

Class X Session 2024-25
Subject - Science
Sample Question Paper - 5

Time Allowed: 3 hours

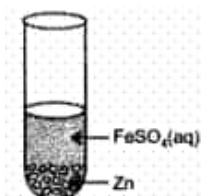
Maximum Marks: 80

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. On adding zinc granules to freshly prepared ferrous sulphate solution, a student observes that [1]



- a) a dull brown coating is formed b) a greyish black coating is formed
- c) a white coating is formed d) no coating is formed
2. In the double displacement reaction between aqueous potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate? [1]
- a) Ammonium nitrate b) Potassium sulphate
- c) Lead acetate d) Lead sulphate (insoluble)
3. An aqueous solution **A** turns phenolphthalein solution pink. On addition of an aqueous solution **B** to **A**, the pink colour disappears. The following statement is true for solution **A** and **B**. [1]
- a) A is strongly acidic and B is a weak acid. b) A has pH less than 7 and B has pH greater than 7.

c) A is strongly basic and B is a weak base.

d) A has pH greater than 7 and B has pH less than 7.

4. $\text{CH}_2 = \text{CH}_2 + \text{BR}_2(\text{aq}) \rightarrow \text{BrCH}_2 - \text{CH}_2\text{Br}$ [1]

The above reaction is an example of:

a) Hydrogenation reaction

b) Substitution reaction

c) Combustion reaction

d) Addition reaction

5. During smelting, an additional substance is added which combines with impurities to form a fusible product known as: [1]



a) Flux

b) Slag

c) Gangue

d) Mud

6. Select the correct statements. [1]

I. Oxide ores of heavy metals are concentrated by hydraulic washing.

II. Froth floatation process is used for the concentration of magnetic ores.

III. Oxides of highly reactive metals can be reduced to metals by the action of heat alone.

IV. Carbonate ores are decomposed to form metal oxides by heating in the absence of air.

a) II and III only

b) I, III and IV only

c) I and IV only

d) I, II, III and IV

7. Which of the following are unsaturated hydrocarbons? [1]

i. $\text{H}_3\text{C} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$

ii. $\text{H}_3\text{C} - \text{C} \equiv \text{C} - \text{CH}_3$

iii. $\text{H}_3\text{C} - \underset{\text{CH}_3}{\text{C}} \text{H} - \text{CH}_3$

iv. $\text{H}_3\text{C} - \underset{\text{CH}_3}{\text{C}} = \text{CH}_2$

a) (ii) and (iv)

b) (iii) and (iv)

c) (i) and (iii)

d) (ii) and (iii)

8. A black strip of paper was clipped onto a destarched leaf in a potted plant to cover a part of the leaf. The plant was then exposed to sunlight for four hours, the paper strip was removed and the leaf was tested for starch. When iodine solution was added: [1]

a) The entire leaf turned blue-black.

b) The uncovered part of the leaf became blue-black.

- c) The colour of the iodine solution remain unchanged. d) The covered part of the leaf became blue-black.
9. Mendel selected garden peas as his experimental material because [1]
- Pea plants possess a number of well defined contrasting characters.
 - Pea plants contain unisexual flowers.
 - Pea plants have a short life cycle.
 - Pea plants produce many seeds in one generation.
- a) (i) and (iii) only b) (i) and (ii) only
c) (i), (iii) and (iv) only d) (i) and (iv) only
10. In the list of organisms given below, those that reproduce by the asexual method are [1]
- banana
 - dog
 - yeast
 - Amoeba
- a) (i) and (iv) b) (ii), (iii) and (iv)
c) (ii) and (iv) d) (i), (iii) and (iv)
11. If a round green seeded pea plant (RRYY) is crossed with wrinkled yellow seeded pea plant (rr yy) the seeds to be produced in F₁ generation will be: [1]
- a) round and green b) wrinkled and green
c) Wrinkled and yellow d) round and yellow
12. In submerged water plants like Hydrilla: [1]
- Light is necessary for photosynthesis
 - Photosynthesis does not occur
 - Carbon dioxide is not needed for photosynthesis
 - Light is not needed for photosynthesis
13. The magnetic field strength of a solenoid can be increased by inserting: [1]
- A wooden piece into it
 - An iron piece into it
 - A glass piece into it
 - Paper roll into it
14. Which of the following is the most likely temperature of the filament of an electric light bulb when it is working on the normal 220 V supply line? [1]
- 2500°C
 - 1500°C
 - 500°C
 - 4500°C
15. Accumulation of non-biodegradable pesticides in the food chains in increasing amount at each higher trophic level is known as: [1]
- Biological magnification
 - Accumulation
 - Eutrophication
 - Pollution
16. Which group(s) of organisms is/are not a constituent of a food chain? [1]
- A. Grass, lion, rabbit, wolf

- a) B and D b) All of these
- c) B and C d) A and C

Reason (R): At higher temperatures, molecular motion becomes more rapid.

18. **Assertion (A):** Urethra in human males acts as a urinogenital canal. [1]

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.

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.

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.

21. i. Why does carbon form the largest number of compounds? Give two reasons. [2]
 ii. Why are some of these called saturated and the other unsaturated compounds?
 iii. Which one of these two is more reactive and why?

23. Why is blood circulation in human heart called double circulation? [2]

24. State laws of refraction of light. [2]

25. Which chemical is used in fire extinguishers. It is harmful as it leads to depletion of ozone layer, thus allowing UV radiations from the Sun to enter into the atmosphere. [2]

OR

How is ozone formed in the upper atmosphere? State its importance. What is responsible for its depletion? Write one harmful effect of ozone depletion.

26. A student uses spectacles of focal length -2.5 m . [2]
- Name the defect of vision he is suffering from.
 - Which lens is used for the correction of this defect?
 - List two main causes of developing this defect.
 - Compute the power of this lens.

Section C

27. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it. [3]
- What will be the action of gas on
- Dry litmus paper?
 - Moist litmus paper?

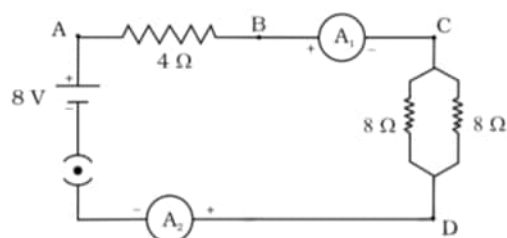
Write a balanced chemical equation for the reaction taking place.

28. What is the cause of the inertness of noble gas elements? [3]

OR

- An ore, on heating in air, give sulphur dioxide gas. Name the method in each metallurgical step, that will be required to extract this metal from its ore.
 - State which of the following reactions will take place or which will not, giving suitable reason for each?
 - $\text{Zn(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{Cu(s)}$
 - $\text{Fe(s)} + \text{ZnSO}_4\text{(aq)} \rightarrow \text{FeSO}_4\text{(aq)} + \text{Zn(s)}$
29. Explain nutrition in Amoeba. [3]
30. In a pea plant, find the contrasting trait if [3]
- the position of flower is terminal
 - the flower is white in colour
 - shape of pod is constricted
31. An object is kept at a distance of 18 cm , 20 cm and 30 cm , from a lens of power $+5\text{D}$. (i) In which case or cases would you get a magnified image? (ii) Which of the magnified image can we get on a screen? (b) List two widely used applications of a convex lens. [3]
32. Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is Rs. 6.00. [3]
- Electric heater of 1000 W for 5 hours daily.
 - Electric refrigerator of 400 W for 10 hours daily.

33. Find out the following in the electric circuit given in Figure [3]



- The potential difference across 4Ω resistance

ii. The power dissipated in $4\ \Omega$ resistor

Section D

34. Discuss the formation of covalent bonds in molecules of [5]
- Ammonia
 - Ethylene
 - Carbon dioxide.

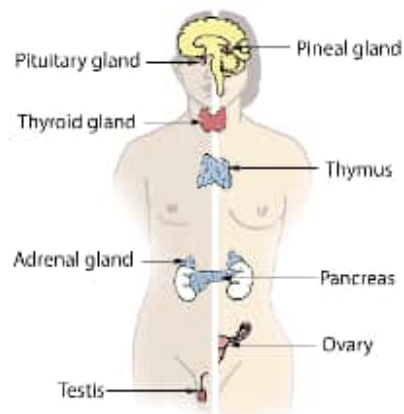
OR

Discuss the important characteristics of covalent compounds.

35. Explain various steps of budding in yeast. [5]

OR

Given below is a diagram of the human endocrine system.



Using the given diagram, answer the following questions:

- How pituitary gland regulates the growth of the body?
 - Which hormone is responsible for the carbohydrate, protein, and fat metabolism in the body?
 - Which pair of glands prepare the body to deal with emergency situations?
 - Which gland secretes insulin and what does it do in the body?
 - What is the function of endocrine glands?
36. How are the images formed when an object is moved from infinity to the convex lens? [5]

OR

An object 2 cm high is placed at a distance of 16 cm from a concave mirror which produces a real image 3 cm high.

(i) Find the position of the image.

(ii) What is the focal length of mirror?

Section E

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

The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions.

Group A - Lemon juice, vinegar, colourless aerated drink

Group B - Tomato juice, coffee, ginger juice

Group C - Sodium hydroxide, sodium chloride, lime water

- For the solutions provided, which group is/are likely to have pH value (i) less than 7, and (ii) greater than 7?
- List two ways of determining pH of a solution.

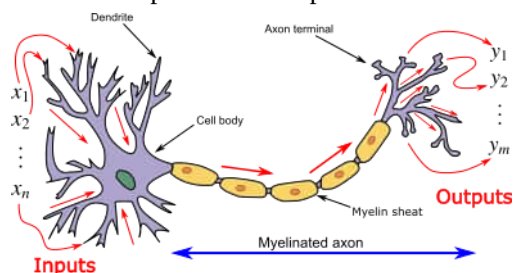
OR

Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels.

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

[4]

In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell, see figure, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end.



- Name the largest cell present in the body.
- What is an axon ?
- Name one gustatory receptor and one olfactory receptor present in a human beings.

OR

Name the following parts of a neuron:

- Where information is acquired.
- Through which information travels as an electrical impulse.

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.

- What makes iron filings arrange in a definite pattern?
- Draw a diagram to show this pattern of iron filings.
- 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) a greyish black coating is formed

Explanation: The colour of the coating is grayish black. When Zinc Reacts with ferrous sulphate zinc displaces iron forming zinc sulphate and iron metal is precipitated and settles on the surface of zinc granules. This is because zinc is more electropositive than iron so it can displace iron from its solution. Also, the solution turns colourless from light green.

$$FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + \underset{\text{Black}}{Fe(s)}$$
2.

(c) Lead acetate

Explanation: To get lead iodide we need a compound containing lead. Hence, Ammonium nitrate and Potassium sulphate are ruled out. Lead sulphate is insoluble hence it cannot be used. So the answer is **Lead acetate** can be used in place of Lead Nitrate.
3.

(d) A has pH greater than 7 and B has pH less than 7.

Explanation: A has pH greater than 7 and B has pH less than 7.
4.

(d) Addition reaction

Explanation: The given reaction is an example of the addition reaction. In this reaction, a bromine atom **adds** to each carbon atom of ethene. The double bond in ethene is broken and the hydrocarbon becomes saturated.
5.

(b) Slag

Explanation: During the smelting of iron, limestone is added as a flux. The temperature inside the blast furnace decomposes limestone to calcium oxide which removes silicate impurity. Impurities like silicon are passed into the slag. The metal is separated from the molten slag.

$$CaCO_3 \rightarrow CaO + CO_2$$
$$CaO + SiO_2 \rightarrow CaSiO_3 \text{ (Slag)}$$
6.

(c) I and IV only

Explanation: Froth floatation process is used for the concentration of sulphide ores. Oxides of highly reactive metals are reduced to metals by electrolysis of their molten or fused oxides.
7.

(a) (ii) and (iv)

Explanation: **(i)** and **(iv)** are unsaturated hydrocarbons (they contain double or triple bonds between two carbon atoms). **(i)** is ethyne (an alkyne). **(iv)** is iso-butene (2-methyl propene)

A and C are saturated hydrocarbons (they contain only single bonds between the carbon atoms).
8.

(b) The uncovered part of the leaf became blue-black.

Explanation: The uncovered part of the leaf became blue-black.
9.

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

Explanation: (i), (iii) and (iv) only
10.

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

Explanation: Asexual reproduction is the mode of reproduction in single-parent produces offsprings.

 - Amoeba reproduces asexually by binary fission.

- Asexual reproduction occurs in yeast by means of budding and in banana asexual reproduction occurs by the means of vegetative propagation from the stem.
- Dogs reproduced sexually.

11. (a) round and green

Explanation: Since roundness and green colour are shown by capital letters in the genotype so they are dominant traits. We know that only dominant traits are expressed in F_1 generation.

12. (a) Light is necessary for photosynthesis

Explanation: Light is necessary for photosynthesis

13.

(b) An iron piece into it

Explanation: An iron piece into it

14. (a) 2500°C

Explanation: 2500°C

15. (a) Biological magnification

Explanation:

The chemicals used to protect crops from diseases and pests are washed down into the soil or the water bodies. From the soil, these are absorbed by the plants along with water and minerals. From the water bodies, these are taken up by aquatic plants and animals. The non-biodegradable chemicals thus enter the food chain. They get accumulated progressively at each trophic level. As human beings occupy the top level in any food chain, the maximum concentration of these chemicals gets accumulated in human bodies. This phenomenon is known as biological magnification.

16.

(c) B and C

Explanation:

Organisms in groups B and C do not make up a food chain. A food chain is a series of organisms in order of who eats whom. In B, grasshopper is out of place. In D, nobody out of wolf, snake or tiger eats grass.

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

Explanation: A chemical reaction becomes faster at higher temperatures because at high temperature, the movement of particles are greater.

18.

(c) A is true but R is false.

Explanation: A is true but R is false.

19.

(c) A is true but R is false.

Explanation: The magnitude of magnetic field produced by a current carrying circular coil is maximum at the centre and is not proportional to the distance of a point from the circular coil.

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

Explanation: There are both biotic (living) and abiotic (non-living) elements in an ecosystem. This is accurate because ecosystems consist of both living and non-living elements, including soil, water, air, and other non-living things like animals, plants, and bacteria. Since living things depend on nonliving resources like water, air, and soil nutrients for survival, both biotic and abiotic components are crucial to the maintenance of life. On the other hand, abiotic factors like sunshine and climate also affect how living things are distributed and behave in an ecosystem. The justification, which states that biotic and abiotic elements function separately in every ecosystem, also bolsters the assertion. This is so that life can continue to exist in an ecosystem even while living things and non-living resources do not rely on one another.

Section B

21. i. Carbon forms large no. of compounds due to the following reasons:

Catenation: The property of an element to combine with itself to form long chain is called catenation. Atoms of same element combine through covalent bonds and form long chains and structures. Carbon exhibit this property of catenation. Due to which we see such a large variety of organic compounds in nature.

Tetravalency: Carbon has a valency of four. So, it is capable of bonding with four other atoms of carbon or atoms of some other element. Compounds of carbon are formed with oxygen, nitrogen, hydrogen, sulphur, chlorine and many other elements, which may act as functional groups with specific properties which depend on the elements other than the carbon present in the molecule.

- ii. Some compounds are called saturated because they contain single bond only between two carbon atoms but some are unsaturated because in these hydrocarbons, valence of carbon is satisfied by double or triple bond.
 - iii. Unsaturated hydrocarbons are more reactive because of the presence of double and triple bonds between them, which are weaker compared to single bond.
22. After fertilization, the zygote starts dividing by repeated mitotic divisions called cleavage. In about 4 to 5 days after fertilization, zygote becomes a multicellular structure called blastocyst. The blastocyst gets attached to the lining of uterus is called implantation.
23. In Humans blood flow in two directions simultaneously in one cardiac cycle. Oxygenated blood comes to the heart from the lungs and at the same time, de-oxygenated blood goes from Heart towards the lungs. Because of this double movement is blood circulation in the human heart called double circulation.

OR

Aerobic Respiration	Anaerobic Respiration
It takes place in the presence of oxygen.	It takes place in the absence of oxygen.
Carbon-di-oxide and water are the end products.	Carbon-di-oxide and Lactic acid/ ethanol are the end products.
More efficient in energy production.	Less efficient in energy production.
It takes Place in animals and plants.	It takes place in unicellular organisms.

24. The two laws of refraction are:
- i. The incident ray, the refracted ray and the normal at the point of incidence, all lie in the same plane.
 - ii. The ratio of the sine of the angle of incidence (i) to the sine of angle of refraction (r) is a constant for the pair of given media.
- This constant is called the refractive index of the second medium with respect to the first medium.
25. CFCs, i.e. chlorofluorocarbons are used in fire extinguishers it is most common ozone depletion substance (ODS), which create a hole in ozone layer thus allowing UV radiations from the Sun to enter into the atmosphere.

OR

- The higher energy UV radiations split apart some molecular oxygen into free oxygen atoms. These atoms then combine with molecular oxygen to form ozone.
- $$\text{O}_2 \xrightarrow{\text{UV}} \text{O} + \text{O}$$
- $$\text{O}_2 + \text{O} \longrightarrow \text{O}_3$$
- It prevents harmful UV radiation to reach the earth.
 - CFC/chlorofluoro carbon/aerosol.
 - Skin cancer

26. $f = -2.5 \text{ m}$
- i. Since the focal length is negative, it is a concave lens and it is used in myopia.
 - ii. Concave
 - iii. i. excessive curvature of the cornea.
ii. elongation of the eyeball.
 - iv. $f = -2.5 \text{ m}$

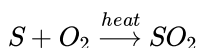
The negative sign of focal length indicates that the lens used is concave hence the boy is suffering from myopia (short-sightedness).

$$\begin{aligned} \text{Power of the lens} &= \frac{1}{f(\text{in m})} \\ &= \frac{1}{(-2.5)} \\ &= -2.5 \text{ D} \end{aligned}$$

Section C

27. The gas is sulphur-dioxide (SO_2)
- i. It will not react with dry litmus paper.
 - ii. The gas will bleach moist litmus paper.

The balanced chemical equation is



28. The inertness or reluctance of the members of the noble gas family is linked with their structure. The first member helium (He) has two electrons in the only shell which is the K-shell. The atoms of all other members have eight electrons in their outermost shell, also called valence shell. The electronic configuration of the members of the family are as follows:

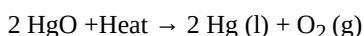
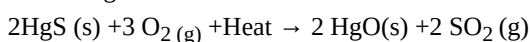
Noble gas element	Symbol	Atomic No. (Z)	Electronic Configuration	No. of electrons in outermost shell
Helium	He	2	2	2
Neon	Ne	10	2, 8	8
Argon	Ar	18	2, 8, 8	8
Krypton	Kr	36	2, 8, 18, 8	8
Xenon	Xe	54	2, 8, 18, 18, 8	8
Radon	Rn	86	2, 8, 18, 32, 18, 8	8

This is the maximum number of electrons which the atoms of these elements can have in their outermost shell. They have, therefore, no tendency to either lose or gain one or more electrons. In other words, these atoms are fully satisfied. The members of the family are called inert gases or noble gases.

OR

- i) The ore is Cinnabar (Hg_2S)

Cinnabar is the ore of mercury (Hg) which has low reactivity and can be reduced to mercury by heating alone. So to obtain mercury from cinnabar the only step required is heating strongly in the presence of oxygen called "Roasting". In the first step, cinnabar gets converted to mercuric oxide which on further heating is reduced to mercury.



- ii) a. This reaction will take place as Zn is more reactive than Cu, so Zn will displace Cu from its salt $CuSO_4$ and will form colourless $ZnSO_4$ solution and reddish brown particles Cu.

- b. This reaction will not occur as Fe is less reactive than Zn, so it will not be able to displace Zn from $ZnSO_4$.

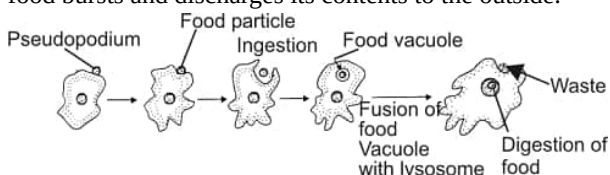
29. Nutrition in Amoeba: Amoeba is omnivorous. i.e. it feeds on smaller animals, plants, micro-organisms and fragments of larger organisms. Nutrition is holozoic. Ingestion can occur at any place on the surface since a regular mouth is absent. Ingestion occurs through phagocytosis or engulfing the food particle in an invagination of the body. The engulfed food particle comes to lie inside a food vacuole. The latter is surrounded by a membrane.

Digestion: The digestion is intracellular and the food vacuoles act as temporary stomach for digestion.

Absorption: It occurs by diffusion and distribution takes place by cyclosis.

Assimilation: Assimilation of digested material occurs in a single cell.

Egestion: The undigested food is eliminated through the surface of the cell, where the food vacuole containing the undigested food bursts and discharges its contents to the outside.



30. Contrasting traits were used by Mendel and were classified as dominant or recessive. Mendel used 7 traits of pea plant for his experiments. Out of which 3 are.

Character	Given Trait	Contrasting Trait
(i) Position of flower	Terminal	Axial (dominant)
(ii) Colour of flower	White	Violet (dominant)
(iii) Shape of pod	Constricted	Full (dominant)

31. (i) Focal length = $1/\text{power} = 1/5D = 1/5m = 20\text{cm}$

It is convex lens of focal length 20cm.

So, the Magnified image will be formed in all cases, 20cm is focus, 18 cm is on focal length, 22 cm and 30 cm is between focus

and focus and center of curvature. In all cases, magnified image is formed.

(ii) In case of 22 cm and 30 cm image formed is real and hence can be obtained on screen.

$$32. P_1 = \frac{1000W}{1000} = 1kW$$

$$t_1 = 5 \text{ h}$$

$$P_2 = \frac{400W}{1000} = 0.4 \text{ kW}$$

$$t_2 = 10 \text{ h}$$

No. of days $n = 30$

Energy consumed by heater:

$$E_1 = P_1 \times t_1 \times n = 1 \text{ kW} \times 5 \text{ h} \times 30 = 150 \text{ kWh}$$

Energy consumed by refrigerator:

$$E_2 = P_2 \times t_2 \times n = 0.4 \text{ kW} \times 10 \text{ h} \times 30 = 120 \text{ kWh}$$

$$\text{Total energy} = (150 + 120) \text{ kWh} = 270 \text{ kWh}$$

We know that $1\text{kWh} = 1\text{unit}$, so

$$270 \text{ kWh} = 270 \text{ units}$$

Cost of 1 unit is Rs. 6.00

$$\text{Total cost} = 270 \times 6 = \text{Rs. } 1620$$

33. Given :-

Resistor, $R_1 = 4 \Omega$

Resistor, $R_2 = 8 \Omega$

Resistor, $R_3 = 8 \Omega$

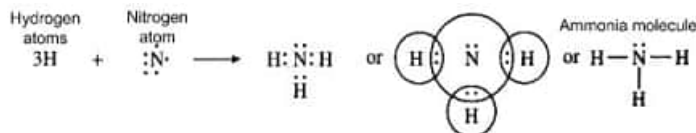
Potential Difference, $V = 8 \text{ volts}$.

i. The potential difference across 4Ω resistors, $V = IR = 1 \times 4 = 4V$

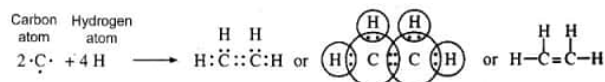
ii. Power dissipated in 4Ω resistors, $P = I^2R = (1A)^2(4\Omega) = 4W$

Section D

34. i. Covalent bonds in ammonia (NH_3) molecule: The atomic number of nitrogen is 7. Its electronic configuration is 2, 5. This means that nitrogen atom has five valence electrons. In order to have eight electrons in the valence shell, the nitrogen atom shares three electrons with the electrons of three hydrogen atoms. Thus, nitrogen atom gets linked to three hydrogen atoms by three covalent bonds. The formation of ammonia molecule may be shown as follows:



- ii. Covalent bonds in ethylene (C_2H_4) molecule: Ethylene molecule has two carbon atoms. Each carbon atom shares two electrons with the two hydrogen atoms. At the same time, both the carbon atoms mutually share two electrons each. Thus both the carbon atoms get linked by double bond. Each carbon atom also gets linked to two hydrogen atoms by single bonds. The formation of ethylene molecule may be shown as follows:



- iii. Covalent bonds in carbon dioxide (CO_2) molecule: Carbon atom has four electrons. Each oxygen atom has six valence electrons (2, 6). The carbon atom shares its electrons with the electrons of the two oxygen atoms. As a result, the carbon atoms gets linked to the oxygen atoms by double bonds. The formation of carbon dioxide molecule may be shown as follows:



OR

The important characteristics of covalent compounds are as follows :

1. Covalent compounds consist of molecules. Covalent compounds do not have any ions. Therefore, they consist of molecules.

For example, H_2 , Cl_2 , H_2O , NH_3 etc.

2. Covalent compounds are liquids or gases in nature. We have studied that the ionic compounds are crystalline solids. But only a few covalent compounds are solids (e.g. sugar, glucose, iodine). These are mostly liquids (water, ethyl alcohol) or gases (oxygen, hydrogen, ammonia) at room temperature. Actually, the attractive forces in covalent molecules are weak and these molecules are

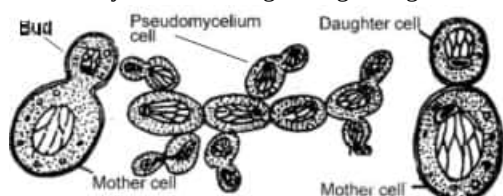
not as close to one another as the ionic solids.

3. Covalent compounds have low melting and boiling points. As covalent molecules do not have ions, the attractive forces among them are weak. Therefore, the covalent molecules can be easily separated from each other. In other words, they have low melting and boiling points.

4. Covalent compounds do not conduct electricity. Covalent compounds normally do not conduct electricity. Some of them are poor conductors of electricity. The current is carried by the ions. As covalent compounds do not have ions, these are poor conductors of electricity.

5. Covalent compounds are insoluble in water. Covalent compounds generally do not dissolve in water. They are soluble in alcohol, ether, benzene etc. which are called organic solvents. However some of them such as ammonia and ethyl alcohol are water soluble.

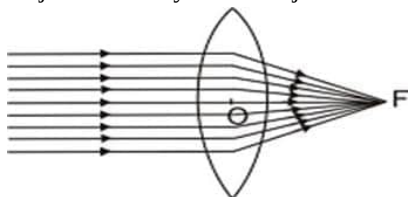
35. **Budding in yeast:** Most of the common yeasts reproduce by budding. The process of budding occurs under normal conditions when the yeast cells are growing in sugar solution. *Saccharomyces* usually reproduce by budding.



In the process, each cell gives rise to one or more tiny outgrowths which gradually increase in size as large as the mother cell itself. Ultimately, it is cut off from the mother cells by a constriction at the base and can lead a separate existence. The nucleus divides amitotically during budding and one daughter nucleus passes in the bud and the other remains in the mother cell. The nuclear membrane persists throughout the nuclear division. The budding may be repeated by the daughter cell while still attached to the parent cell, resulting in the formation of one or more chains and even subchains, called pseudomycelium. The cells ultimately become separated from one another and lead independent life.

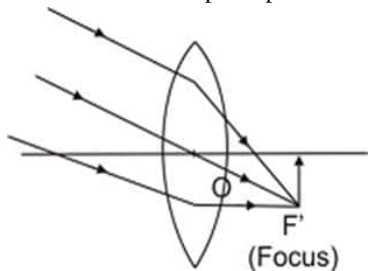
OR

- Pituitary gland secretes growth hormone that regulates the growth and development of the body.
 - Thyroxine hormone is secreted by the thyroid gland that is responsible for the carbohydrate, protein, and fat metabolism in the body.
 - A pair of adrenal glands located on kidneys prepares the body to deal with stress, anxiety, and emergency situations.
 - The pancreas secretes insulin that regulates our blood sugar levels.
 - Endocrine glands are ductless glands that secrete hormones to regulate many body functions, including growth, development, reproduction, and metabolism.
36. Object at Infinity. When object is at infinity, a real image is formed at F on the other side of the lens

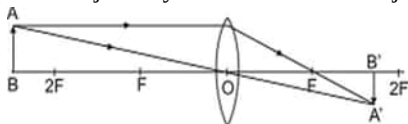


Object at infinity. Image at F on the other side of lens.

However if the rays are parallel to themselves but not parallel to principal axis, then these rays after refraction will form image at focus F' and not at principal focus F .

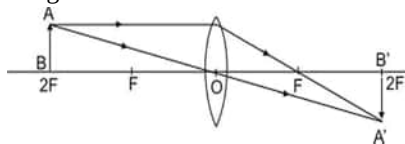


Object at infinity, rays parallel to themselves but not parallel to principal axis. Image is formed at F' , the focus on the other side of lens. Object beyond $2F$. When the object is beyond $2F$, a real, inverted, diminished image is formed between F and $2F$.

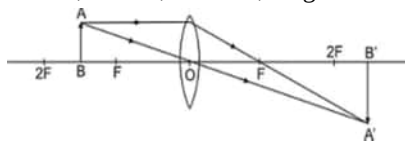


Object beyond $2F$, real, inverted, diminished image between F and $2F$. Object at $2F$. When the object is at $2F$, a real, inverted

image of the same size is formed on the other side of the lens at 2F as given in Fig.

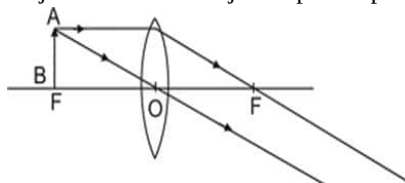


Object at 2F, image at 2F on the other side of the lens. Image is of size same as that of the object. When the object is between F and 2F, its real, inverted, magnified image is formed on the other side of the convex lens as shown in fig.



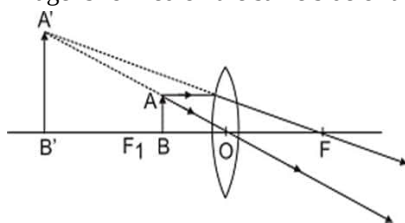
Object between F and 2F real, inverted, magnified image is formed beyond 2F on the other side of lens.

Object at F. When object is placed principal focus, a real, inverted, very highly magnified image is formed at infinity.



Object at F, a very highly magnified, real, inverted image is formed at infinity.

Object between F and C. When an object is placed between principal focus and optical centre of the lens, virtual, erect, magnified image is formed on the same side of the lens.



Object between F and C; a virtual, erect, magnified image is formed on the same side.

OR

Object height, $h = +2$ cm

Image height, $h' = -3$ cm (real image hence inverted)

Object distance, $u = -16$ cm

Image distance, $v = ?$

Focal length, $f = ?$

(i) Position of image

From the expression for magnification

$$m = \frac{h'}{h}$$

$$= \frac{v}{u}$$

$$\text{We have, } v = -u \frac{h'}{h}$$

$$\text{Putting values, we get } v = -(-16) \times \frac{-3}{2}$$

$$v = -24 \text{ cm}$$

The image is formed at distance of 24 cm in front of the mirror (negative sign means object and image are on the same side).

(ii) Focal length of mirror

Using mirror formula, Putting values, we get

Using mirror formula,

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

$$\text{Putting values, we get } \frac{1}{f} = \frac{1}{-16} + \frac{1}{-24}$$

$$= -\frac{3+2}{48}$$

$$\text{or } f = -\frac{48}{5}$$

$$= -9.6 \text{ cm}$$

Section E

37. Read the text carefully and answer the questions:

The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions.

Group A - Lemon juice, vinegar, colourless aerated drink
 Group B - Tomato juice, coffee, ginger juice
 Group C - Sodium hydroxide, sodium chloride, lime water

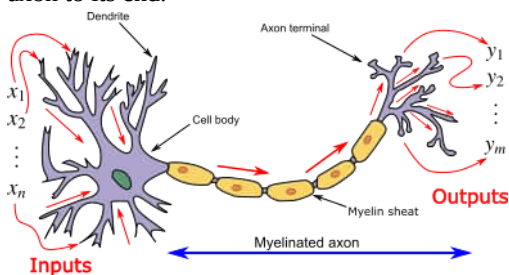
- (i) i. Groups A and B - less than 7
 ii. Group C - greater than 7
- (ii) pH paper and universal indicator.

OR

- i. Copper vessel is tarnished due to formation of basic copper oxide.
- ii. Lemon juice being acidic react with copper oxide and the salt formed is washed away.

38. Read the text carefully and answer the questions:

In animals, control and coordination are provided by nervous and muscular tissues. Touching a hot object is an urgent and dangerous situation for us. We need to detect it and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect the smell. This information, acquired at the end of the dendritic tip of a nerve cell, see figure, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end.



- (i) Nerve cell is the largest cell present in the body.
- (ii) Axon is a large, single, unbranched nerve fibre arising from the cyton. It carries impulses from cyton located in CNS to the effectors.
- (iii) **Gustatory receptor:** Taste buds on the tongue. The receptors for gustation are located in the oral cavity, which brings food and fluids from outside the body into the gastrointestinal tract.
Olfactory receptor: Receptor in the nose. These receptors are common to arthropods, terrestrial vertebrates, fish, and other animals.

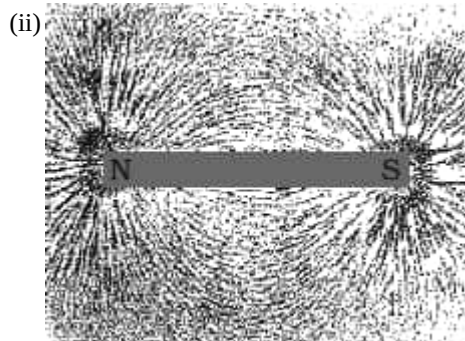
OR

- a. Dendrites.
- b. Axon.

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) The bar magnet kept at the centre of board has its magnetic field around it. The iron filings sprinkled on the board experience a force on them due to the magnetic field of bar magnet. So, when the student taps the board the iron filings align themselves according to the magnetic field lines of the bar magnet.



- (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.

Two magnetic field lines do not intersect each other because if there was point of intersection, The compass needle would point towards 2 directions.

OR

