

Code No.

Roll No.

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Candidates must write the Code on the title page of the answer-book

- Please check that this question paper contains **9** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **27** questions.
- **Please write down the Serial Number of the questions before attempting it.**
- 15 minute time has been allotted to read this question paper.

SCIENCE

Time allowed : 3 hours

Maximum Marks : 80

General Instructions :

- (i) The question paper comprises **two** Sections, A and B. You are to attempt both the sections.
- (ii) All questions are **compulsory**.
- (iii) All questions of Section A and Section B are to be attempted separately.
- (iv) There is an internal choice in **three** questions of **three** marks each, two questions of five marks each in Section A and in one question of two marks in Section B.
- (v) Question numbers **1** and **2** in **Section A** are **one**-mark questions. They are to be answered in **one** word or in **one** sentence.
- (vi) Question numbers **3** to **5** in **Section A** are **two**-marks questions. These are to be answered in about **30** words each.
- (vii) Question numbers **6** to **15** in **Section A** are **three**-marks questions. These are to be answered in about **50** words each.
- (viii) Question numbers **16** to **21** in **Section A** are **five**-marks questions. These are to be answered in about **70** words each..
- (ix) Question numbers **22** to **27** in **Section B** are based on practical skills. Each question is a **two**-marks question. These are to be answered in brief.

SECTION A

1. Name and define the SI unit of current.

Sol. S.I. unit of current is ampere, which is denoted by letter A.

Definition of 1 ampere : Current is said to be one ampere if one coulomb of charge flows through any cross section of a conductor in one second, i.e.

$$1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}$$

or $1 \text{ A} = 1 \text{ C s}^{-1}$

2. Write the name of the main constituent of biogas. Also state its percentage.

Sol. Methane	-	50-75%
Carbon dioxide	-	25 - 50%
Nitrogen	-	0 - 10%
Hydrogen Sulphide	-	0.1 - 0.5 %
Oxygen	-	0 - 0.5 %

SECTION B

3. Write the name, symbol and electronic configuration of an element X whose atomic number is 11.

OR

Can the following groups of elements be classified as Dobereiner's triad:

(a) Na, Si, Cl

(b) Be, Mg, Ca

Atomic mass of Be-9, Na-23, Mg-24, Si-28, Cl-35, Ca-40, Justify your answer in each case

Sol. Name - sodium

symbol- Na

Electronic configuration - 2,8,1

OR

(a) Na, Si, Cl

No, because their physical properties are not same although the atomic mass of silicon is average of atomic mass of sodium and chlorine.

(b) Be, Mg, Ca

Yes, because they have similar properties and mass of Mg is roughly the average of atomic mass of Be & Ca.

4. How is O₂ and CO₂ transported in human beings?

Sol. About 97% of the O₂ that diffuses into the blood combines with haemoglobin of RBCs forming an unstable compound called oxyhaemoglobin. The remaining 3% O₂ dissolves into water of plasma. 70% of CO₂ is transported from tissues to lungs in the form of bicarbonates dissolved in blood plasma. About 23% of CO₂ is transported to lungs in the form of carbamino-haemoglobin.

5. Write the structure of eye lens and state the role of ciliary muscles in the human eye.

Sol. Eye lens is transparent fibrous jelly-like material bi-convex lens.

Ciliary muscles : These muscles hold the lens in position. The images of the objects at different distances from the eye are brought to focus on the retina by changing the focal length of the eye-lens, which is composed of fibrous jelly-like material, can be modified to some extent by the ciliary muscles.

SECTION C

6. Identify the acid and base which form sodium hydrogen carbonate. Write chemical equation in support of your answer. State whether this compound is acidic, basic or neutral. Also write its pH value.

Sol. Sodium hydrogen carbonate - NaHCO_3

Sodium hydrogen carbonate is formed by the combination of an acid - H_2CO_3 (Carbonic acid) and base (NaOH)

Chemical equation : $\text{NaOH} + \text{H}_2\text{CO}_3 \rightarrow \text{NaHCO}_3 + \text{H}_2\text{O}$

The compound is neutral pH value = 7

7. Based on the group valency of elements write the molecular formula of the following compounds giving justification for each:

(i) Oxide of first group elements.

(ii) Halide of the elements of group thirteen, and

(iii) Compound formed, when an element, A of group 2 combines with an element, B of group seventeen.

Sol. (1) Valency of first group = 1

Valency of oxygen = 2

So,	M	O
	1	2

Molecular formula = M_2O

eg. Li_2O , Na_2O etc.

(2) Halide of elements of group thirteen

BCl_3 , AlCl_3 , GaCl_3 , InCl_3 , TlCl_3

(3) A → group 2

B → group 17

BeCl_2

8. 2g of silver chloride is taken in a china dish and the china dish is placed in sunlight for sometime. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction.

OR

Identify the type of reaction taking place in each of the following cases and write balanced chemical equation for the reactions.

(a) Zinc reacts with silver nitrate to produce zinc nitrate and silver.

(b) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.

Sol. Silver chloride will change into slightly grey or black colour. It is a photochemical decomposition in which AgCl_2 is decomposed into Ag and Cl_2 by sunlight.

$2\text{AgCl}(\text{s}) \rightarrow 2\text{Ag}(\text{s}) + \text{Cl}_2(\text{g})$

Photochemical decomposition

OR

(a) $\text{Zn} + \text{AgNO}_3 \rightarrow \text{ZnNO}_3 + \text{Ag}$

displacement reaction

(b) $\text{KI} + \text{PbNO}_3 \rightarrow \text{KNO}_3 + \text{PbI}$

Double displacement reaction

9. Define the term transpiration. Design an experiment to demonstrate this process.

Sol. Transpiration is defined as the evaporation of excess water from the stomata present in the leaves of plants.

Experiment to show transpiration process:

Procedure:

- (i) Take a healthy potted plant and cover the pot with the help of rubber sheet. Aerial parts remain uncovered
- (ii) Keep the plant on glass plate and cover it with a bell jar.
- (iii) Apply Vaseline at the base of bell jar to prevent outer air coming inside.
- (iv) Keep the whole apparatus in light and observe for sometime.

Observation : Water drops appear inside the bell jar

Result : Transpiration occurs from potted plant.

10. What is feedback mechanism of hormone regulation. Take the example of insulin to explain this phenomenon.

Sol. The feedback mechanism of hormone is the mechanism through which the balance of hormone in the body is maintained. The positive feedback stimulates the production of hormone and the negative feedback inhibits the production of hormone.

Example-

- (i) Eating carbohydrate rich food
↓
- (ii) The increases blood glucose level
↓
- (iii) Pancreas secrete insulin
↓
- (iv) Cellular uptake of glucose increases
↓
- (v) Blood glucose decreases.

- (i) Fasting
↓
- (ii) Blood glucose decreases
↓
- (iii) Pancreases secrete glucagons (insulin decreased)
↓
- (iv) Cellular uptake of glucose decreases
↓
- (v) Blood glucose increases

11. What are plant hormones? Name the plant hormones responsible for the following:

- | | |
|----------------------------|---------------------------------|
| (i) Growth of stem | (ii) Promotion of cell division |
| (iii) Inhibition of growth | (iv) Elongation of cells |

Sol. Plant hormones are the chemical substances that are naturally produced in plants and are capable of regulating the important processes of plants.

- | | | | |
|------------------|----------------|---------------------|------------|
| (i) Gibberellins | (ii) Cytokinin | (iii) Abscisic acid | (iv) Auxin |
|------------------|----------------|---------------------|------------|

12. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F₁ and F₂ generations when he crossed the tall and short plants? Write the ratio he obtained in F₂ generation plants.

OR

List two differences between acquired traits and inherited traits by giving an example of each.

Sol. Mendel used pea plant for his experiment. When Mendel performed a cross between tall plant and dwarf plant he found that all the plants in F₁ generation are tall. In F₂ generation 75% of plants were tall while 25% of plants were dwarf. The ratio obtained in F₂ generation is 3 : 1.

OR

Acquired trait	Inherited trait
1. The trait which is acquired by individual during their life and is lost with death.	1. The trait which passes from parent to the offspring and also transmitted to next generation.
2. Eg. Cycling	2. Eg. Eye colour

13. Why should there be equitable distribution of resources? List three forces that would be working against an equitable distribution of our resources.

14. How can we help in reducing the problem of waste disposal? Suggest any three methods.

OR

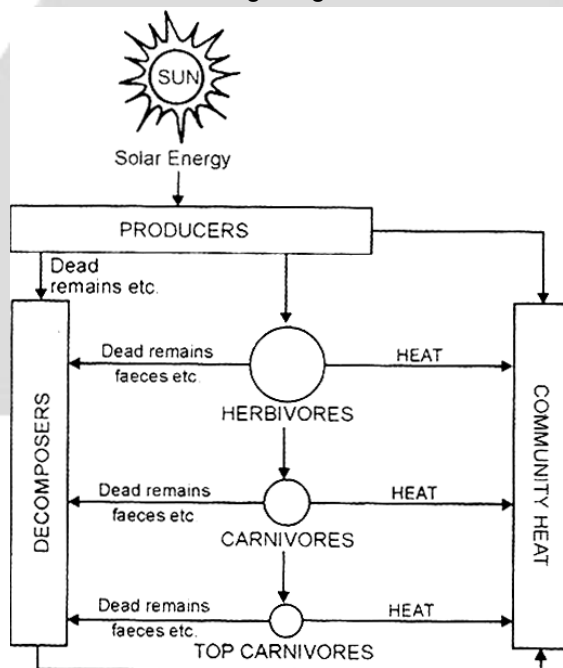
Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem.

Sol. There methods that help in reducing the problem of waste disposal are:

- (i) Use compostable items
- (ii) Reduce the use of plastics
- (iii) Recycle the items

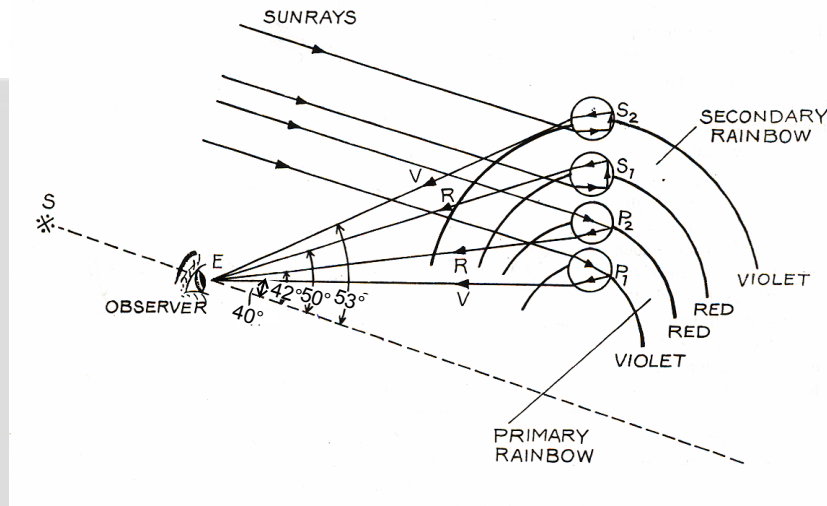
OR

An ecosystem includes all the living things in a given area that interact with each other, as well as the non- living environment that surround the living things.



15. What is a rainbow? Draw a labelled diagram to show the formation of a rainbow.

Sol. When the sun shines upon falling raindrops and observer with his back towards the sun sees concentric arcs of spectral colours hanging in the sky. These coloured arcs, which have their common centre on the line joining the sun and the observer, are called 'rainbow'.



16. Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with
(i) Sodium metal
(ii) Hot concentrated sulphuric acid

OR

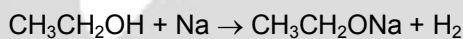
What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds?

(i) Poor conductors of electricity and
(ii) Have low melting and boiling points? What happens when this compound burns in oxygen?

Sol (i) Chemical formula - $\text{CH}_3\text{CH}_2\text{OH}$
Name of compound - Ethanol

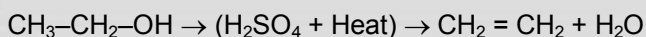
Two uses of ethanol

(1) It is used as a fuel
(2) It is used as and anti bacterial hand sanitizer gels as an antiseptic



∴ Hydrogen gas is evolved.

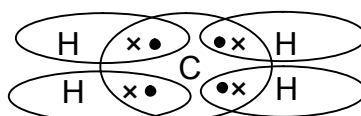
(ii) Ethanol on reacting with hot concentrate sulphuric acid produces ethene and water.



OR

Methane is CH_4 , it is a colourless, odourless flammable gas which is main constituent of nature gas.

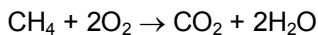
Electron dot structure



Bond formed in this compound is single covalent bond.

(i) These compounds are poor conductors of electricity because they form covalent compounds that does not consist of free electron or free ions.

(ii) Have low melting and boiling point because of weak Vanderwaal's force of attraction.



Combustion reaction takes place producing carbon dioxide and water.

17. (a) Write chemical equations for the following reactions:

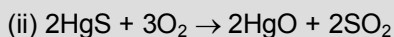
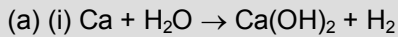
(i) Calcium metal reacts with water.

(ii) Cinnabar is heated in the presence of air

(iii) Manganese dioxide is heated with aluminum powder.

(b) What are alloys? List two properties of alloys.

Sol.



(iii) No, reaction takes place because manganese is less reactive than aluminium.

(b) An alloy is a homogenous mixture of two or more metals or a metal and a non-metal.

Two properties alloy are :

(i) Electrical conductivity

(ii) Melting point of an alloy is less than that of pure metal.

18. An object is placed at a distance of 30 cm from a concave lens of focal length 30 cm.

(i) Use lens formula to determine the distance of the image from the lens.

(ii) List four characteristics of the image (nature position, size, erect/inverted) in this case.

(iii) Draw a labelled diagram to justify your answer of part (ii)

Sol.

Given

$$u = -30 \text{ cm}$$

$$f = -30 \text{ cm}$$

(i) Lens formula $\Rightarrow \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

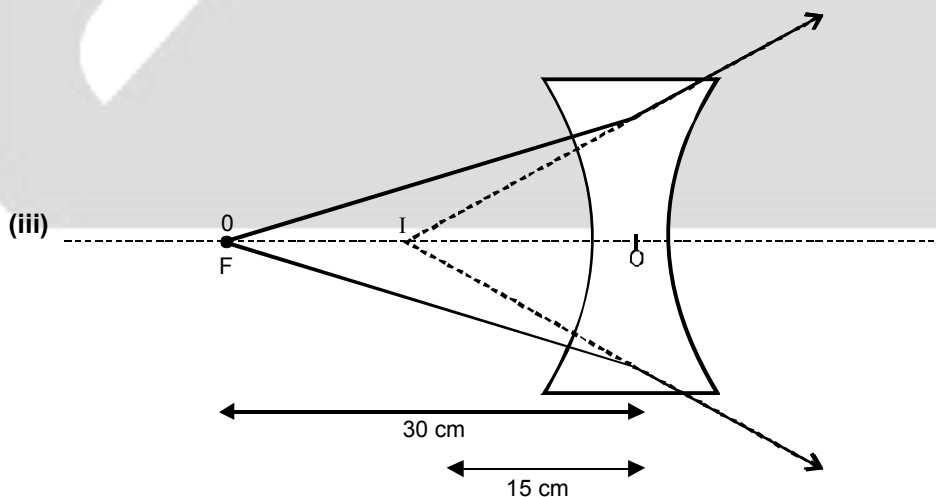
(ii) $\frac{1}{v} + \frac{1}{30} = \frac{-1}{30}$

$$\frac{1}{v} = -\frac{1}{30} - \frac{1}{30}$$

$$\mathbf{v = -15 \text{ cm}}$$

$$m = \frac{v}{u} = \frac{-15}{-30} = \frac{1}{2} = 0.5$$

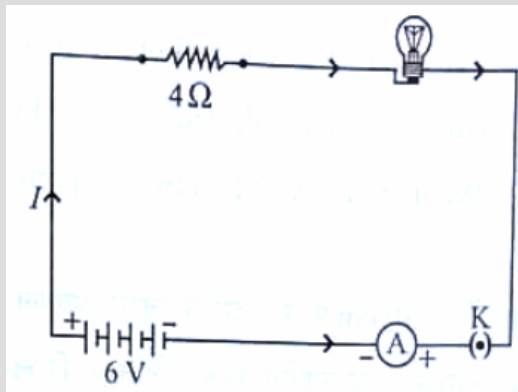
Image is virtual erect diminished and at a distance of 15 cm from optical centre same side of object.



19. (a) With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.
 (b) In an electric circuit two resistors of $12\ \Omega$ each are joined in parallel to a $6\ \text{V}$ battery. Find the current draw from the battery.

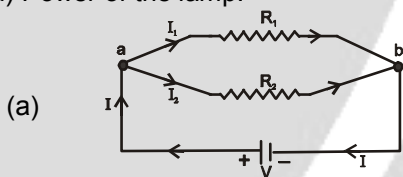
OR

An electric lamp of resistance $20\ \Omega$ and a conductor of resistance $4\ \Omega$ are connected to a $6\ \text{V}$ battery as shown in the circuit. Calculate



- (a) The total resistance of the circuit.
 (b) The current through the circuit.
 (c) The potential difference across the (i) electric lamp and (ii) conductor, and
 (d) Power of the lamp.

Sol.



Since charge must be conserved, therefore the current I that enters at point 'a' must be equal to the current that leaves that point. Therefore we have

$$I = I_1 + I_2 \quad \dots(i)$$

Since the resistors are connected in parallel therefore the potential across each resistor must be same, hence by Ohm's law we have

$$I_1 = \frac{V}{R_1} \text{ and } I_2 = \frac{V}{R_2}$$

substituting in equation (i) we have,

$$I = \frac{V}{R_1} + \frac{V}{R_2} \quad \dots(ii)$$

Let R_p be the equivalent resistance of the parallel combination, then by Ohm's law we have,

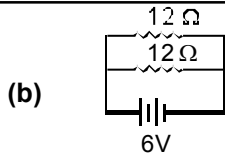
$$I = \frac{V}{R_p} \quad \dots(iii)$$

Hence from equations (ii) and (iii) we have,

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} \quad \text{or} \quad \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

An extension of this analysis to three or more resistors in parallel gives the following general expression

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$



$$\frac{1}{R_{eq}} = \frac{1}{12} + \frac{1}{12}$$

$$R_{eq} = 6 \Omega$$

$$V = iR$$

$$6 = i(6) \Rightarrow i = 1A$$

OR

(a) $R_{eq} = 4\Omega + 20\Omega$
 $= 24\Omega$

(b) $V = iR$

$$6 = i(24) \Rightarrow i = \frac{1}{4}A = 0.25A$$

(c) $(V)_{lamp} = \frac{1}{4} \times 20 = 5V$

$$(V)_{conductor} = \frac{1}{4} \times 4 = 1V$$

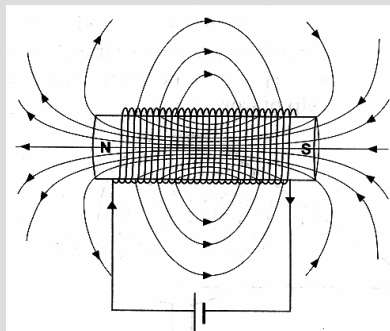
(d) $P_{lamp} = I^2R$

$$= \frac{1}{4} \times \frac{1}{4} \times 200 = \frac{5}{4} = 1.25 \text{ watt}$$

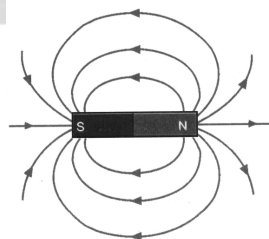
20. What is a solenoid? Draw the pattern of magnetic field lines of (i) A current carrying solenoid and (ii) a bar magnet. List two distinguishing features between the two fields.

Sol. If a conducting wire is wound in the form of a cylindrical coil whose diameter is very less in comparison to the length and the axis of the turns must be parallel to axis solenoid then this coil is called a ideal solenoid (it looks like a helical spring).

The magnetic field lines in a solenoid, through which current is passed, are as shown in figure.



Magnetic field lines plotted for a bar magnet are as shown in figure.



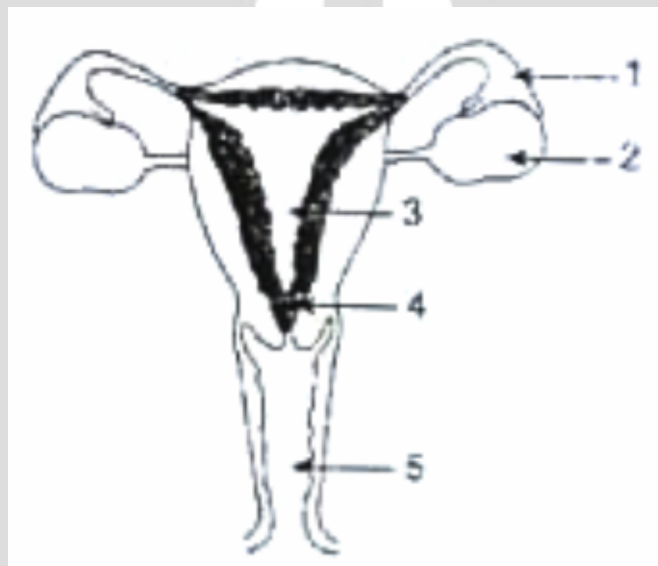
Two distinguish featus of field -

Solenoid	Bar magnet
1. Field strength can be changed by changing the amount of current.	1. Field strength is fixed and cannot be changed.
2. Poles can be interchanged by changing the direction of current	2. Poles cannot be interchanged i.e. field direction is fixed.

21. Define pollination. Explain the different types of pollination. List two agents of pollination? How does suitable pollination lead to fertilization?

OR

- (a) Identify the given diagrams. Name the parts 1 to 5



- (b) What is contraception? List three advantages of adopting contraceptive measures.

Sol. Pollination is defined as the transfer of pollen grains from another to the stigma of a flower of a plant. There are two types of pollination:

- (i) **Self Pollination:-** It is the transfer of pollen grains from anther to the stigma of the same or genetically similar flower.
- (ii) **Cross Pollination:-** It is the transfer of pollen grain from anther of one flower to the stigma of another flower borne on a different plant of the same species.

Two agents of pollination are insects and wind.

By the process of pollination, pollens grain reaches to the stigma of flower. After that pollen tube develops from pollen grain. Pollen tube develops from pollen grain. Pollen tube contains two male gametes. One male gamete fuses with the egg to form diploid zygote and other male gametes fuses with polar nuclei to form triploid nucleus, which develops into endosperm. Thus, suitable pollination leads to fertilization.

OR

- (a) 1. Fallopian tube 2. Ovary 3. Uterus 4. Cervix 5.Vagina

- (b) The deliberate use of artificial methods or other techniques to prevent pregnancy as a consequence of sexual intercourse is called contraception. Three advantages are:
- (i) Unwanted pregnancy can be prevented
- (ii) Birth rate can be controlled.
- (iii) Transfer of sexually transmitted disease can be prevented.

SECTION - D

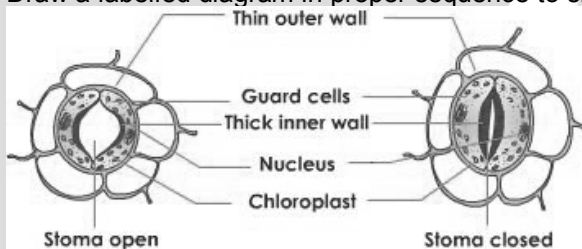
22. In the experimental set up to show that "CO₂ is given out during respiration". Name the substance taken in the small test tube kept in the conical flask. State its function and the consequence of its use.

Sol. The substance taken in test tube is KOH (Potassium hydroxide). KOH absorbs the CO₂ released by the germinating seeds and a partial vacuum is created because of the loss of CO₂ in the flask. This vacuum causes the water in the delivery tube to rise up.

23. A student is observing the temporary mount of a leaf peel under a microscope. Draw labelled diagram of the structure of stomata as seen under the microscope.

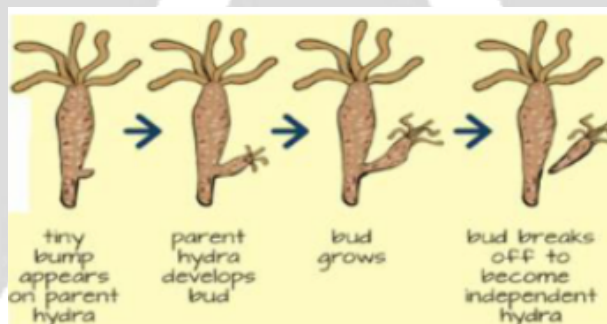
OR

Draw a labelled diagram in proper sequence to show budding in hydra.



Sol.

OR



24. List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen.

Sol.

1. The lens holder along with lens should be kept vertical throughout the experiment.
2. While measuring the distance, metre scale should be kept horizontal and it must be parallel to the ground.
3. Distance should be measured only when well defined sharp image of the distance object is obtained.
4. Lens and screen should be at same level.

25. While studying the dependence of potential difference (V) across a resistor on the current (I) passing through it, in order to determine the resistance of the resistor a student look 4 readings for different values of current and plotted a graph between V and I. He got a straight line graph passing through the origin. What does the straight line signify? Write the method of determining resistance of the resistance using this graph.

OR

What would you suggest to a student if while performing an experiment he finds that the pointer/needle of the ammeter and voltmeter do not coincide with the zero marks on the scale when circuit is open? No extra ammeter/voltmeter is available in the laboratory.

Sol. Straight line signifies that $I \propto V$
i.e. on increasing V, I also get increased.

