beings at the pH of **[1 Mark]**

(a) 5.1   (b) 5.8

(c) 6.5   (d) 8.0

7. 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. **[1 Mark]**

(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

8. In human respiratory system, when a person breaths in, the position of ribs and diaphragm will be: **[1 Mark]**

(a) lifted ribs and curve/dome shaped diaphragm

(b) lifted ribs and flattened diaphragm.

(c) relaxed ribs and flattened diaphragm

(d) relaxed ribs and curve/dome shaped diaphragm.

9. Select out of the following a gland which does NOT occur as a pair in the human body: **[1 Mark]**

(a) Pituitary   (b) Ovary

(c) Testis   (d) Adrenal

**10.** Which of the following statements(s) is (are) true about human heart? **[1 Mark]**

(A) Right atrium receives oxygenated a 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 oxygenated 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)

11. **Which one of the following organism is represented by this diagram?** **[1 Mark]**
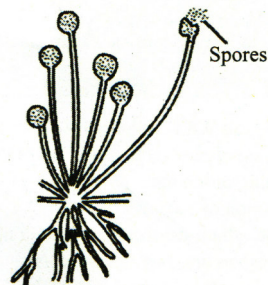
(a) Spirogyra   (b) Planaria

(c) Yeast   (d) Rhizopus

12. **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** **[1 Mark]**

(a) Tt and Tt   (b) TT and Tt

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

13. **Strength of magnetic field produced by a current carrying solenoid DOES NOT depend upon :** **[1 Mark]**

(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

14. **S.I. unit of electrical resistivity is** **[1 Mark]**

(a) ohm per meter^3 (b) ohm per meter^2

(c) ohm metre   (d) ohm meter^3

15. **The minimum resistance which can be made using the five resistors each of resistance 10Ω is :** **[1 Mark]**

(a) $\frac{1}{50}\Omega$ (b) $\frac{1}{5}\Omega$

(c) 2Ω (d) 1Ω

16. **Consider the following statements in the context of human eye:** **[1 Mark]**

(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 of 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. Nos. 17 to 20 are Assertion-Reason based questions:

These questions consist of two statements - Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below :

(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 and 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.

17. **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.

[1 Mark]

18. **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. **[1 Mark]**

19. **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. **[1 Mark]**

20. **Assertion (A):** Metals in the middle of activity series are found in nature as sulphides or carbonates.

Reason (R): The sulphide ores are calcinated whereas carbonate ores are roasted to extract metals from them. **[1 Mark]**

Section-B

Q. Nos. 21 to 26 are very short answer questions.

21. **(a)** Define a decomposition reaction. Write an equation to show thermal decomposition of ferrous sulphate crystals. **[2 Marks]**

OR

(b) What is meant by a balanced chemical equation? Why is it necessary for the equation to be balanced? **[2 Marks]**

22. Two text tubes A and B are taken, each containing one mL of starch solution. Add 1 mL of saliva to test tube 'A' only and leave both the test tubes undisturbed for a few minutes. Now add a new drops of dilute iodine solution to both the test tubes. **[2 Marks]**

(a) When one of the two test tubes shows change in colour. Write the changed colour observed in this test tube.

(b) What can we conclude from this activity.

23. Name two types of germ cells present in human beings. List two structural differences between the two. **[2 Marks]**

24. **(a)** State two laws of refraction of light.

OR

(b) Define the term absolute refractive index of a medium. A ray of light entres 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.

[2 Marks]

25. 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. **[2 Marks]**
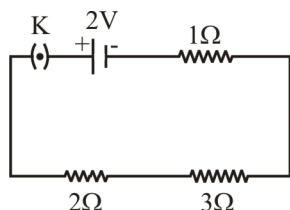
26. Name the term used for the materials which cannot be broken down by biological process. Give two ways by which they harm various components of an ecosystem. **[2 Marks]**

Section-C

Q. Nos. 27 to 33 are short answer questions.

27.(a) Give reasons for the follows : **[3 Marks]**
   (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. **[3 Marks]**

28. **(a)** In angiosperms why fertilisation cannot take place in flowers if pollination does not take place? Where is zygote located in a flower after fertilisation? What does it develop into?
   (b) Write the name of those parts of a flower which serve the same function as the following to in animals: (i) testis (ii) ovary **[3 Marks]**

29. **(a)** State any two observations when an electric current is passed through acidulated water, in a container having each electrode covered by test tubes filled with water.
   (b) Write the ratio of the mass of the gas collected at the cathode to the mass of the gas collected at the anode.

[3 Marks]

30. Draw a labeled diagram to show electrolytic refining of copper. State what happens when electric current is passed through the electrolyte taken in the case. **[3 Marks]**

31. **(a)**An object is placed in front of concave mirror of focal length 12 cm. If distance of the object from the pole of the mirror is 8 cm, then use mirror formula to determine the position of the image formed. Draw a labeled ray diagram to justify your answer in this case. **[3 Marks]**

OR

(b)(i) The image of an object formed by a mirror is real, inverted and is of magnification–1. If the image is at a distance of 30 cm from the mirror, where is the object placed? Give reason to justify your answer.
   (ii) Where would the image be if the object is moved 15 cm towards the mirror? Draw ray diagram for the new position of the object to justify your answer. **[3 Marks]**

32. **(a)** State Fleming's left hand rule. Apply this rule to determine the direction of force experienced by a straight current carrying conductor AB placed in a uniform magnetic field as shown.
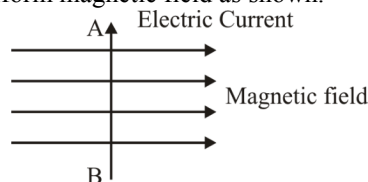
[3 Marks]

   (b) What will happen to an electron which enters in the same field in the same direction in which the current is flowing in the conductor AB? Give reason to justify your answer.

33. Use of pesticides to protect our crops affect organisms at various trophic levels especially human begins. Name the phenomenon involved and explain how does it happen. **[3 Marks]**

OR

   (b) (i) What are tropic movements ? Give an example of a plant hormones 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. **[3 Marks]**

Section-D

Q.No.34 to 36 are long answer questions.

34. (a) Upper half of a convex lens is covered with a black paper. Draw a ray diagram to shown 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.
   (b) An object is placed at a distance of 30 cm from the optical centre of a concave lens of focal length 15 cm. Use lens formula to determine the distance of the image from the optical centre of the lens. **[5 Marks]**