Class X Session 2023-24
Subject - Science
Sample Question Paper - 4

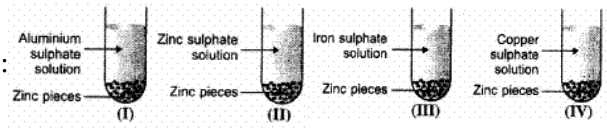
Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective-type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answers to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. Zinc pieces were placed in each of the four test tubes containing different salt solutions as shown below **[1]**



A colour change would be observed in solutions:

a) II and IV
b) III and IV
c) II and III
d) I and IV

2. Which one of the following processes involve chemical reactions? **[1]**

a) Keeping petrol in a china dish in the open.
b) Storing of oxygen gas under pressure in a gas cylinder.
c) Liquefaction of air.
d) Heating copper wire in presence of air at high temperature

3. Name the substance which on treatment with chlorine (Cl) yields bleaching powder. **[1]**

a) CaO
b) $Ca(OH)_2$
c) CuO
d) $CaCO_3$

4. Which of the following gas is used in welding and cutting metals? **[1]**

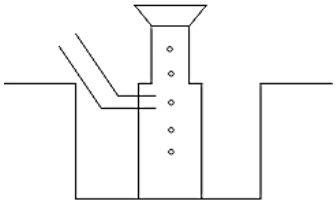
a) All of these

b) Ethyne

c) Ethane

d) Ethene

5. A metal is heated with dil H_2SO_4. The gas evolved is collected by the method shown in the figure. Answer the following questions based on it: **[1]**



Name the gas evolved.

a) H_2 gas

b) O_2 gas

c) CO gas

d) CO_2 gas

6. Before keeping any eatables in the jar, Riya always keeps anhydrous $CaCl_2$ in the bottle to: **[1]**

a) All of these

b) To absorb moisture

c) Kill germs

d) To clean the bottle

7. Which of the following is the correct representation of the electron dot structure of nitrogen? **[1]**

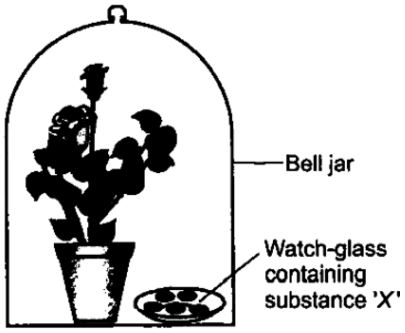
a) $:\dot{N}::\dot{N}:$

b) $:\ddot{N}\vdots\dot{N}:$

c) $:N\vdots\vdots N:$

d) $:\ddot{N}:\ddot{N}:$

8. The given figure is a demonstration of an experiment to show that carbon dioxide is essential for photosynthesis. What is the substance **X**, kept in watch-glass? **[1]**



a) Sodium bicarbonate

b) Sodium carbonate

c) Potassium sulphate

d) Potassium hydroxide

9. In human males, all the chromosomes are paired perfectly except one. This/these unpaired chromosome is/are **[1]**

i. large chromosome

ii. small chromosome

iii. Y-chromosome

iv. X-chromosome

a) (iii) and (iv)

b) (i) and (ii)

c) (ii) and (iv)

d) (iii) only

10. Select the barrier method of contraception among the following. **[1]**

a) Copper-T

b) Oral pill

c) Cervical cap

d) Tubectomy

11. Alternative forms of a gene are called **[1]**

a) Chromosomes

b) Multiples

c) Loci

d) Alleles

12. How does a gaseous exchange take place in woody plants? **[1]**

a) Epidermal cells

b) Stem hair

c) Lenticels

d) Root hair

13. A toaster of 4 kW is running in an existing circuit 110 volt that has a stream ranking of 4 A. Find the stream of electrons drawn by the toaster. **[1]**

a) 23.34 A

b) 36.36 A

c) 14.6 A

d) 9.06 A

14. In a house, two 60W electric bulbs are lighted for 4 hours and three 100W bulbs for 5 hours every day. The electric energy is consumed in 30 days: **[1]**

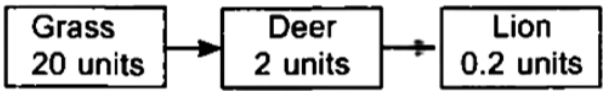
a) 59.4 kWh

b) None of these

c) 100 kWh

d) 45 kWh

15. What does the given flow chart represent? **[1]**



a) Biomagnification

b) Lindeman's law

c) Both Unidirectional energy flow and Lindeman's law

d) Unidirectional energy flow

16. Which of the following groups contain only biodegradable items? **[1]**

a. Grass, flowers and leather
b. Grass, wood and plastic
c. Fruit peels, cake and lime-juice
d. Cake, wood and grass

a) Groups (a), (c) and (d)

b) Groups (a), (b) and (c)

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

d) Groups (b), (c) and (d)

17. **Assertion (A):** To dilute sulphuric acid, acid is added to water and not water to acid. **[1]**
Reason (R): Specific heat of water is quite large.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

18. **Assertion (A):** Multiple fission produces many daughter cells simultaneously. **[1]**
Reason (R): Multiple fission occurs during favourable conditions.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

19. **Assertion (A):** When a charged particle moves perpendicular to magnetic field then its kinetic energy and momentum gets affected. **[1]**

Reason (R): Force does not change velocity of charged particle.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** Trophic levels are formed by only plants. **[1]**

Reason (R): Food chains and webs are formed due to linked organisms on the basis of their nutrition.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. Unsaturated hydrocarbons contain multiple bonds between the two C-atoms and show addition reaction. Give the test to distinguish ethane from ethene. **[2]**

22. Draw a flow chart showing various types of reproduction with examples. **[2]**

23. What is the significance of emulsification of fats? **[2]**

OR

How is the small intestine designed to absorb digested food?

24. An object 3 cm high is placed 20 cm from convex lens of focal length 12 cm. Find the nature, position and height of the image. **[2]**

25. We do not clean ponds or lakes but an aquarium needs to be cleaned regularly. Why? **[2]**

OR

What are the problems caused by the non-biodegradable wastes that we generate?

26. What is scattering of light? Explain how the colour of the scattered light depends on the size of the scattering particles. **[2]**

Section C

27. Hydrogen is not a metal but it has been assigned a place in the reactivity series of metals. Explain. **[3]**

28. Two ores A and B were taken. On heating, ore A gives CO_2, whereas, ore B gives SO_2. What steps will you take to convert them into metals? **[3]**

OR

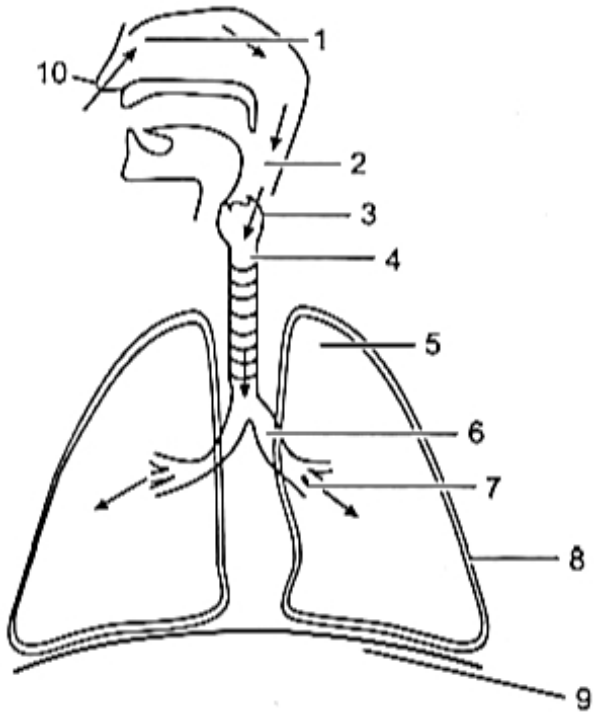
i. List in tabular form three chemical properties on the basis of which we can differentiate between a metal and a non-metal.

ii. Give reasons for the following:

a. Most metals conduct electricity well.

b. The reaction of iron (III) oxide [Fe_2O_3] with heated aluminum is used to join cracked machine parts.

29. Study the diagram given below and answer the following: **[3]**



i. Label the parts numbered 1 - 10. What does the figure represent?

ii. Name all the parts in a sequence through which air from outside reaches the last part of lungs.

iii. What is the structural and functional unit of lungs? What important role is played by them?

30. Explain Mendel's observation when he crossed a homozygous tall (TT) plant with homozygous dwarf (tt) plant followed by self-cross. **[3]**

31. A student wants to project the image of a candle flame on a screen 80 cm in front of a mirror by keeping the candle flame at a distance of 20 m from its pole. **[3]**

i. Which type of mirror should the student use?

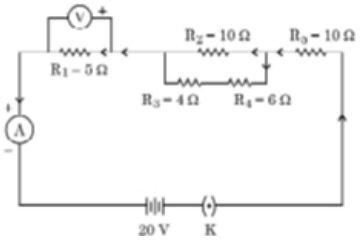
ii. Find the magnificent of the image produced.

iii. Find the distance between the object and its image.

32. i. A wire of resistance 2 has been connected to a source of 50 V as its two ends. What is the current flowing through the wire? **[3]**

ii. An electric refrigerator rated 400 W operates 8 hour/day. What is the cost of the energy to operate it for 30 days at ₹ 3.00 per kWh?

33. Study the following circuit and find: **[3]**



i. Effective resistance of the circuit

ii. Current drawn from the battery

iii. Potential difference across the 5Ω resistor

Section D

34. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound. Why such compounds **[5]**

i. Are poor conductors of electricity and

ii. Have low melting and boiling points.

What happens when this compound burns with oxygen?

OR

Name the following compounds.

1. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-OH$

2. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{O}{||}}{C}-OH$

3. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-Cl$

4. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-OH$

5. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-C\equiv CH$

6. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{}{\underset{\underset{O}{||}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-H$

35. Differentiate between the following: **[5]**

i. Pollen tube and style

ii. Fission in Amoeba and plasmodium

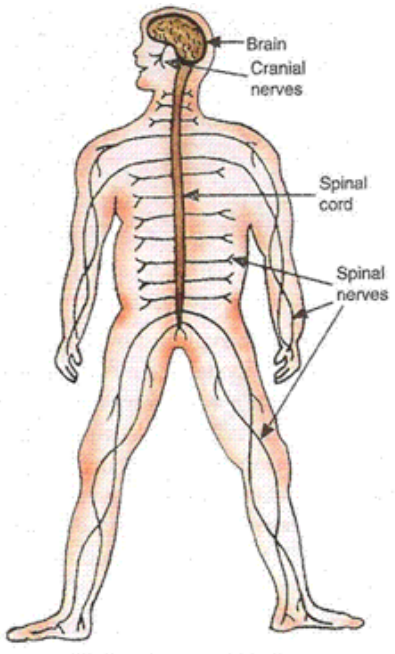
iii. Fragmentation and regeneration

iv. Bud of Hydra and Bryophyllum

v. Vegetative propagation and spore formation

OR

The given diagram shows the human nervous system.



The human nervous system.

Using the given diagram, answer the following questions:

i. What constitutes the central nervous system?

ii. What is the function of the spinal cord?

iii. How is spinal cord protected?

iv. What forms the peripheral nervous system?

v. Which type of nervous system controls and regulates the functions of the internal organs of our body involuntarily?

36. i. Define focal length of a spherical lens. **[5]**

ii. A divergent lens has a focal length of 30 cm. At what distance should an object of height 5 cm from the optical centre of the lens be placed, so that its image is formed 15 cm away the lens? Find the size of the image also.

iii. Draw a ray diagram to show the formation of image in the above situation.

OR

i. Two lenses have power of

a. + 2 D

b. - 4 D.

What is the nature and focal length of each lens?

ii. An object is kept at a distance of 100 cm from each of above lenses. Calculate

a. image distance and

b. magnification in each of the two cases.

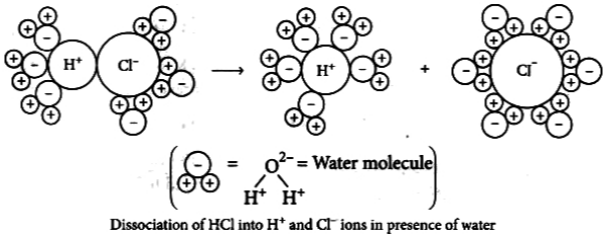
Section E

37. **Read the text carefully and answer the questions:** **[4]**

The acidic behaviour of acids is due to the presence of hydrogen (H^+) ions in them. They produce hydrogen ions in the presence of water. Water is a polar solvent and this property of water helps in weakening the bond between the ions and makes them soluble.

Hence, acids and bases produce ions in aqueous solutions. It may be noted that a dry HCl gas or a solution of hydrogen chloride in organic, non-polar solvents like toluene or benzene do not show acidic properties. This is because hydrogen chloride does not undergo ionization in toluene.

The reason why HCl splits into H^+ and Cl^- ions in presence of water lies in the fact that water molecules, being polar, pull the H^+ and Cl^- ions apart and thus, the bond in HCl is broken.



Dissociation of HCl into H^+ and Cl^- ions in presence of water

(i) Which acids are present in bee sting?

(ii) If the pH of a solution is 8, then find its $[H^+]$ ion.

OR

If you are given water, Hydrochloric acid, and Acetic acid, then mention increasing the order of acid strength.

38. **Read the text carefully and answer the questions:** **[4]**

Animals have a nervous system for controlling and coordinating the activities of the body. But plants have neither a nervous system nor muscles. So, how do they respond to stimuli? When we touch the leaves of a chui-mui (the 'sensitive' or 'touch-me-not' plant of the Mimosa family), they begin to fold up and droop. When a seed germinates, the root goes down, the stem comes up into the air. What happens? Firstly, the leaves of the sensitive plant move very quickly in response to touch.

There is no growth involved in this movement. On the other hand, the directional movement of a seedling is caused by growth. If it is prevented from growing, it will not show any movement.

(i) Write the types of movement.

(ii) Give an example of a plant hormone that promotes growth.

(iii) What is the function of the nervous system?

OR

How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light ?

39. **Read the text carefully and answer the questions:** **[4]**

A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt-sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern.

(i) Draw a diagram to show this pattern of iron filings.

(ii) Draw the magnetic field lines of a bar magnet showing the poles of the bar magnet as well as the direction of the magnetic field lines.

(iii) How is the direction of magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other?

OR

How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet.

Solution

Section A

1.

(b) III and IV

Explanation: The colour change will take place in III and IV as zinc is more reactive than iron as well as copper.

$Zn + \underset{Pale\ Green}{FeSO_4} \rightarrow \underset{Colorless}{ZnSO_4} + Fe$

$Zn + \underset{Blue}{CuSO_4} \rightarrow \underset{Colorless}{ZnSO_4} + Cu$

2.

(d) Heating copper wire in presence of air at high temperature

Explanation: In the other given options here, there is no involvement of chemical reaction. When copper is heated in presence of air at high-temperature copper undergoes an oxidation reaction to give out copper oxide.

3.

(b) $\mathrm{Ca(OH)_2}$

Explanation: Bleaching powder is prepared by passing chlorine gas over dry slaked lime.

$\underset{\text{slaked lime}}{Ca(OH)_2} + Cl_2 \rightarrow \underset{\text{bleaching powder}}{CaOCl_2} + H_2O$

4.

(b) Ethyne

Explanation: Ethyne

5. **(a)** H_2 gas

Explanation: H_2 gas is evolved.

6.

(b) To absorb moisture

Explanation: Anhydrous calcium chloride is used to absorb moisture or as a packaging aid to ensure dryness.

7.

(c) :N⋮⋮N:

Explanation: In Nitrogen molecule, each nitrogen atom has 5 valence electrons and there is a triple bond between the two nitrogen atoms. Thus, the correct electron dot structure is, :N⋮⋮N:

8.

(d) Potassium hydroxide

Explanation: In the given experiment, plant is destarched first and then kept in the bell jar along with potassium hydroxide in a watch-glass. When this set-up is kept in sunlight for few hours and is then tested for starch, it will show negative result. This shows that plant fails to get CO_2 to perform photosynthesis because CO_2 gets absorbed by potassium hydroxide (KOH).

9. **(a)** (iii) and (iv)

Explanation: In human beings, there are 23 pairs of the chromosome, out of which one pair is sex chromosome. In males, there are two types of sex chromosomes-X and Y. In males, all chromosomes are paired except sex chromosomes. Hence, normal-sized X chromosomes and small-sized Y chromosomes are unpaired.

10.

(c) Cervical cap

Explanation: Cervical cap is a flexible rubber or plastic cover that is fitted over the cervix in the female's vagina. It checks the entry of sperms into the uterus.

11.

(d) Alleles

Explanation: An alternative form of a gene is known as an allele. Alleles vary in their sequence which may or may not result in a variant phenotype of a particular trait. Alleles represent variations of a gene that is responsible for a particular trait.

12.

(c) Lenticels

Explanation: A lenticel is a porous tissue consisting of cells with large intercellular spaces in the bark of woody stems and roots. These raised pores in the stem of a woody plant that allows gas exchange between the atmosphere and the internal tissues.

13.

(b) 36.36 A

Explanation: 36.36 A

14. **(a)** 59.4 kWh

Explanation: Case 1:

Power, $P_1 = 60W$

Number, $n_1 = 2$

Time for use, $T_1 = 4$ hours everyday

Energy consumed, $E_1 = n_1 \times P_1 \times T_1$

$E_1 = 2 \times 60 \times 4 = 480$ watt-hour $= 0.48$kWh

Therefore, energy consumed for 30 days $= 30 \times 0.48 = 14.4$ watt-hour

Case 2:

Power, $P_2 = 100W$

Number, $n_2 = 3$

Time for use $T_2 = 5$ hours everyday

Energy consumed, $E_2 = n_2 \times P_2 \times T_2$

$E_2 = 3 \times 100 \times 5 = 1500 = 1.5$kWh

Therefore, energy consumed for 30 days $= 30 \times 1.5 = 45$kWh

Therefore, overall energy consumed $= 14.4 + 45 = 59.4$kWh

15.

(c) Both Unidirectional energy flow and Lindeman's law

Explanation: Lindeman’s law states that only 10% of the energy present in a trophic level is transferred to the next trophic level. Besides, the flow chart also represents unidirectional flow of energy from producers to carnivores through herbivores.

16. **(a)** Groups (a), (c) and (d)

Explanation:

The waste that is generated may be biodegradable or non-biodegradable. Substances that are broken down by biological processes are said to be biodegradable. Grass, flowers, leather, wood, fruit peels, cake and lime-juice are all biodegradable. Substances that are not broken down by biological processes are said to be non-biodegradable. Plastic is non-biodegradable. Plastic is inert and persists in the environment for a long time.

17. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: Both A and R are true and R is the correct explanation of A.

18.

(c) A is true but R is false.

Explanation: In multiple fission, the parent organism divides into many daughter cells at the same time during unfavourable conditions like deficiency of food or water and extremes of temperature. Production of large number of daughters increases the chances of survival of daughter cells.

19.

(d) A is false but R is true.

Explanation: When a charged particle moves perpendicular to magnetic field, it experiences a force which changes the direction of motion of the particle without changing the magnitude of velocity of the particle. Hence kinetic energy remains constant but momentum of electron changes.

20.

(d) A is false but R is true.

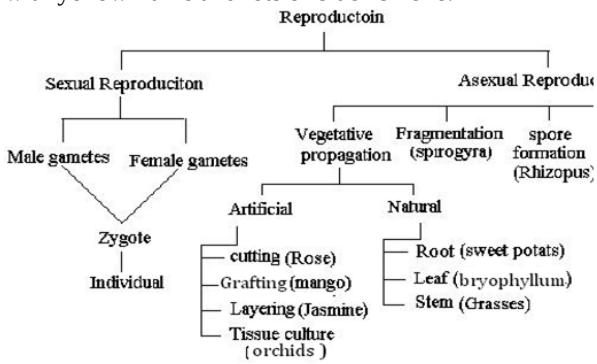
Explanation: A is false but R is true.

Section B

21. Ehene is an unsaturated hydrocarbon as it contains a double covalent bond between two carbon atoms. Presence of un-saturation or double covalent bond can be distinguished with the help of bromine solution in CCl_4. It is an orange colour solution which shows colour change after addition in ethene solution. The orange colour disappears because of formation of the colourless ethylene dibromide ($CH_2Br - CH_2Br$).

$CH_2{=}CH_2 + Br_2 \rightarrow CH_2Br{-}CH_2Br$

Ethane is a saturated hydrocarbon and cannot show this test. It burns with a clear flame whereas unsaturated hydrocarbons burn with yellow flame and lots of black smoke.

22. 

23. Significance of emulsification of fats is as follows:
    - Bile contains bile pigments and bile salts.
    - Bile salts help in the breakdown of oil droplets into small globules forming a milky emulsion. This process is called emulsification.
    - This process facilitates further digestion of fats.
    - Steapsin is a pancreatic lipase which acts on the already emulsified fats and converts them to fatty acids and glycerol.
    - This aids in the easy digestion of food.

    OR

    The inner lining of small intestine has numerous microscopic finger-like projections called villi which increase the surface area for absorption. The villi are richly supplied with blood vessels which transport the absorbed food to each and every cell of the body where, it is utilized to obtaining energy and repair of old tissues.

24. Since lens is convex, therefore/is positive.

    Given: u = - 20 cm, f = + 12 cm, h = 3 cm, v= ?, h' = ?

    Using lens formula

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

    We have, $\frac{1}{v} - \frac{1}{-2012} = \frac{1}{12}$

    $\frac{1}{v} + \frac{1}{20} = \frac{1}{12}$

    $\frac{1}{v} = \frac{1}{12} - \frac{1}{20}$

    $\frac{1}{v} = \frac{5-3}{60} = \frac{1}{30}$

    v = 30 cm

    Since 'V' is positive, the image is located on the other side of the lens.

    m = $\frac{v}{u} = \frac{+30}{-20}$

    = -1.5

    Since m is negative and greater than 1, the image is real, inverted and larger than the object.

    m = $\frac{h'}{h} = -1.5 = \frac{h'}{3}$

    or h' = -4.5 cm

    Thus the image is 30 cm from the convex lens, located on the other side of the lens. It is real, inverted and 4.5 cm high.

25. An aquarium is an artificial and incomplete ecosystem in contrast to a pond/lake which are natural, self-sustaining and complete ecosystems. Ponds and lakes have their own cleaning mechanisms because of presence of various microorganisms but Aquarium

lacks decomposer microbes which convert the complex organic compounds of dead organisms into simple substances that can be reused by plants. Hence the dead fishes of the aquarium are not decomposed. so it needs regular cleaning.

OR

Following problems are caused by the Non biodegradable waste:

a. Plastics which do not get decomposed get accumulated in soil, water bodies & pollute these natural resources.

b. Non-biodegradable substances like pesticides and fertilizers mix with run off to water & enter the water bodies. Excess fertilizers in water bodies cause excess growth of algae on the surface leading to oxygen depletion in water bodies, affecting the growth of aquatic organisms. Pesticides being toxic also affect the aquatic plants & animals.

c. Some of the non-biodegradable pesticides like DDT enter the food chain and cause biomagnification in humans and other animals.

26. Scattering of light is the phenomenon in which a part of the incident light is dispersed in different directions.
Dependence of colour and scattered light on the size of particles:

i. When the particles like dust and water droplets present in the atmosphere are large in size, the scattered light appears white.

ii. When the particles are extremely minute in size, they will scatter blue light present in the white sunlight.

Section C

27. Hydrogen has a tendency to lose an electron and forms a positive ion H^+ like metals although hydrogen is not a metal yet it has been assigned a place in the reactivity series of metals. The metals which lose electrons less readily than hydrogen are placed below it and the metals which lose electrons more readily than hydrogen are placed above it in the reactivity series of metals.

28. i. Ore A is a carbonate ore.

The steps involved in the extraction of metal M form ore A are as follows:

a. The carbonate ore is heated strongly in the limited supply of air to produce a metal oxide. **[calcination]**

$MCO_3\ (s) \xrightarrow{\Delta} MO(s) + CO_2(g)$

b. The oxide ore is reduced with carbon(coke).

$MO\ (s) + C\ (s) \rightarrow M(s) + CO\ (g)$

ii. Ore B is a sulphide ore.

The steps involved in the extraction of metal M from ore B are as follows:

a. The sulphide ore is heated strongly in the presence of the excess of air to produce a metal oxide.**[roasting]**

$2MS(s) + 3O_2(g) \xrightarrow{\Delta} 2MO(s) + 2SO_2(g)$

b. The oxide of metal B is reduced by carbon to obtain the corresponding metal.

$MO(s) + \underset{Carbon}{C(s)} + \rightarrow \underset{Metal}{M(s)} + CO_2/CO(g)$

OR

i. Difference between Metals and Non-metals:

Metals	Non-metals
They react with oxygen to form basic oxide. $\underset{Magnesium}{2Mg} + O_2 \rightarrow \underset{Magnesium\ oxide}{2MgO}$	They react with oxygen to neutral or basic oxide. $\underset{Carbon}{4C(s)} + O_2(g) \rightarrow \underset{Carbondioxide}{CO_2(s)}$
They react with water to produce metal hydroxide and hydrogen gas. $Mg + 2H_2O \longrightarrow Mg(OH)_2 + H_2$	They do not react with water,
Generally, they do not combine with hydrogen except sodium, potassium, and calcium which form ionic hydrides.	They react with hydrogen to form covalent hydrides.

ii. a. Metals for example Na have an electronic configuration of 2, 8, 1 i.e. It has one free electron. This electron moves through the metal and conducts an electric current due to the presence of a free electron. So, metals conduct electricity because they readily give up their valence electron.

b. $\underset{(s)}{Fe_2O_3} + \underset{(s)}{2Al} \rightarrow \underset{s}{Al_2O_3} + \underset{(Heat)}{2Fe(l)}$

It is a thermite reaction.

This reaction is an exothermic reaction the reaction produces a large amount of heat due to which iron metal is produced in molten form and use to join the tracks.

29. i. Label the parts numbered 1 - 10:

1. Nasal cavity,
2. Pharynx,
3. Larynx,
4. Trachea,
5. Lungs,
6. Bronchus,
7. Bronchioles,
8. Pleura,
9. Diaphragm and
10. Nostrils

The figure represents the human respiratory system.

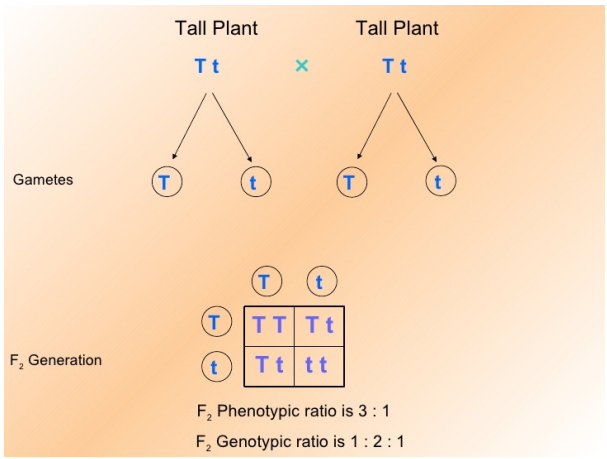
ii. Nostrils → Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli.

iii. Alveoli are the structural and functional unit of the lungs. They are the site of the exchange of gases between blood capillaries and lungs i.e., oxygen is taken in and carbon dioxide is given out.

30. When Mendel crossed a homozygous tall (TT) plant with homozygous dwarf (tt) plant, all plants in F_1 generation were tall (Tt).

Self crossing of F_1 gives F_2. F_2 generation had 3 tall : 1 recessive plants.

Since presence of dwarf allele was masked by tall allele in F_1, tall allele (T) was dominant over dwarf allele (t).



31. i. Concave Mirror

ii. It is given, object distance u = -20m, distance v= 80m

Magnification is given as M = -v/u

M = -v/u = -(-80m/-20) = 4

iii. Distance between object and image v-u = -80m-(-20m)=60m

32. i. Zero, current flows due to potential difference and not due to potentials.

ii. The total energy consumed by the refrigerator in 30 days would be

400 w × 8.0 hour/day × 30 days = 96000 Wh

= 96 kWh

Thus the cost of energy to operate the refrigerator for 30 days is

96 kW h × ₹ 3.00 per kWh = ₹ 288.00

33. i. Effective resistance of the circuit

R_3 and R_4 are in series and both are parallel to R_2

$R_3 + R_4 = 10$ Ohm

Effective Resistance across R_2(R')

$\frac{1}{R'} = \frac{1}{R_2} + \frac{1}{R_3+R_4}$

R' = 5 Ohm

Now, R_1', R' and R_5 are in series

Effective resistance of the circuit = $R_1 + R' + R_5$

= 5 + 5 + 10

= 20 Ohm

ii. Current drawn from battery

V = IR

I = $\frac{V}{R}$

I = $\frac{20}{20}$

I = 1 A

iii. Potential difference across 5-ohm resistor

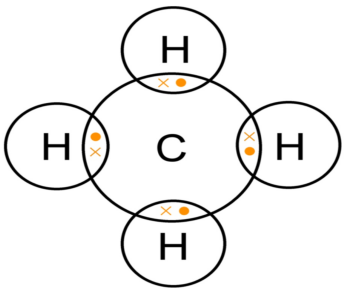
V = IR

V = 1 $\times$ 5

V = 5V

Section D

34. Methane (CH_4) is the simplest hydrocarbon. Covalent bonds are formed in methane. The electron dot structure of methane is



i. Methane is a poor conductor of electricity as no ions or charged particles are formed in these compounds.

ii. Methane has a low melting and boiling point due to weak covalent bonds.

When methane compound burns with oxygen, carbon dioxide and water are produced. It is a combustion process. The reaction is:

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

OR

According to the question, Given compounds are

i. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-OH$

Propan-1-ol or Propanol

ii. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{O}{||}}{C}-OH$

Propanoic acid

iii. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-Cl$

Chloropropane

iv. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-OH$

Propanal

v. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-C\equiv CH$

Prop-1-yne or Propyne

vi. $H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{O}{||}}{C}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}-H$

Butan-2-one

35. i. Differences between pollen tube and style are:

Pollen Tube	Style
It is part of male gamete. When pollen grain sticks to flower	The middle elongated part of the carpel, i.e. female part

stigma a tube growing out of pollen grain better known as pollen tube.	of a flower. Which allows path for pollen tube to grow.
It transports male gametes from pollen grains to ovules.	The attachment of stigma to the ovary.

ii. Difference between fission in amoeba and plasmodium is

Fission in Amoeba	Fission in Plasmodium
The fission in amoeba is binary fission. The division of parental body into two identical daughter cells at a time. Thus, the size is comparitive to parent cell.	The fission in plasmodium is multiple fission. The parental body divides into numerous daughter cells simultaneously. Here the daughter cells are numerous and very small.

iii. Difference between fragmentation and regeneration is:

Fragmentation	Regeneration
The method in which multicellular organism breaks up into two or more smaller fragments.	The growth of a whole new organism from any of its body, with the help of special cells.i.e. single segment forming new individual.

iv. Difference between bud of Hydra and Bryophyllum is:

Bud of Hydra	Bud of Bryophyllum
It is seen during budding as an outgrowth on the body of Hydra which gets fully grown and then detaches from the body and becomes a new individual.	This is present on the leaves of Bryophyllum develop into a new plant when it comes in contact with soil and other favourable conditions. The bud here are numerous in single leaf at a time

v. Difference between vegetative propagation and spore formation is:

Vegetative propagation	Spore Formation
New plants are obtained from different parts of parent body like leaves, stems, etc. It is a form of asexual reproduction that can be natural or induced artificially.	Spore formation is also an asexual reproduction procedure which occur in non-flowering plants. Parent plant produce numerours spores. Spores when fall on land, have the ability to germinate and produce new fungal colonies under favourable conditions.

OR

i. The brain and the spinal cord constitute the central nervous system (CNS).

ii. The spinal cord is concerned with spinal reflex actions and the conduction of nerve impulses to and from the brain.

iii. The spinal cord is enclosed in a bony cage called vertebral column and is surrounded by membranes called meninges which protects it.

iv. All the nerves of the body together make up the peripheral nervous system. It consists of three types of nerves that are spinal nerves, cranial nerves, and visceral nerves.

v. The autonomic nervous system (ANS) means a self-governing nervous system. Its function is to control and regulate the functions of the internal organs of our body involuntarily.

36. i. The distance between the focus and optical centre of lens is called focal length of lens.

ii. Given

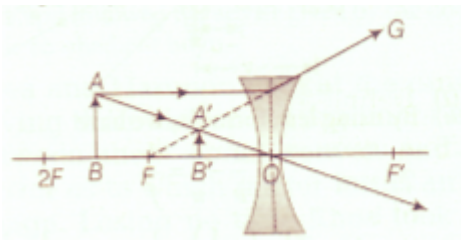
f =-30 cm, v= -15 cm, u=?, h_0 =5cm

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow -\frac{1}{30} = -\frac{1}{15} - \left(\frac{1}{u}\right) \Rightarrow u = -30\ cm$

$\therefore$ m = $\frac{v}{u} = \frac{h_i}{h_0}$

$\Rightarrow\ \frac{15}{30} = \frac{h_i}{5} \Rightarrow h_i = \frac{5}{2} \Rightarrow h_i = 2.5cm$

iii.



OR

i. a. Given, P = + 2D

P is positive, so lens is convex .

$\therefore$ f = $\frac{1}{P} = \frac{1}{2} = 0.5\ m = 50cm$

b. Given, P = -4D

P is negative, so lens is concave .

$\therefore$ f = $\frac{1}{P} = \frac{1}{-4}$

= - 0.25 m = - 25cm

ii. a. As u = -100cm

Case I f = 50 cm

Then by lens formula, $-\frac{1}{u} + \frac{1}{v} = \frac{1}{f},\ we\ get$

$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{50} - \frac{1}{100} = \frac{1}{100}$

or v = 100 cm

Case II f = -25 cm

By lens formula, $-\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$,

$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = -\frac{1}{25} - \frac{1}{100} = \frac{-5}{100} = -\frac{1}{20}$

v = -20 cm

b. As,m $= \frac{v}{u}$

Case I: u = - 100 cm, v = 100 cm

$m = \frac{100cm}{-100cm} = -1$

Case II: u = -100 cm, v = -20 cm

$m = \frac{-20cm}{-100cm} = \frac{1}{5} = 0.2$

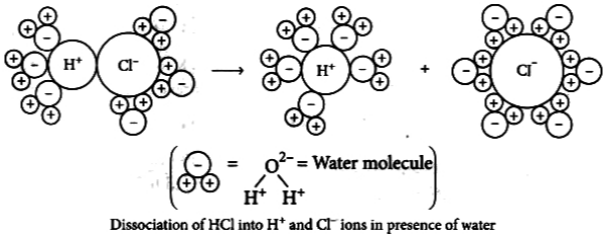
Section E

37. **Read the text carefully and answer the questions:**

The acidic behaviour of acids is due to the presence of hydrogen (H^+) ions in them. They produce hydrogen ions in the presence of water. Water is a polar solvent and this property of water helps in weakening the bond between the ions and makes them soluble.

Hence, acids and bases produce ions in aqueous solutions. It may be noted that a dry HCl gas or a solution of hydrogen chloride in organic, non-polar solvents like toluene or benzene do not show acidic properties. This is because hydrogen chloride does not undergo ionization in toluene.

The reason why HCl splits into H^+ and Cl^- ions in presence of water lies in the fact that water molecules, being polar, pull the H^+ and Cl^- ions apart and thus, the bond in HCl is broken.



Dissociation of HCl into H^+ and Cl^- ions in presence of water

(i) Formic acid is the common name for methanoic acid and it is present in a bee stings.

(ii) pH = $-\log_{10}[H^+] = 8$

$\log 10\ [H^+] = -8$

$[H^+] = 10^{-8}$ mol/L

OR

Water < Acetic acid < Hydrochloric acid

38. **Read the text carefully and answer the questions:**

Animals have a nervous system for controlling and coordinating the activities of the body. But plants have neither a nervous system nor muscles. So, how do they respond to stimuli? When we touch the leaves of a chui-mui (the 'sensitive' or 'touch-me-not' plant of the Mimosa family), they begin to fold up and droop. When a seed germinates, the root goes down, the stem comes up into the air. What happens? Firstly, the leaves of the sensitive plant move very quickly in response to touch.

There is no growth involved in this movement. On the other hand, the directional movement of a seedling is caused by growth. If

it is prevented from growing, it will not show any movement.

(i) There are two types of movement:

a. dependent on growth

b. independent on growth.

(ii) Auxin is a plant hormone that promotes growth.

(iii)The function of the nervous system is to control and coordinate the activities of the body.

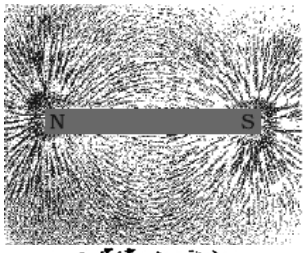
OR

The movements of the leaves of the sensitive plant are touch sensitive and independent of growth while the movement of the shoot towards light is growth related and known as phototropism.

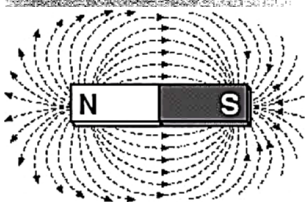
39. **Read the text carefully and answer the questions:**

A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt-sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern.

(i)



(ii)



(iii)The direction of a magnetic field at a point is determined by placing a small compass needle. The N - pole of compass indicates the direction of magnetic field at that point.

If magnetic field lines intersect each other, then at the intersection point there will be two directions of the same field which is not possible.

OR

Magnetic field lines can be drawn by moving a small compass from point to point around a magnet. At each point, draw a short line in the direction of the compass needle. Joining the points together reveals the path of the magnetic field lines.