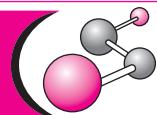


Part 1



Experiment 1

Identification of halide ions (Cl^- , Br^- and I^- ions)

Aim : To identify the presence of chloride, bromide and iodide ions from the given salt solutions.

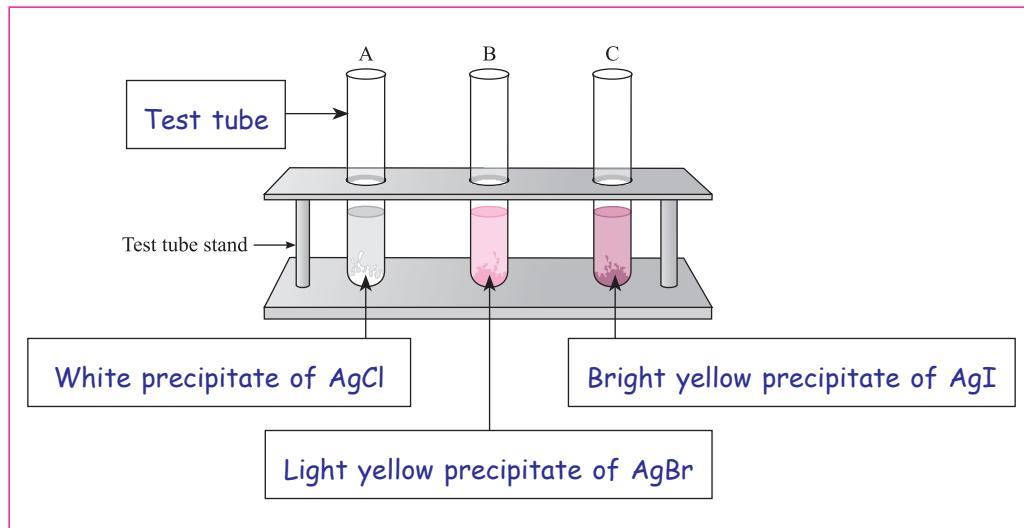
Requirements : Test tubes, test tube stand, dropper, beaker, etc.

Chemicals : Silver nitrate solution (AgNO_3), solutions of potassium chloride, potassium bromide and potassium iodide.

Procedure :

- (1) Take three test tubes and label them as A, B and C.
- (2) Take about 5 ml of solutions of potassium chloride in test tube A, potassium bromide in test tube B and potassium iodide in test tube C.
- (3) Add 4 to 5 drops of silver nitrate solution in each test tube and stir it.
- (4) Observe the colour of precipitate formed in each test tube and record your observations.
- (5) Depending upon the colour of the precipitate, identify the halide present in the solution.

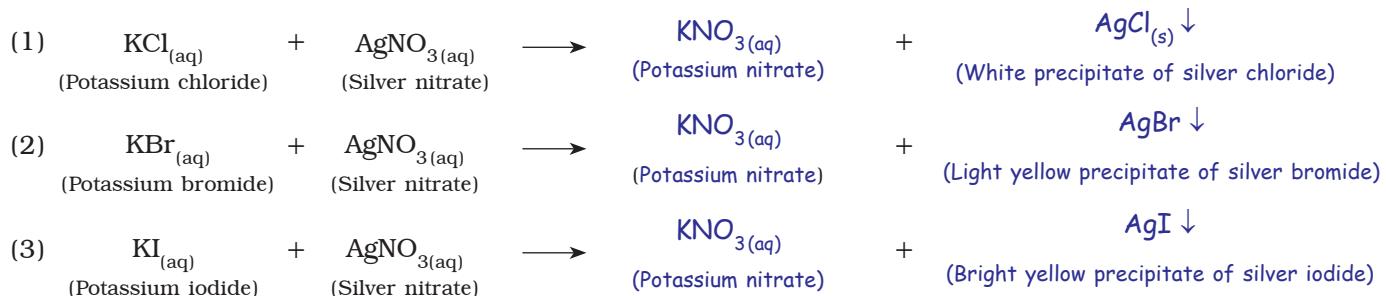
Diagram : Label the various components in the given diagram.



Observation table :

Test Tube	Reaction/Test	Colour of Precipitate	Inference
A	$\text{KCl} + \text{AgNO}_3$	White	Chloride (Cl^-) present.
B	$\text{KBr} + \text{AgNO}_3$	Light yellow	Bromide (Br^-) present.
C	$\text{KI} + \text{AgNO}_3$	Bright yellow	Iodide (I^-) present.

Chemical reactions :



Inferences :

- (1) Halide ions (Cl^- , Br^- , I^-) are precipitated in all the three reactions of above experiments.
- (2) In the above experiment, depending on the colour of the precipitates, presence of Cl^- , Br^- and I^- in the given solutions are confirmed.
- (3) Elements of halogen group in the periodic table show similar properties.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. The number of electrons in the outermost shell of halogens is

- (A) 1 (B) 2 (C) 3 (D) 7

D

2. is in solid state at room temperature.

- (A) Fluorine (B) Iodine (C) Chlorine (D) Bromine

B

3. Which of the following substances is the strongest reducing agent?

- (A) Cl_2 (B) Cl^- ion (C) Br (D) Br^- ion

D

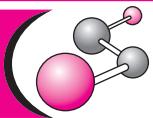
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Teacher's Signature : _____

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Remember :

- (1) All halogen elements are oxidizing agents.
- (2) Precipitation reactions produce insoluble salts.


**Experiment
2**
Identification of the type of reaction

Aim : To identify the type of reaction.

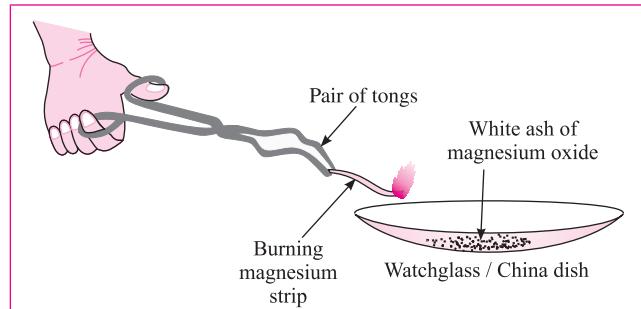
- Combustion of magnesium strip in air.
- Action of dilute sulphuric acid on zinc.
- Effect of heat on lead nitrate.

Requirements : Burner or spirit lamp, matchbox, candle, splinter, hard glass test tube, test tubes, test tube holder, pair of tongs, beaker, sandpaper, watchglass or china dish, glass rod, candle, etc.

Chemicals : Magnesium ribbon, zinc dust, dilute sulphuric acid, lead nitrate powder, blue litmus paper.

(A) Combustion of magnesium strip in air
Procedure :

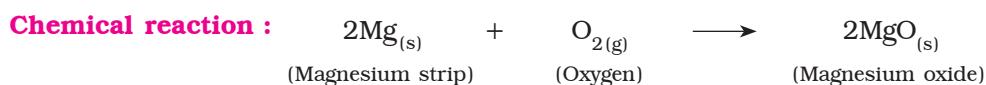
- Take a piece of magnesium strip. Using pair of tongs hold it on the flame of a burner.
- Collect the remaining ash in watchglass or china dish.
- Identify the type of reaction, record the observation and write the chemical reaction.

Diagram :


Combustion of magnesium strip in air

Observation table :

Reaction/Test	Magnesium strip is burnt. $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
Number of reactants	2
Number of products	1
Features of the reaction	There are two reactants and a single product. Magnesium burns with bright flame. This is a chemical change.
Type of reaction	Combination reaction.


Observations :

- The magnesium strip burns with luminous flame.
- A white coloured powder remains behind.

Inference : In this reaction, two reactants combine to form one product. Therefore, this is a **Combination reaction**. A new substance MgO is formed in the reaction. Hence this change is a chemical change.

Precautions :

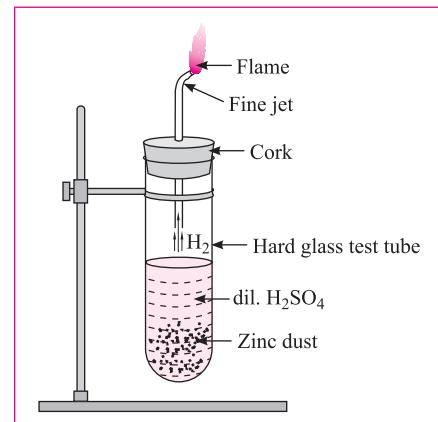
- Magnesium strip should be held by a pair of tongs.
- It is better to use sunglasses to protect your eyes from dazzling light of burning magnesium strip.

(B) Action of dilute sulphuric acid on zinc

Procedure :

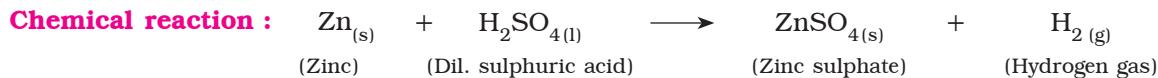
- (1) Take a big hard glass test tube and fix with clamp stand.
- (2) Take some zinc dust in a test tube.
- (3) Add 3 to 4 ml of dilute sulphuric acid in it so that the zinc dust gets immersed in the acid.
- (4) Fix a cork having a delivery tube with a fine jet, immediately on the mouth of a test tube.
- (5) Take a lighted candle near the mouth of a fine jet.
- (6) Record your observations.
- (7) Identify the type of reaction. Write the chemical reaction.

Diagram :



Reaction of H_2SO_4 with zinc

Reaction/Test	Dilute sulphuric acid is added to zinc. $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$
Number of reactants	2
Number of products	2
Features of the reaction	There are 2 reactants and 2 products. Hydrogen from H_2SO_4 gets displaced by zinc metal.
Type of reaction	Displacement reaction. This is a chemical change.



Observations :

- (1) The reaction is very fast and colourless gas is obtained.
- (2) The gas burns instantaneously with pop sound.
- (3) Zinc dust disappears and colourless solution is obtained.

Inferences :

- (1) When atom or group of atoms in one substance takes the place of atom or group of atoms in the other substance to form new substances, are called displacement reactions.
- (2) The hydrogen gas evolved in the reaction.
- (3) Zn is more reactive than hydrogen. Therefore, the more reactive Zn displaces the less reactive hydrogen from sulphuric acid and a colourless solution is obtained.

Precautions :

- (1) Handle acid very carefully.
- (2) Do not inhale the gas evolved.
- (3) Hydrogen gas burns with mild explosion, so a fine jet should be used to see the burning of hydrogen.

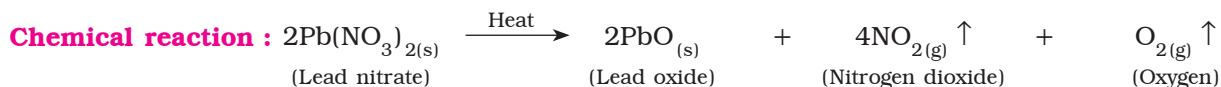
(C) Effect of heat on lead nitrate $[Pb(NO_3)_2]$

Procedure :

- (1) Take a small amount of lead nitrate white powder in a dry test tube. Hold the test tube with a test tube holder.
- (2) Heat the test tube over the flame of the burner.
- (3) Place the moist strip of the blue litmus paper at the mouth of the test tube.
- (4) Hold the glowing splinter at the mouth of the test tube.
- (5) Record your observation.
- (6) Identify the type of the reaction. Write the chemical reaction.

Observation table :

Reaction	Lead nitrate is heated. $2Pb(NO_3)_2 \xrightarrow{\text{Heat}} PbO_{(s)} + 4NO_{2(g)} \uparrow + O_{2(g)} \uparrow$
Number of reactants	1
Number of products	3
Features of the reaction	Simple substances are formed. This is a chemical change.
Type of reaction	Decomposition reaction.



Inferences :

- (1) When two or more simpler substances are formed from a single compound, the reaction is called decomposition reaction. Example : Heating lead nitrate.
- (2) When lead nitrate is heated Nitrogen dioxide (NO_2), Oxygen (O_2) are given out and a yellow solid residue of lead oxide (PbO) remains in the test tube.
- (3) In this reaction, three simple substances are formed from a single compound. Therefore this reaction is a **Decomposition reaction**.
- (4) The Nitrogen dioxide gas evolved in this reaction is acidic in nature. Therefore blue litmus turns red. The oxygen gas evolved in this reaction supports burning. Therefore glowing splinter keeps on glowing.

Precaution : Do not inhale the gases evolved in this reaction.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.
1. Magnesium burns in air to produce

(A) $Mg(OH)_2$ (B) MgO (C) MgO_2 (D) $MgCl_2$
 2. The reaction $CuSO_{4(aq)} + Zn_{(s)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$ is a reaction.

(A) displacement (B) double displacement
 (C) decomposition (D) combination

3. When lead nitrate is heated a yellow solid residue of _____ is obtained.

(A) Lead dioxide

(B) Lead oxide

(C) Lead trioxide

(D) Lead sulphate

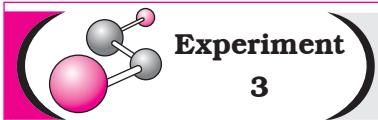
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Remember : Chemical reactions involve the breaking and making of bonds between atoms to produce new substance.



Classification of the chemical reactions as

**(i) combination (ii) decomposition (iii) displacement
(iv) double displacement reaction**

Aim : To classify the given chemical reactions into the type (i) combination (ii) decomposition (iii) displacement and (iv) double displacement.

- (A) Action of water on quick lime (CaO).
- (B) Effect of heat on ferrous sulphate crystals.
- (C) Reaction of copper sulphate solution with iron nails.
- (D) Reaction between sodium sulphate and barium chloride solutions.

Requirements : 250 ml beaker, china dish, asbestos sheet, dropper, hard glass test tubes, test tube holder, test tube stand, sandpaper, filter paper, burner/spirit lamp.

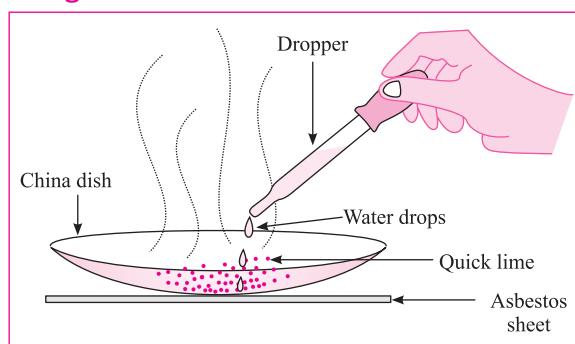
Chemicals : Quick lime, ferrous sulphate crystals, iron nails, copper sulphate solution, sodium sulphate solution, barium chloride solution, water.

(A) Action of water on quick lime

Procedure :

- (1) Take about 10 g of quick lime (CaO) in a clean china dish. Place the china dish on an asbestos sheet.
- (2) Take some water in a beaker. With the help of a dropper add a few drops of water on quick lime in the dish. Record your observations.

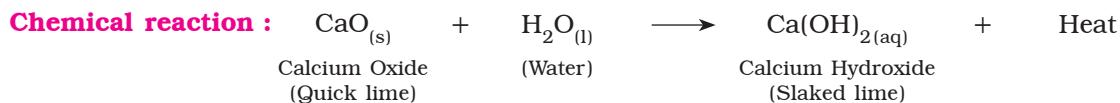
Diagram :



Action of water on quick lime

Observation table :

Experimental procedure	Observation
1. Water is added to quick lime.	Added water is converted into steam. China dish becomes hot. Hissing sound is produced.
2. The noise produced in the reaction.	Hissing sound.
3. The heat is absorbed or evolved during the reaction.	Evolved.
4. A gas or vapour is formed during the reaction.	Vapours are formed.
5. The change in the physical state.	Solid state gets converted into liquid state.



Inferences :

- (1) The reaction between quick lime and water is **exothermic** reaction.
- (2) Here calcium oxide and water react to form **calcium hydroxide (slaked lime)**.
- (3) This is an example of **combination reaction**.
- (4) The clear solution obtained after the suspension settles is called **lime water**.

Precautions :

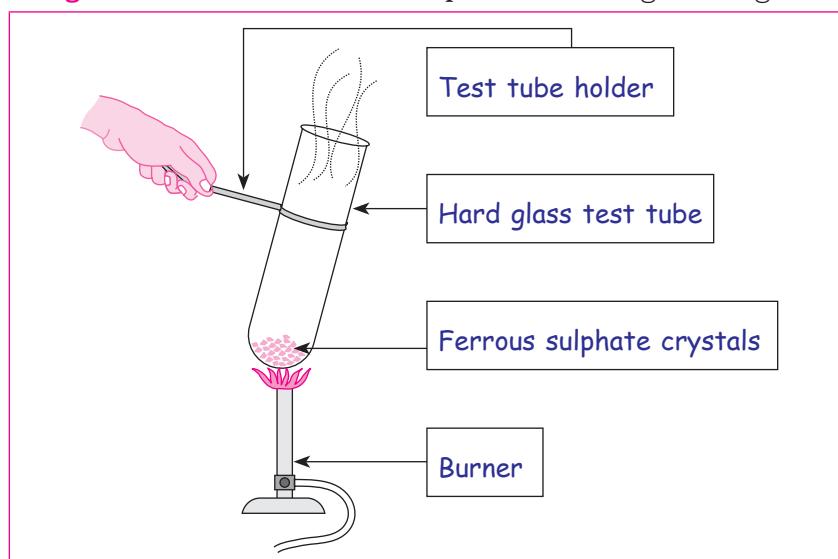
- (1) Never put quick lime in water. It may cause the lime water splash out of the beaker and damage eyes or skin.
- (2) Do not touch or dip your finger in lime water.

(B) Effect of heat on ferrous sulphate crystals

Procedure :

- (1) Take about 10 g of ferrous sulphate crystals in a clean and dry hard glass test tube. Observe the colour of the crystals.
- (2) Hold the test tube with a test tube holder. Heat the test tube gently on low flame of a burner for about 10 minutes.
- (3) Note the smell and colour of the gas evolved.
- (4) Continue heating till the colour of the residue in the test tube changes.
- (5) Place the hot test tube on asbestos sheet. Observe the colour of the residue after cooling.

Diagram : Label the various components in the given diagram.



Effect of heat on ferrous sulphate crystals

Observation table :

Experimental procedure	Observation
1. The original colour of Ferrous sulphate.	Light green
2. Ferrous sulphate is heated.	White powder of anhydrous ferrous sulphate is formed. Finally it gives a mixture of Fe_2O_3 , SO_3 and SO_2 .
3. Colour of the gas evolved during heating.	Colourless
4. The colour of the substance in the cold test tube.	Light green



Inferences :

- (1) Light green crystals of ferrous sulphate on heating undergo decomposition. A mixture of SO_3 and SO_2 gases formed.
- (2) A residue of red colour remains in the test tube.
- (3) This is an example of decomposition reaction.

Precautions :

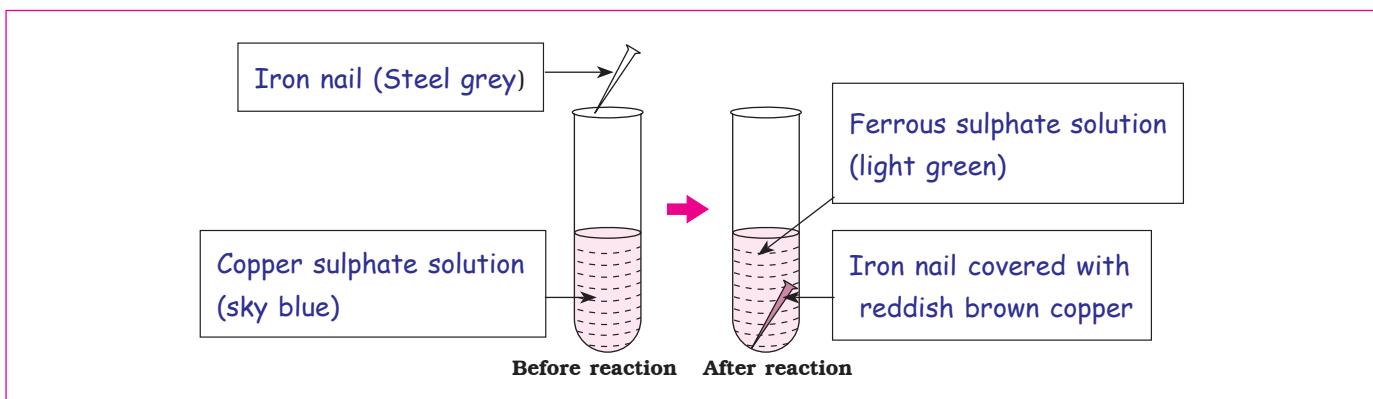
- (1) Use hard glass test tube for heating the substance.
- (2) During heating, keep the test tube away from you.

(C) Reaction of copper sulphate solution on iron nails

Procedure :

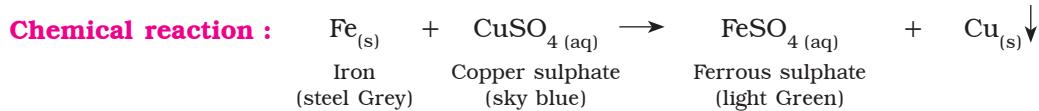
- (1) Take about 20 ml of copper sulphate solution in a test tube. Note its colour.
- (2) Take 2 or 3 iron nails free from rust. Clean them with sandpaper and wash with water. Note the colour of the iron nails.
- (3) Place the iron nails in copper sulphate solution for about 15 minutes.
- (4) Remove the nails from the solution, wash them with water and keep them on a filter paper to dry.
- (5) Finally note the colour of the solution as well as the nails after reaction.

Diagram : Label the various components in the given diagram.



Observation table :

Experimental procedure	Observation
1. Colour of copper sulphate solution before the experiment.	The colour of copper sulphate solution before the experiment is sky blue.
2. Colour of iron nail before the experiment.	Colour of iron nail before the experiment is steel grey.
3. Colour of copper sulphate solution after the experiment.	Solution becomes light green after the experiment.
4. Colour of iron nail after the experiment.	The iron nail become reddish brown after the experiment.



Inferences :

- (1) On immersing the brown coloured iron nails in blue coloured copper sulphate solution, they displace **copper** from the copper sulphate solution and their colour becomes **reddish**.
- (2) This is a **displacement** reaction.

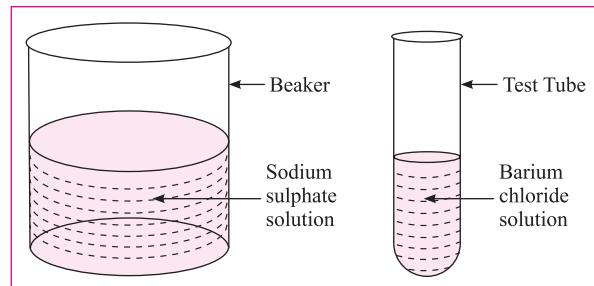
Precaution : Clean the iron nails by rubbing with sandpaper for effective result.

(D) Reaction between sodium sulphate solution and barium chloride solution

Procedure :

- (1) Take about 15 ml of sodium sulphate solution in a clean beaker. Note its colour and appearance.
- (2) Take about 5 to 10 ml of barium chloride solution in a clean test tube. Note its colour and appearance.
- (3) Add barium chloride solution to sodium sulphate solution with constant stirring. Observe the changes and note them.

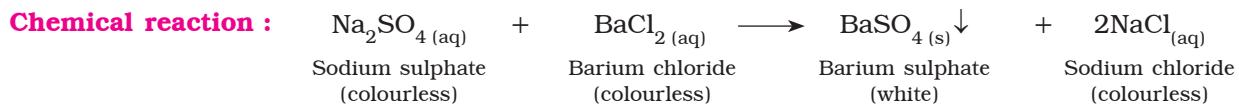
Diagram :



Reaction between sodium sulphate solution and barium chloride solution

Observation table :

Experimental procedure	Observation
1. The colour and appearance of sodium sulphate solution before the reaction.	The colour and appearance is clear and transparent.
2. The colour and appearance of barium chloride solution before the reaction.	The colour and appearance is clear and transparent.
3. The colour and appearance of the mixture after mixing two solutions.	White precipitate.



Inferences :

- (1) In this chemical reaction, two new compounds are formed by mutual exchange of the components (ions or radicals) of the two compounds. Such reactions are called **double displacement** reactions.
- (2) In this reaction, white coloured insoluble **barium sulphate** is formed.
- (3) This is a **double displacement** reaction.

Precaution : Clean the apparatus thoroughly before using it.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. To observe the reaction of water on quick lime,

- (A) quick lime is added to water in a test tube
(B) a lot of water is added to quick lime
(C) a few drops of water are added to quick lime
(D) none of these

C

2. When crystals of Ferrous sulphate are strongly heated, the residue obtained is

- (A) red in colour (B) blue in colour
(C) green in colour (D) colourless

A

3. When Barium chloride solution is added to Sodium sulphate solution,

- (A) blue precipitate is formed (B) white precipitate is formed
(C) green precipitate is formed (D) no reaction takes place

B

4. The reaction of iron nails with copper sulphate solution is an example of

- (A) combination reaction (B) decomposition reaction
(C) displacement reaction (D) double displacement reaction

C

5. Reddish brown deposit formed on iron nails kept in a solution of copper sulphate is

- (A) Cu_2O (B) Cu (C) CuO (D) CuS

B

Date : _____

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Remember : In double displacement reactions, two reactants exchange ions and form two new compounds.



Experiment 4

Study of the magnetic field produced by an electric current flowing through a coil of copper wire

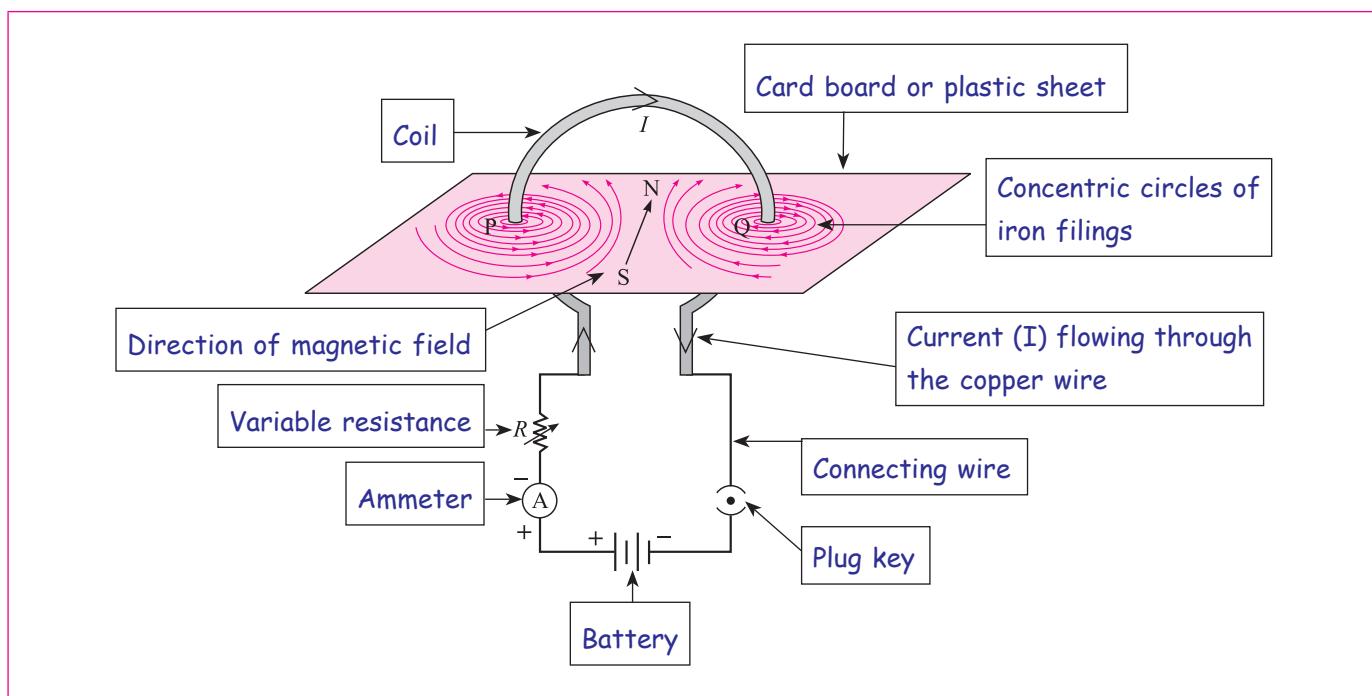
Aim : To study the magnetic field produced by an electric current flowing through a coil of copper wire.

Requirements : A 12 V battery, insulated copper wire (gauge 24), connecting wires, variable resistance, plug key, a cardboard or plastic sheet, iron filings, a magnetic needle, a hollow tube or cylinder of cardboard.

Procedure :

- (1) Make a coil of insulated copper wire by winding 20 to 25 turns of the wire around a hollow tube or cylinder of cardboard.
- (2) Pass this coil through a horizontal cardboard or plastic sheet as illustrated in the diagram.
- (3) Connect the free ends of the wire in a circuit containing a variable resistance, ammeter, 12 V battery and plug key as shown in the diagram.
- (4) Spread iron filings on the cardboard or the plastic sheet.
- (5) Close the plug key to pass the electric current through the coil.
- (6) Tap the cardboard lightly with a finger and observe the arrangement of iron filings.
- (7) Increase the current in the coil gradually by decreasing the resistance in the circuit and observe how the arrangement of iron filings changes.

Diagram : Label the various components in the given diagram.



Circuit diagram

Observations :

- (1) Iron filings form **concentric circular paths**. These concentric circles represent **magnetic lines of force**.
- (2) As we go away from the wire, the concentric circles representing the magnetic lines of force become **bigger and bigger**.

(3) As the electric current through the coil increases, the intensity of the magnetic field **also increases** and the lines of force **are seen more distinctly** .

Inferences/Conclusions :

- (1) When the current flows through the coil, **magnetic lines of force** produced at each point around the copper wire forming the coil.
- (2) At a given point on the cardboard, the magnetic field produced by the current flowing through the coil is directly proportional to the **current** and the **number of turns** forming the coil.

Precaution : Connect the various components in the electric circuit properly.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. Intensity of magnetic field is expressed in
(A) ampere (B) volt (C) coulomb (D) oersted D
2. The direction of the magnetic field around a straight conductor carrying current is given by
(A) the right hand thumb rule (B) Fleming's left hand rule
(C) Fleming's right hand rule (D) Coulomb's rule A
3. is used to determine the presence and direction of magnetic field.
(A) The voltmeter (B) An ammeter
(C) A galvanometer (D) The magnetic needle D
4. In this experiment, the magnetic field at a point on the cardboard depends
(A) only on the current (I)
(B) only on the number of turns (n) in the coil
(C) only on the distance (r) of the point from the wire
(D) on all of these, i.e. I , n and r D

Date : _____

Teacher's Signature : _____

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Remember : As we go towards the centre of the wire loop, the circles representing the magnetic lines of force become so big that its arc appear as a straight line.

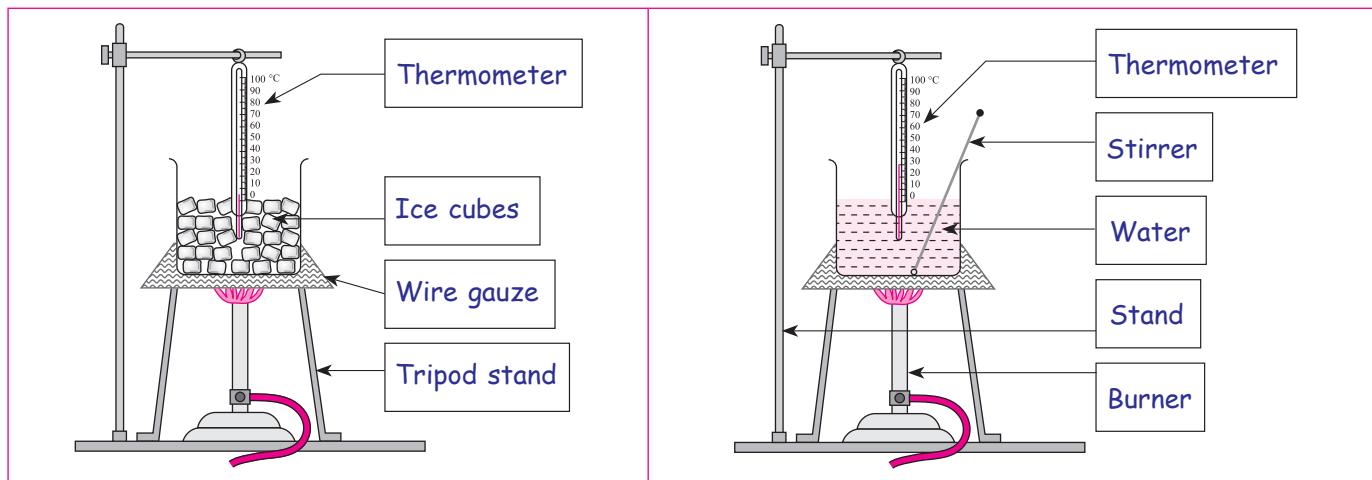
Aim : To study the effect of heat on ice and plot the temperature versus time graph.

Requirements : A beaker, ice cubes, a thermometer, a stand, a burner, a tripod, a wire gauze, a stirrer.

Procedure :

- (1) Find the least count of the thermometer.
- (2) Take a few ice cubes in a glass beaker.
- (3) Keep the tripod on the stand. Keep the wire gauge on the tripod. Keep the beaker on it. Insert the bulb of a thermometer in ice and measure its temperature.
- (4) Heat the beaker gently using the burner.
- (5) Record the temperature of ice/water after every minute.
- (6) As the ice is heated, it starts melting. Stir the mixture of ice and water well. Continue the heating even after all ice has melted.
- (7) Continue to record the temperature of the water even after it starts boiling.
- (8) Plot the graph of temperature versus time.

Diagrams : Label the various components in the given diagram.



Effect of heat on ice

Observations :

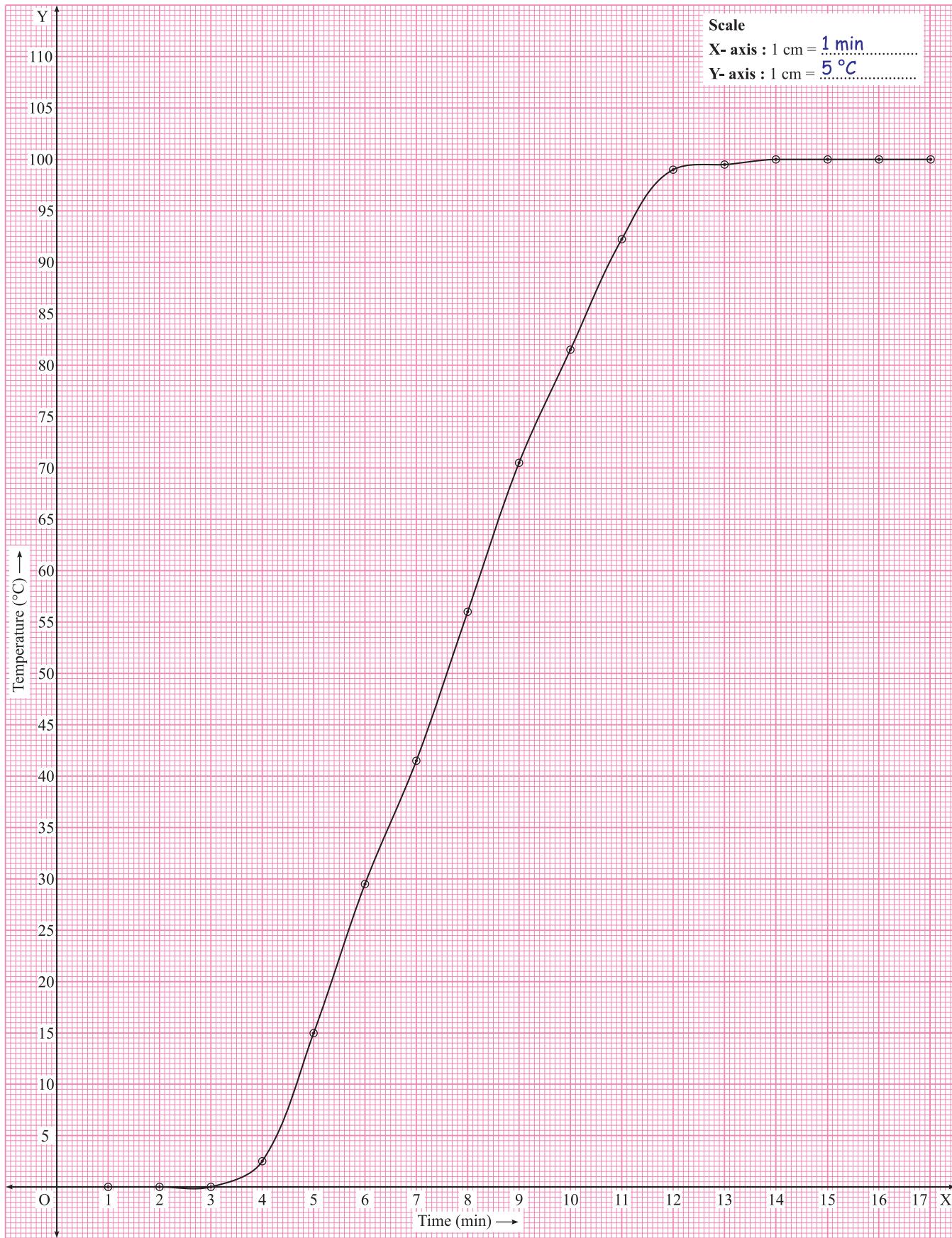
- (1) Least count of the thermometer = 1°C .
- (2) The temperature of the mixture of ice and water remains 0°C till the ice melts completely.
- (3) As heating is continued, the temperature goes on increasing from 0°C to 100°C .
- (4) The temperature of water remains constant (100°C) even after it starts boiling.

Observation table :

Time (min)	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Temperature ($^{\circ}\text{C}$)	0	0	0	0	1.5	15	29	43	57	71	83	94.5	98	99

Time (min)	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Temperature ($^{\circ}\text{C}$)	100	100	100	100										

Time (min)	28	29	30	31	32	33	34	35	36	37	38	39	40
Temperature (°C)													



Graph of temperature versus time

Inference/Conclusion : The thermometer shows rise in temperature only after all ice has melted.

The thermometer does not show rise in temperature once water starts boiling. From these observations, we conclude that heat energy is absorbed during the transformation of ice into water and water into steam, but there is no rise in temperature during the transformation state. This is indicated by the constant reading of the thermometer.

Precaution : The bulb of the thermometer should not touch the bottom of the beaker.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. When ice melts, its volume

(A) increases

(B) decreases

(C) remains constant

(D) increases or decreases

B

2. Ice/water is a substance that

(A) expands on melting and contracts on freezing

(B) contracts on melting and does not undergo change in volume on freezing

(C) contracts on melting and expands on freezing

(D) does not undergo any change in volume on melting or freezing

C

3. Heat absorbed when 1g of ice melts at 0°C to form 1g of water at the same temperature is cal.

(A) 80 (B) 800 (C) 540 (D) 54

A

4. Heat needed to raise the temperature of 1kg of water from 14.5°C to 15.5°C is

(A) 4180 J (B) 10^3 J (C) 1 cal (D) 4180 cal

A

5. Heat needed to convert 1g of water at 100°C and at a pressure of one atmosphere into 1g of steam under the same conditions is

(A) 80 cal (B) 540 cal (C) 89 J (D) 540 J

B

Date : _____

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Remember : When there is a change of state of a substance, solid \leftrightarrow liquid, liquid \leftrightarrow gas (vapour), solid \leftrightarrow gas (vapour) heat energy is absorbed by the substance or heat energy removed from the substance at constant temperature.

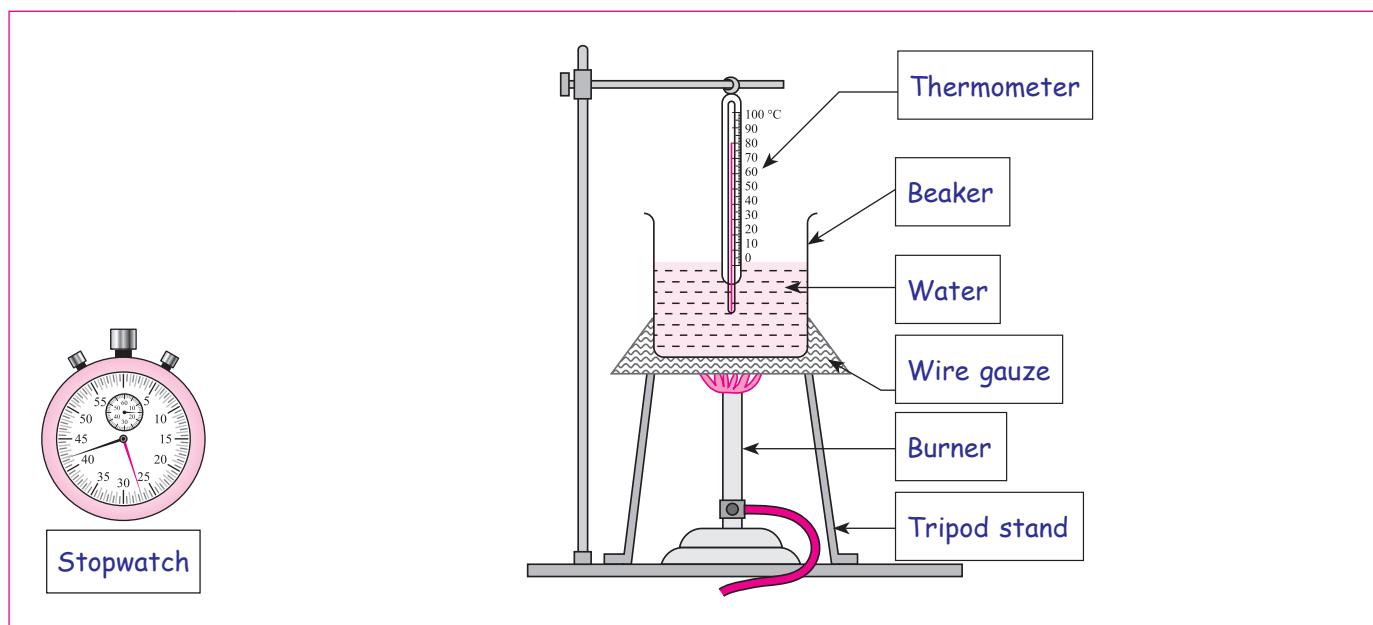
Aim : To measure the temperature of hot water during natural cooling and plot the temperature versus time graph.

Requirements : A 250 ml glass beaker, a thermometer (0°C – 100°C), a stopwatch (or clock with hour hand, minute hand and second hand), a stand, a tripod, a burner, a wire gauze, water.

Procedure :

- (1) Find the least count of the thermometer.
- (2) Take 150 ml of water in a beaker.
- (3) Set up the apparatus as shown in the figure. Ensure that the bulb of the thermometer is about 2 cm above the bottom of the beaker.
- (4) Heat the water.
- (5) When the temperature of the water reaches 80°C , put off the burner.
- (6) When the temperature of the water reaches 70°C , start the stopwatch and measure the temperature of the water after every minute.
- (7) Note the temperature till the water attains room temperature.
- (8) Plot the graph of temperature versus time.

Diagram : Label the various components in the given diagram.



Natural cooling of hot water

Observations :

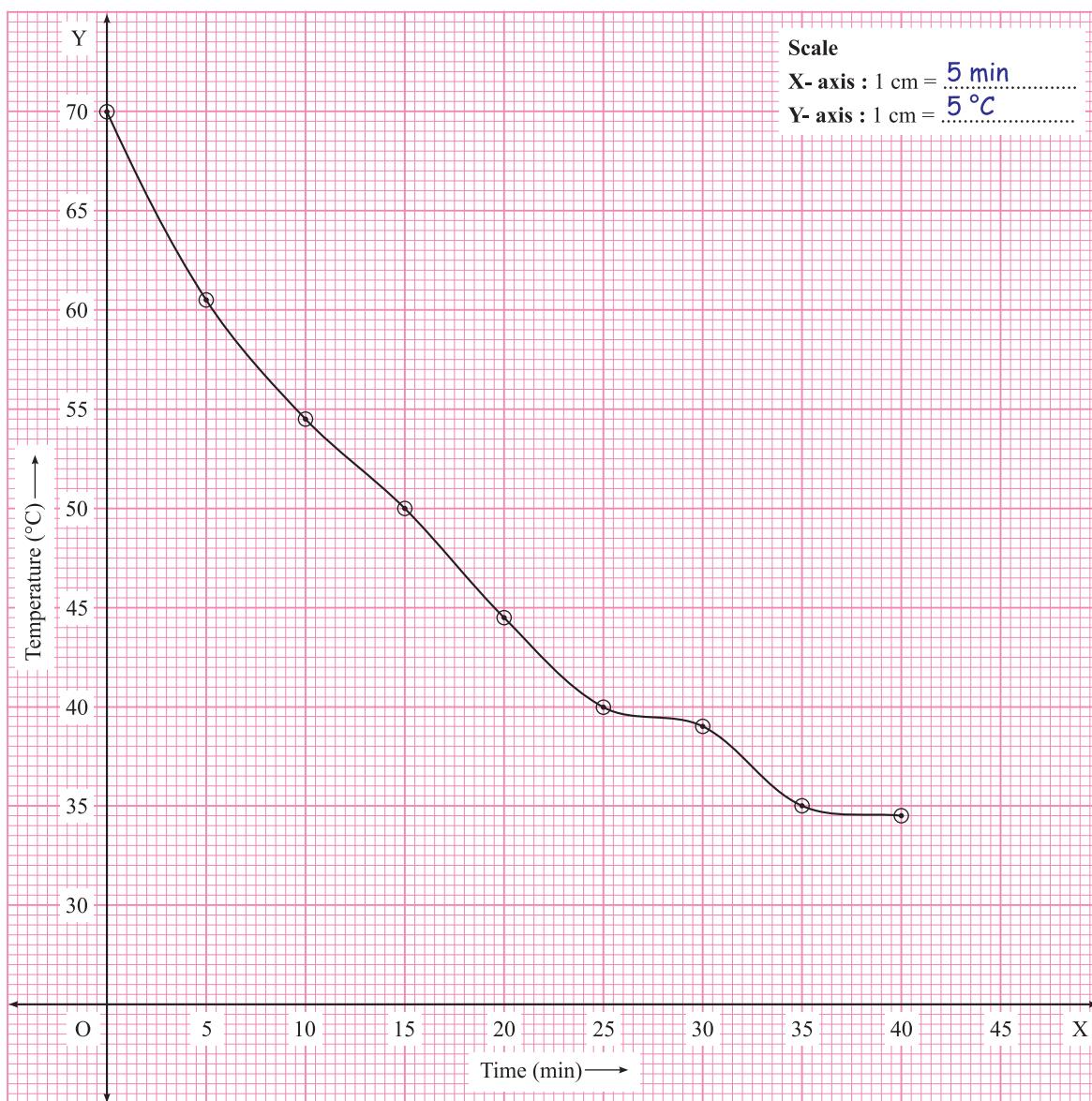
- (1) Least count of the thermometer = 1°C .
- (2) Initial temperature of water = 70°C .

Observation table :

Time (min)	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Temperature (°C)	70	68	66	64	62	61	60	59	58	56	54	53	51	49

Time (min)	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Temperature (°C)	51	50	49		46		44					40		

Time (min)	28	29	30	31	32	33	34	35	36	37	38	39	40
Temperature (°C)			38					35					34



Inferences/Conclusions :

- (1) The hot water loses heat to the surroundings. This results **lowering of the temperature of the water**.
- (2) The rate of cooling depends on the excess of temperature of water over the surroundings. When the difference between the temperature of hot water and the temperature of the surroundings is more, the **rate of cooling is more**.

Precautions :

- (1) Switch off the ceiling fans during the experiment.
- (2) The bulb of the thermometer should not touch the bottom of the beaker.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. Which of the following is the correct relation?

- | | |
|---|---|
| (A) $4.18 \text{ calories} = 1 \text{ joule}$ | (B) $1 \text{ calorie} = 4.18 \text{ joules}$ |
| (C) $10^7 \text{ calories} = 1 \text{ joule}$ | (D) $1 \text{ calorie} = 10^7 \text{ joule}$ |

B

2. Which of the following are the processes of transfer of heat?

- | | |
|----------------|-------------------|
| (A) conduction | (B) convection |
| (C) radiation | (D) All the above |

D

3. The temperature at which water changes into steam is called the _____ of water.

- | | |
|---------------------|-------------------|
| (A) melting point | (B) boiling point |
| (C) expansion point | (D) dew point |

B

4. Heat is absorbed when _____.

- | | |
|-------------------------------------|----------------------------------|
| (A) water is converted into vapour. | (B) water is converted into ice. |
| (C) steam is converted into water. | (D) all of these |

A

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Remember : The rate of change in the temperature of water in the beaker is directly proportional to the temperature difference between water and surrounding.

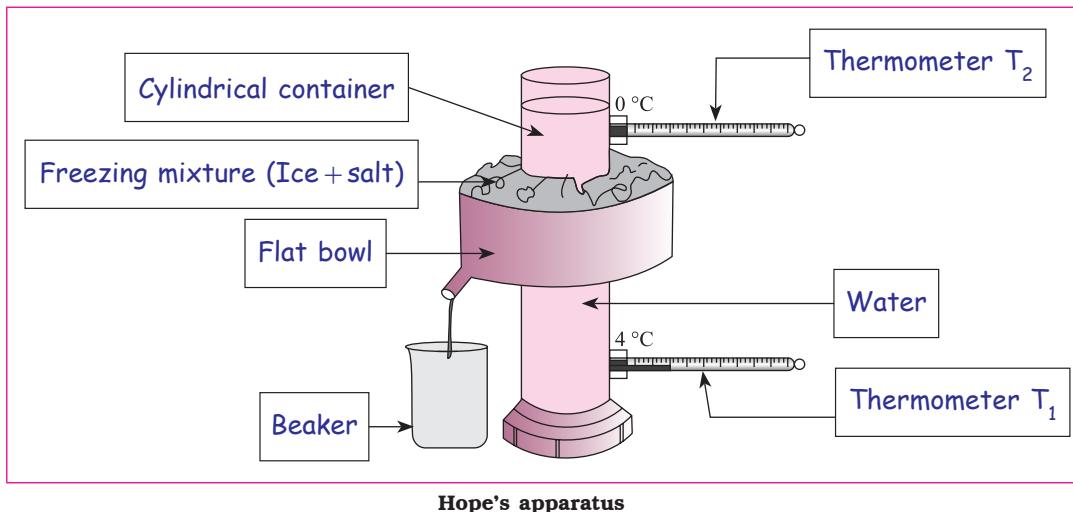
Aim : To study anomalous behaviour of water using Hope's apparatus.

Requirements : Hope's apparatus, ice, common salt, water, two thermometers, a beaker, a stopwatch (or clock).

Procedure :

- (1) Find the least count of the thermometers.
- (2) Fill the cylindrical container of Hope's apparatus with the cold water at about 10°C to 12°C .
- (3) Fill the flat bowl of the apparatus with a freezing mixture of ice and common salt.
- (4) Insert two thermometers in the two holes provided to record the temperature of water in the cylinder at above and below the flat bowl respectively.
- (5) Record the temperatures shown by the thermometers after every minute and note the same in the observation table.
- (6) Plot the graphs, temperature (T_1) vs time and temperature (T_2) vs time on the same graph paper.
- (7) Observe the graphs.

Diagram : Label the various components in the given diagram.

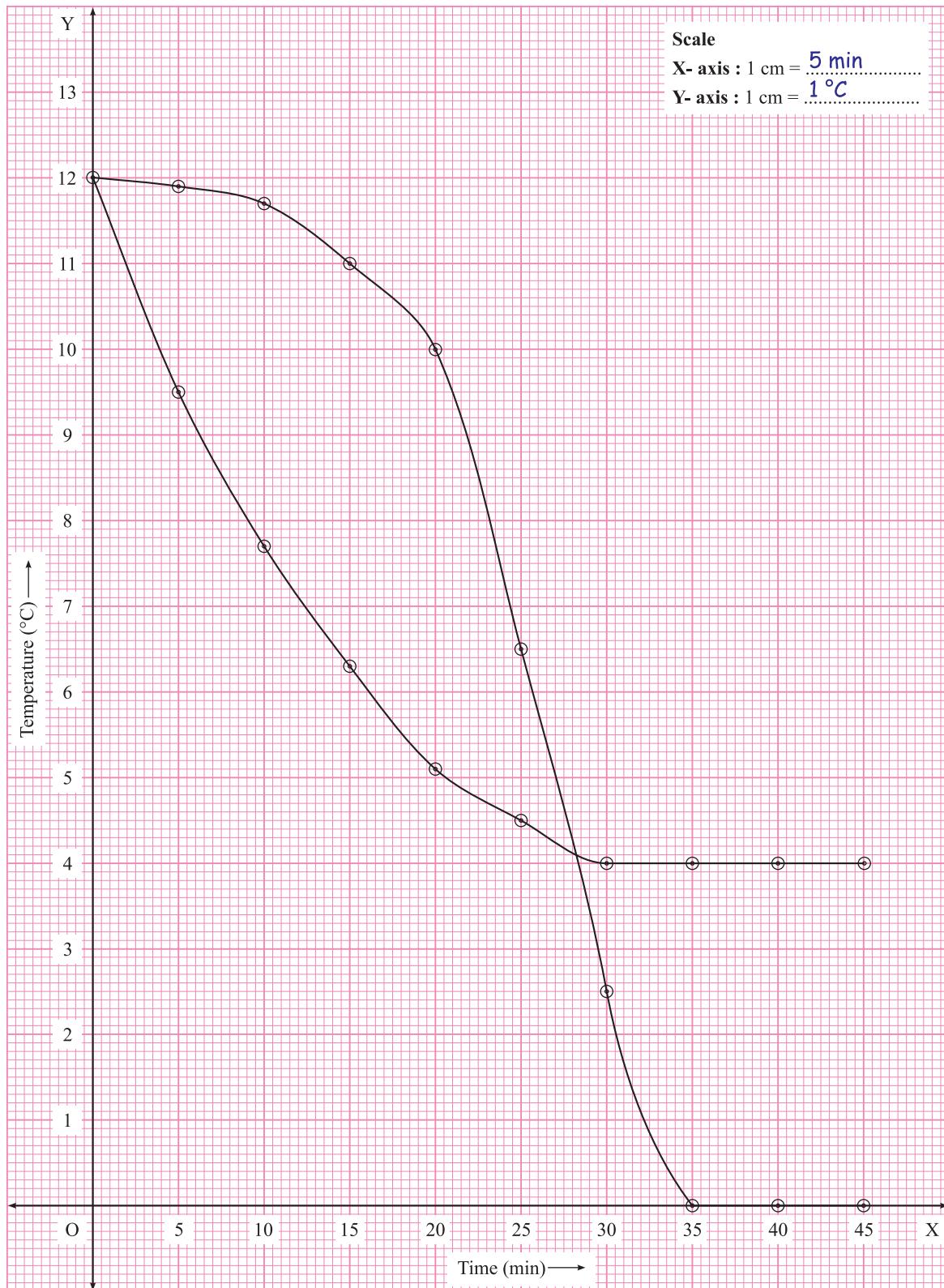


Observation table : Least count of the thermometers = 1°C .

Time (min)	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Temperature T_1 ($^{\circ}\text{C}$)	12					9.5					7.7			
Temperature T_2 ($^{\circ}\text{C}$)	12					11.9					11.7			

Time (min)	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Temperature T_1 ($^{\circ}\text{C}$)		6.3					5.1					4.5		
Temperature T_2 ($^{\circ}\text{C}$)		11					10					6.5		

Time (min)	28	29	30	31	32	33	34	35	36	37	38	39	40	45
Temperature T_1 ($^{\circ}\text{C}$)			4					4					4	4
Temperature T_2 ($^{\circ}\text{C}$)			2.5					0					0	0



Graph of temperature versus time

Inferences/Conclusion with explanation :

- (1) Initially, both the thermometers show the **same** temperature. In a short time, the temperature shown by the lower thermometer starts **decreasing**, while the temperature shown by the upper thermometer **does not change very much**.
- (2) This process continues till the temperature shown by the **lower** thermometer falls to 4°C and remains constant thereafter. This shows that in the temperature range 12°C to 4°C , the density of the water in the central part of the container goes **on increasing** and hence the water **sinks to the bottom**. It means that water **contracts**, i.e., its volume **decreases** as its temperature **falls down from 12°C to 4°C** .
- (3) As the temperature of the water in the central part of the container becomes **less than 4°C** , the temperature shown by the upper thermometer **begins to fall rapidly to 0°C** . But the temperature shown by the lower thermometer **remains constant (4°C)**. Later, the reading shown by the lower thermometer **decreases to 0°C** .
- (4) In the temperature range 4°C to 0°C , the water moves upward. This shows that the density of water goes on decreasing in this range. It means that water **expands**, i.e. its volume **increases** as its temperature **falls** from 4°C to 0°C . The behaviour of water in the temperature range from 4°C to 0°C is called **anomalous behaviour of water**.
- (5) In the graph, the point of intersection of the two curves shows the temperature at which the density of water is **maximum**. This temperature is 4°C .

Precaution : Record all temperatures carefully.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.
1. If the temperature of water is increased from 4°C to 10°C , then its
(A) *volume decreases and density increases* (B) *volume increases and density decreases*
(C) *volume decreases and density decreases* (D) *volume increases and density increases* B
-
2. At 4°C , the density of water is
(A) 10 g/cm^3 (B) 4 g/cm^3
(C) $4 \times 10^3 \text{ kg/m}^3$ (D) $1 \times 10^3 \text{ kg/m}^3$ D
-
3. The density of water is maximum at
(A) 0°C (B) -4°C (C) 100°C (D) 4°C D
-
4. is used to study the anomalous behaviour of water.
(A) *The calorimeter* (B) *Joule's apparatus*
(C) *Hope's apparatus* (D) *The thermos flask* C

5. In this experiment, the point of intersection of the two curves in the graph corresponds to the
(A) melting point of ice
(B) freezing point of water
(C) temperature at which the density of water is minimum
(D) temperature at which the density of water is maximum

D

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Remember : The graph of temperature of water against time shows that initially, both temperatures T_1 and T_2 are identical. The point of intersection of the two curves shows the temperature of maximum density.

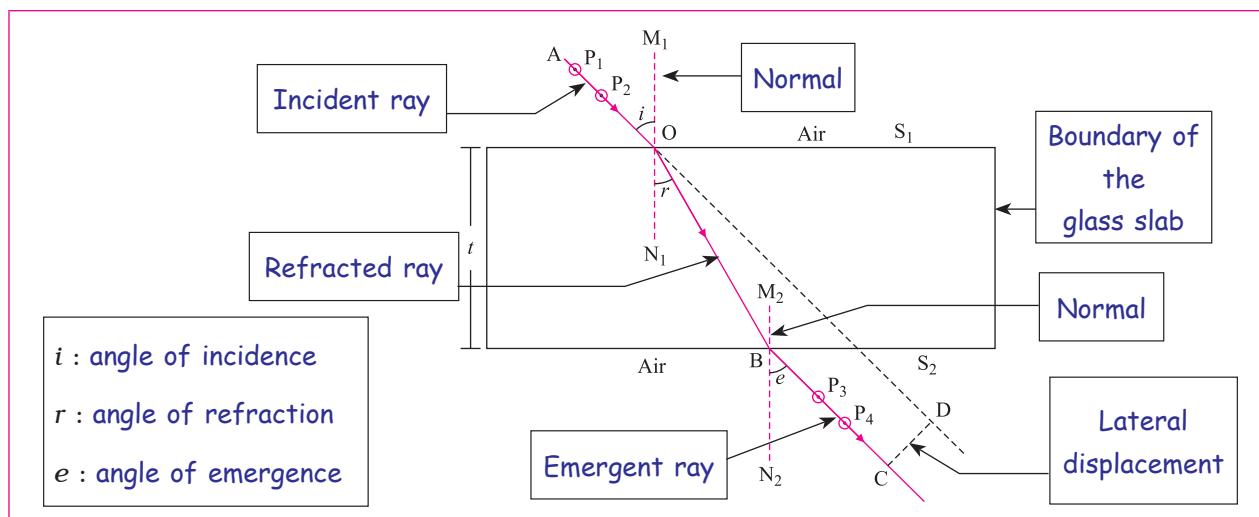
Aim : To measure the angle of incidence, the angle of refraction, the angle of emergence and verify the laws of refraction of light.

Requirements : A rectangular glass slab, a drawing board, a drawing paper, drawing pins, pins, a protractor.

Procedure :

- (1) Fix the drawing paper on the drawing board using drawing pins.
 - (2) Place the rectangular glass slab on it and mark its boundary with a sharp pencil.
 - (3) Remove the glass slab and draw a normal M_1N_1 at the point O. Draw a line AO which makes an angle of incidence (i) of 30° with normal M_1N_1 .
 - (4) Fix pins P_1 and P_2 on line AO such that the pins are vertical and well separated.
 - (5) Replace the glass slab properly in its original position.
- Observe the images of the bases of pins P_1 and P_2 through the glass slab from the opposite side S_2 and fix two pins P_3 and P_4 such that the bases of these pins are exactly in line with the images of the bases of pins P_1 and P_2 .
- (6) Remove pins P_3 and P_4 and mark their positions by small circles. Draw a line BC through points P_3 and P_4 . Remove pins P_1 and P_2 and the glass slab. Join OB and draw normal M_2N_2 at point B.
 - (7) Measure, the angle of incidence (i), the angle of refraction (r) and the angle of emergence (e).
 - (8) Repeat the procedure for angles of incidence of 45° and 60° .
 - (9) Find the ratio $\frac{\sin i}{\sin r}$ in each case.

Diagram : Label the various components in the given diagram.



Refraction of light through a glass slab

Observation : The path of the ray for angle of incidence of $30^\circ/45^\circ/60^\circ$ is AOBC.

Observation table :

Angle of incidence (i)	Angle of refraction (r)	Angle of emergence (e)	$\frac{\sin i}{\sin r}$
30°	20°	30°	1.46
45°	30°	45°	1.41
60°	38°	60°	1.40

Inferences/Conclusions :

- (1) Incident ray AO and emergent ray BC are parallel to each other. The lateral shift is equal to CD.
[This shift depends upon the thickness t of the glass slab, the refractive index of glass and the angle of incidence.]
- (2) The angle of incidence (i) > the angle of refraction (r). This means when a ray of light travels from air to glass, it bends towards the normal.
- (3) The angle of incidence (i) = the angle of emergence (e).
- (4) The incident ray and the refracted ray are on the opposite side of the normal to the surface at the point of incidence and all the three i.e., the incident ray, the refracted ray and the normal are in the same plane.
- (5) For a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant (Snell's law). This constant is called the refractive index of the second medium with respect to the first medium.

Precaution : Pins should be fixed such that they are vertical and well separated.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. Rakesh performs the experiment on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He observes that in all cases

- (A) $i > r$ but $i = e$ (B) $i < r$ but $i = e$
(C) $i > e$ but $i = r$ (D) $i < e$ but $i = r$

A

2. When a ray of light travels from air to glass and strikes the surface of separation at 90° with the surface,

- (A) it bends towards the normal (B) it bends away from the normal
(C) it passes without bending (D) it passes randomly

C

3. If a ray of light incident from a denser medium passes through a rarer medium in a straight line, the angle of incidence must be

- (A) 0° (B) 30° (C) 60° (D) 90°

A

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Remember : The lateral displacement depends on the thickness of the glass, angle of incidence and angle of refraction.

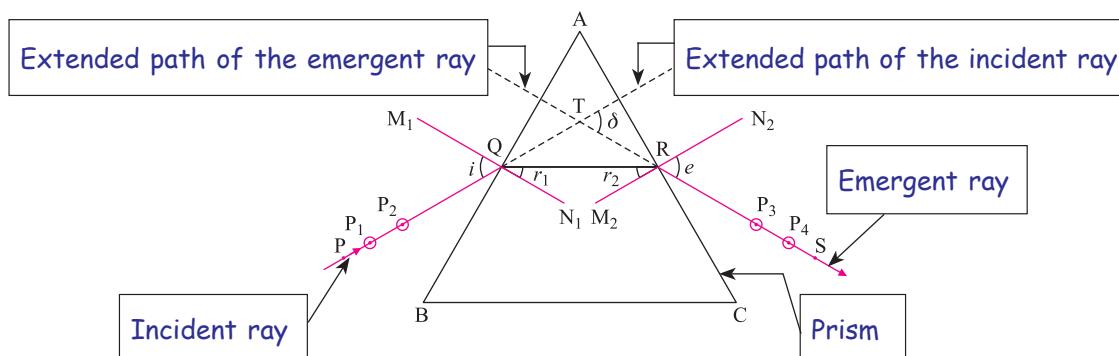
Aim : To study the refraction of light through a glass prism by tracing the path of rays of light passing through the prism and measuring the angle of deviation for different angles of incidence.

Requirements : A glass prism, a drawing board, a white drawing paper, paper pins and drawing pins, a protractor.

Procedure :

- (1) Fix the drawing paper on the drawing board using drawing pins.
 - (2) Place the glass prism on it, with the triangular base of the prism in contact with the paper, and mark its boundary with a sharp pencil.
 - (3) Remove the prism and draw a normal M_1N_1 at point Q. Draw a ray PQ which makes an angle of incidence (i) of 30° with normal M_1N_1 .
 - (4) Fix pins P_1 and P_2 on ray PQ such that the pins are vertical and well separated.
 - (5) Replace the glass prism properly in its original position.
- Observe the images of the bases of pins P_1 and P_2 through the prism from the opposite side and fix two pins P_3 and P_4 such that the bases of these pins are exactly in line with the images of the bases of pins P_1 and P_2 .
- (6) Remove pins P_3 and P_4 and mark their positions by small circles. Draw a line through points P_3 and P_4 . Let this line meet surface AC of the prism in point R. Draw ray RS by taking point S on the line joining points P_3 and P_4 . Remove pins P_1 and P_2 and the prism. Join QR and draw normal M_2N_2 at point R.
 - (7) Extend ray PQ (incident ray) in the same direction and ray RS (emergent ray) in the opposite direction to intersect each other in point T.
 - (8) Measure the angle of incidence (i), angle of refraction (r_1), angle of deviation (δ) and angle of emergence (e). Enter the same in the observation table.
 - (9) Repeat the above procedure for angles of incidence of 45° and 60° .

Diagram : Label the various components in the given diagram.



i : angle of incidence

δ : angle of deviation

r_1 : angle of refraction at surface AB

e : angle of emergence

r_2 : angle of incidence at the surface AC

Observation : The path of the ray for angle of incidence of $30^\circ/45^\circ/60^\circ$ is PQRS.

Observation table :

Angle of incidence (i)	Angle of refraction (r_1)	Angle of deviation (δ)	Angle of emergence (e)
30°	20°	43°	73°
45°	30°	37°	60°
60°	38°	40°	40°

Inferences :

- (1) The angle of incidence (i) $>$ the angle of refraction (r_1).

This means that when a ray of light travels from air to glass, it bends **towards the normal**.

- (2) The angle of emergence (e) $>$ the angle r_2 . This means that when a ray of light travels from glass to air,

it bends **away from the normal**.

- (3) In general, the angle of deviation (δ) depends on the **angle of incidence (i)**. If the angle of incidence is gradually increased, starting from (say) 30° , initially δ **decreases** as i is **increased**, becomes **minimum** for certain value of i and then **increases** as i is increased.

Precaution : Pins should be fixed such that they are vertical and well separated.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. The change in the direction of propagation of light when it passes obliquely from one transparent medium to another is called

(A) dispersion (B) scattering (C) refraction (D) reflection

C

2. A ray of light gets deviated when it passes obliquely from one medium to another medium because

(A) the colour of light changes (B) the frequency of light changes
(C) the speed of light changes (D) the intensity of light changes

C

3. of light is responsible for twinkling of stars.

(A) Reflection (B) Internal reflection (C) Dispersion (D) Refraction

D

4. light is deviated the maximum in the spectrum of white light obtained with a glass prism.

(A) Red (B) Yellow (C) Violet (D) Blue

C

5. light is deviated the least in the spectrum of white light obtained with a glass prism.

(A) Red (B) Yellow (C) Violet (D) Blue

A

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Remember : Even when the incident rays are directed away from the base of the prism, the emergent rays bend towards the base of prism, as the prism is triangular.

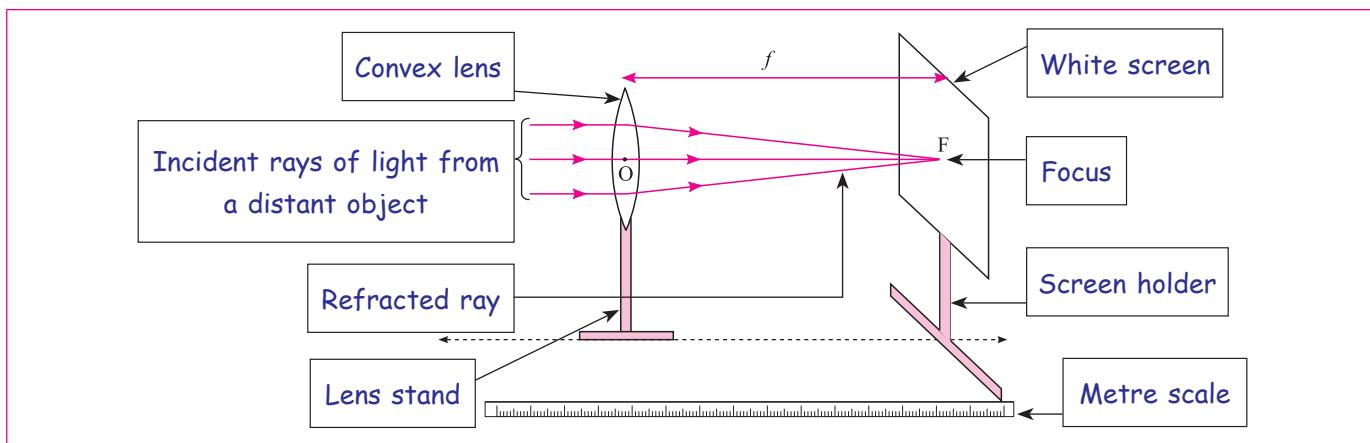
Aim : To determine the focal length of a convex lens by obtaining an image of a distant object.

Requirements : A convex lens, a lens stand, a metre scale, a white screen and a screen holder.

Procedure :

- (1) Mount a convex lens on lens stand.
- (2) Select a distant object like an electric pole. Turn one surface of the lens towards the pole.
- (3) Mount a white screen in the screen holder and place it in front of the lens.
- (4) Move the screen towards or away from the lens to obtain a sharp image of the pole on the screen.
- (5) Measure the distance between the lens and the screen (image).
- (6) Repeat the procedure by selecting two more distant objects like a tree, a house, a telephone pole.
- (7) Record your observations in the observation table. Find the average focal length of the lens. Let it be f_1 .
- (8) Now rotate the lens by 180° so that the other surface of the lens faces the distant object. Obtain the sharp image of the distant object on the screen.
- (9) Again measure the distance between the lens and the screen. Record your observation in the observation table. Take two more readings by selecting two more distant objects. Find the average focal length of the lens. Let it be f_2 .
- (10) From f_1 and f_2 , find the average focal length of the lens.
- (11) Compare f_1 and f_2 to determine whether the lens is symmetric or not.

Diagram : Label the various components in the given diagram.



Determination of the focal length of a convex lens

Observation table :

Sr. No.	Distant object	Distance between the lens and the screen (cm)		Average focal length of the lens $f = \frac{f_1 + f_2}{2}$ (cm)
		for one surface of the lens towards the object	for the other surface of the lens towards the object	
1	Electric pole	19.8	19.8	19.8

2	Tree	19.9	19.8	19.8
3	Window	19.7	19.7	19.7
		Average $f_1 = 19.8$	Average $f_2 = 19.8$	19.8

Inferences/Conclusions :

- (1) The average focal length of the lens (f) = 19.8 cm.
- (2) $f_1 = f_2$. (Use proper sign, =, ≠)
- (3) The lens used is symmetric / is not symmetric.

Precautions :

- (1) Obtain the sharp image of a distant object on the screen.
- (2) Measure the distances accurately.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.
1. The image formed by a concave lens is always

D

(A) real, inverted and diminished (B) real, inverted and magnified
 (C) virtual, erect and magnified (D) virtual, erect and diminished
 2. By using a , light rays incident on it can be converged.

D

(A) plane mirror (B) convex mirror
 (C) concave lens (D) convex lens
 3. The incident ray parallel to the principal axis of a convex lens passes through after refraction.

B

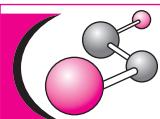
(A) the optical centre of the lens (B) focus F_2
 (C) $2F_2$ (D) none of these

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Remember : The image obtained while finding the focal length of a convex lens is real and inverted.
 A convex lens is a converging lens.



Experiment 11

Arranging the metals according to the decreasing order of their reactivity

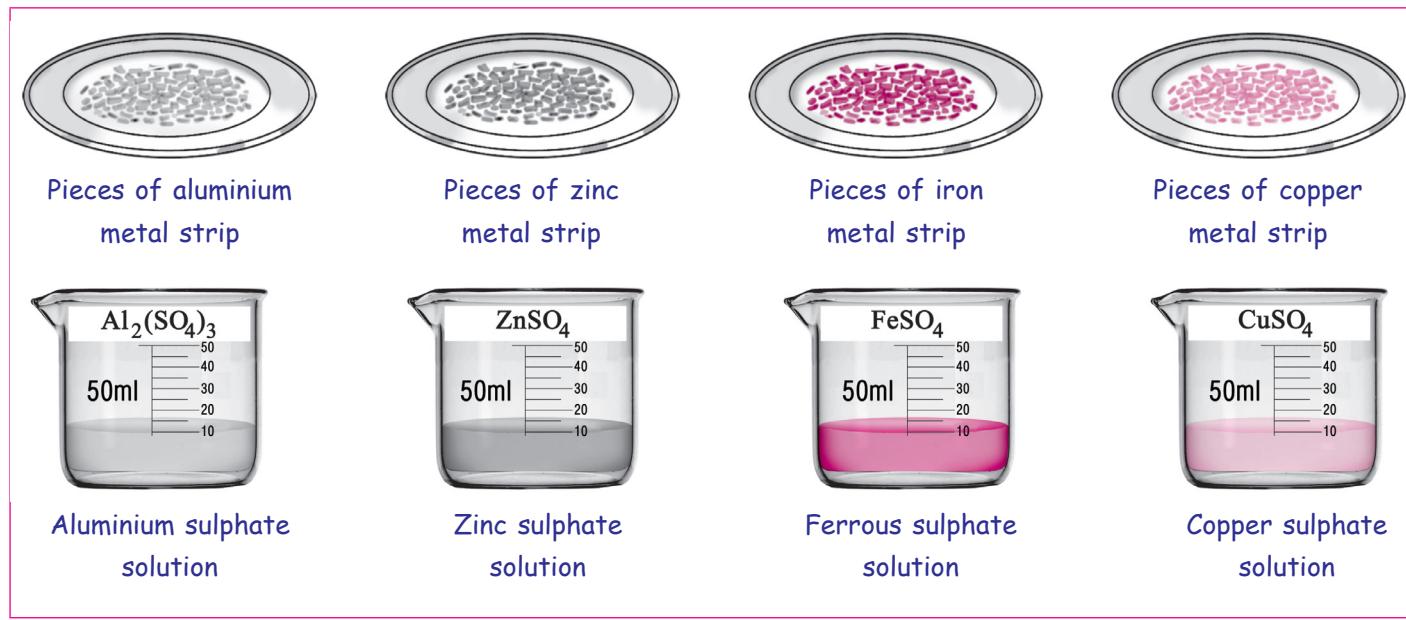
Aim : To study the reactions of the metals Al, Zn, Fe and Cu with the solutions of salts $\text{Al}_2(\text{SO}_4)_3$, ZnSO_4 , FeSO_4 , CuSO_4 and to arrange these metals in decreasing order of their reactivity.

Requirements : Test tubes, Test tube stand, distilled water, sandpaper, forceps, the metals Aluminium, Zinc, Iron and Copper, solutions of the salts $\text{Al}_2(\text{SO}_4)_3$, ZnSO_4 , FeSO_4 , CuSO_4 .

Procedure :

- (1) Take four 50 ml beakers and label them as Aluminium sulphate, Zinc sulphate, Ferrous sulphate and Copper sulphate.
- (2) Clean all the metallic pieces using sandpaper and cut them into small pieces.
- (3) Add 10 ml of solution of $\text{Al}_2(\text{SO}_4)_3$, ZnSO_4 , FeSO_4 and CuSO_4 in the labelled beakers respectively.
- (4) Add two pieces of aluminium metal into beaker containing ZnSO_4 , FeSO_4 and CuSO_4 solutions.
- (5) Keep the beakers undisturbed for about 20 minutes.
- (6) After about 20 minutes, note the change in colour of solutions or any other change.
- (7) Repeat the similar procedure by adding – Zinc pieces to $\text{Al}_2(\text{SO}_4)_3$, FeSO_4 and CuSO_4 solutions, Iron pieces to $\text{Al}_2(\text{SO}_4)_3$, ZnSO_4 and CuSO_4 solutions, Copper pieces to $\text{Al}_2(\text{SO}_4)_3$, ZnSO_4 and FeSO_4 solutions.
- (8) Record your observations.

Figure : Draw and label the diagrams of metals with the solutions of salts.

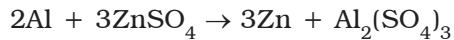


Observation table :

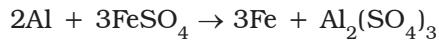
Metal	$\text{Al}_2(\text{SO}_4)_3$	ZnSO_4	FeSO_4	CuSO_4
Aluminium	—	Solution remains colourless. Zinc metal settles down at the bottom of the beaker. Zinc is displaced.	Green colour of FeSO_4 disappears. Iron metal settles down at the bottom of the beaker. Iron is displaced.	Blue colour of CuSO_4 disappears. The brown coloured copper particles settle down at the bottom of the beaker. Copper is displaced.
Zinc	(Solution remains colourless.) No reaction	—	Green colour of ferrous sulphate disappears. Iron metal settles down at the bottom of the beaker. Iron is displaced.	Blue colour of copper sulphate disappears and red-brown Copper particles settle down at the bottom of the beaker. Copper is displaced.
Iron	(Solution remains colourless.) No reaction	(Solution remains colourless) No reaction	—	Blue colour of Copper sulphate changes to light green coloured FeSO_4 . Copper metal is formed in the beaker. Copper is displaced.
Copper	(Solution remains colourless.) No reaction	(Solution remains colourless.) No reaction	(Solution remains colourless.) No reaction	—

Chemical reactions :

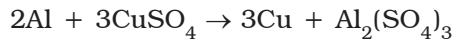
(1) More reactive Al displaces the less reactive Zn from ZnSO_4 solution.



(2) More reactive Al displaces the less reactive Fe from FeSO_4 solution.

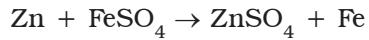


(3) More reactive Al displaces the less reactive Cu from CuSO_4 solution.

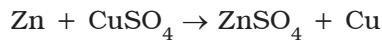


(4) Zn cannot displace Al from $\text{Al}_2(\text{SO}_4)_3$ solution.

(5) More reactive Zn displaces the less reactive Fe from FeSO_4 solution.



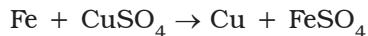
(6) More reactive Zn displaces the less reactive Cu from CuSO_4 solution.



(7) Fe cannot displace Al from $\text{Al}_2(\text{SO}_4)_3$ solution.

(8) Fe cannot displace Zn from ZnSO_4 solution.

(9) More reactive Fe displaces the less reactive Cu from CuSO_4 solution.



(10) Cu cannot displace Zn from $ZnSO_4$ solution, Cu cannot displace Al from $Al_2(SO_4)_3$ solution, Cu cannot displace Fe from $FeSO_4$ solution.

Inferences :

- (1) Aluminium displaces **Zn**, **Cu** and **Fe** from their salt solutions.
 - (2) Zinc displaces **Cu** and **Fe** from their salt solutions.
 - (3) Fe displaces **Cu** from its salt solution.
 - (4) Cu cannot displace **Zn**, **Al** or **Fe** from their salt solutions.
 - (5) Thus, **aluminium** is more reactive metal.

The decreasing order of reactivity of metal is :

Precautions :

- (1) Do not touch any chemical.
 - (2) Label the beakers properly and put them in sequences. It is better to label the beakers both with the chemical names and also by chemical symbols.
 - (3) It is very important that the apparatus you use must be very clean and dry.
 - (4) Always clean the metallic strips before use with a sandpaper. Use the strips of metals of same size, weight and number.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box :

Ans.

1. To show that zinc is more reactive than copper, the correct procedure is to

(A) prepare copper sulphate solution and dip zinc strip in it

(B) prepare zinc sulphate solution and dip copper strip in it

(C) heat together zinc and copper strips

(D) add dil. nitric acid to both the strips

A

- 2.** A solution of $\text{Al}_2(\text{SO}_4)_3$ in water is not clear. It is due to

(A) impurities present in water (B) hydrolysis of $\text{Al}_2(\text{SO}_4)_3$ in water

(C) impurities present in $\text{Al}_2(\text{SO}_4)_3$ (D) none of these

D

- ### 3. Iron is

(A) more reactive than zinc

(B) more reactive than aluminium

D

(C) less reactive than copper

(D) less reactive than aluminium

Date : _____

Teacher's Signature : _____

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Remember : If a metal A displaces another metal B from the solution of its salt, then it means the metal A is more reactive than the metal B.

Aim : To study the oxidation and addition reactions of carbon compounds.

- (A) Oxidation of Ethanol (B) Addition reaction of fatty acids

Requirements : Test tubes, Burner, measuring cylinder, dropper, ethanol, dilute solution of sodium carbonate, dilute solution of potassium permanganate, tincture iodine solution, vanaspati ghee, vegetable oils like groundnut, safflower, sunflower oil.

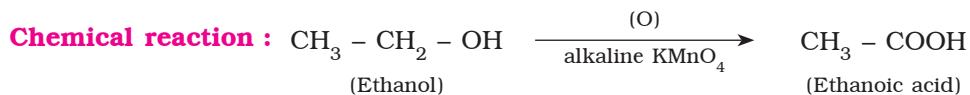
(A) Oxidation of Ethanol

Procedure :

- (1) Take 2-3 ml of ethanol in a test tube. Add 5 ml of sodium carbonate solution to it. Warm the mixture.
- (2) Add a few drops of the dilute solution of potassium permanganate to the warm mixture with constant stirring.
- (3) Observe the change in the pink colour of potassium permanganate immediately after its addition started.

Observations :

- (1) When a solution of potassium permanganate is added to ethanol, in the beginning the pink colour disappears.
- (2) When addition is continued further, the pink colour does not vanish but remains as it is.



Inferences :

- (1) Potassium permanganate oxidizes ethanol to **Ethanoic acid**.
- (2) As potassium permanganate is consumed in this reaction its **pink** colour vanishes.
- (3) When oxidation process is over, the potassium permanganate added afterwards becomes excess and shows its presence with its particular pink colour.

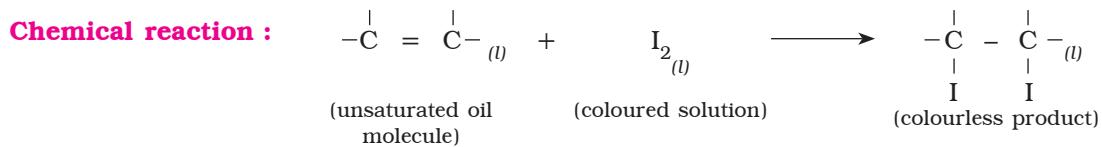
(B) Addition Reaction of Fatty Acids

Procedure :

- (1) Take 4 ml of oil in a test tube. Add 4 drops of tincture iodine in it.
- (2) Shake the test tube well.
- (3) Observe the colour change of tincture iodine.
- (4) Repeat the same procedure using other oils and vanaspati ghee.

Observation table :

Sr. No.	Oil used	Colour change observed in the solution
1.	Groundnut oil	Orange brown colour of tincture iodine vanishes.
2.	Safflower oil	Colour vanishes
3.	Sunflower oil	Colour vanishes
4.	Vanaspati ghee	Colour does not vanish



Inferences :

(1) Iodine is consumed due to its addition to fatty acid. Therefore, the coloured solution becomes colourless.

But when the same procedure is followed for vanaspati ghee, a similar colour change is not observed.

As vanaspati ghee is saturated hydrocarbon, the **addition** reaction does not occur there.

(2) The iodine test indicates the presence of a **multiple bond** in vegetable oil.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. $\begin{array}{c} O \\ || \\ -C-OH \end{array}$ is called

- (A) carboxylic acid group (B) aldehyde group
 (C) ketonic group (D) alcohol group

A

2. contains alcoholic functional group.



D

3. In the reaction of oxidation of ethanol, $KMnO_4$ oxidises ethanol in

- (A) acidic medium (B) alkaline medium
 (C) neutral medium (D) strong acidic medium

B

4. The organic compounds having double or triple bonds in them are termed as

- (A) saturated compounds (B) stable compounds
 (C) volatile compounds (D) unsaturated compounds

D

5. Due to, vegetable oil is converted into vanaspati ghee.

- (A) Hydrogenation (B) Chlorination
 (C) Dehydration (D) Polymerization

A

Date : _____

Teacher's Signature : _____

* * *

Remember : Unsaturated compounds undergo addition reaction to form saturated compound. Unsaturated fats containing double bonds are healthy while saturated fats are harmful to health.

Part 2



Study of Mitosis and Meiosis

Aim : To study different stages of mitosis and meiosis.

I. STUDY OF MITOSIS

Requirements : Permanent slides of onion root tips showing mitosis, compound microscope.

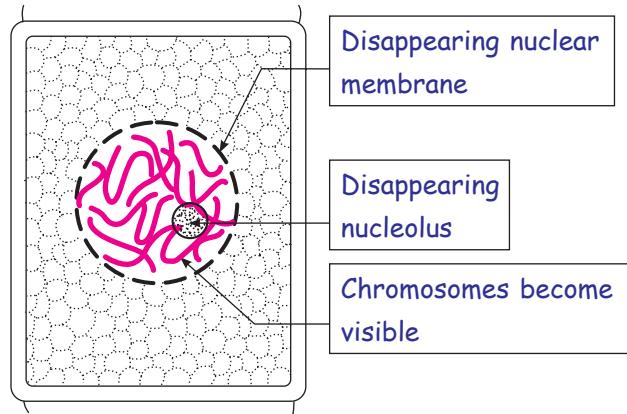
Procedure : Focus the permanent slide of squash preparation of onion root tip under the high power of a microscope and note the changes undergone by the nucleus during the following stages of mitosis :

Observations :

1. Prophase

- (1) In prophase chromosomes are seen in the form of **long** and **coiled** thread-like structures.
- (2) Each chromosome consists of two **sister chromatids** connected by centromere.
- (3) The **nuclear membrane** and **nucleolus** seen distinctly during the early prophase are seen **disintegrating** and **disappearing** towards the end of the prophase.

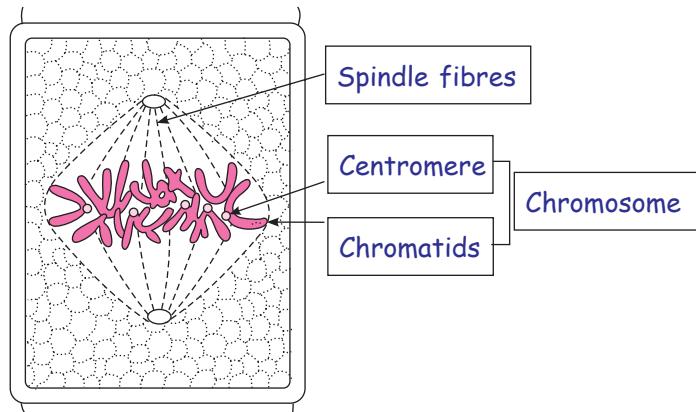
Diagram : Label the different parts in the given diagram.



2. Metaphase

- (1) Nuclear membrane disappears completely in metaphase. The chromosomes are **condensed** and **shortened** and therefore they are seen more distinct and clear.
- (2) The formation of **spindle fibres** is completed during metaphase.

Diagram : Label the different parts in the given diagram.



(3) Where are spindle fibres formed?

Spindle fibres are formed between centromere of each chromosome and both centrioles of opposite poles.

(4) How are chromosomes arranged during this phase?

The chromosomes are seen arranged at equatorial plane of the spindle, during this phase.

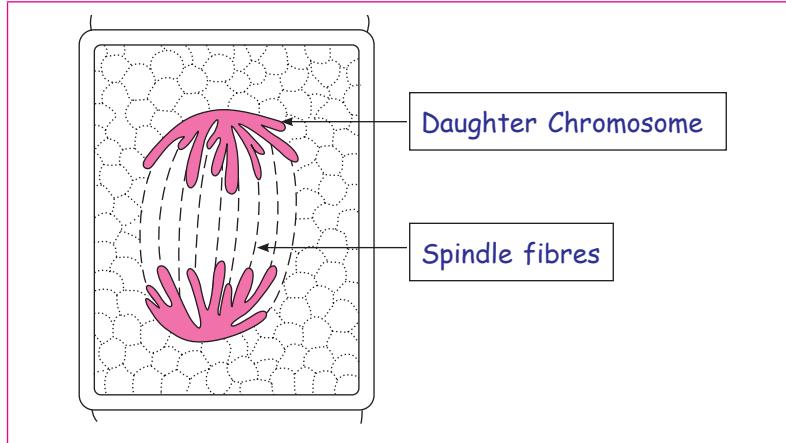
3. Anaphase

(1) Which important division process takes place during anaphase?

In this phase, centromere split and sister chromatids of each chromosome separate and move towards the opposite poles due to the contraction of spindle fibres.

(2) The chromosomes appear 'L' or 'V' shaped during anaphase.

Diagram : Label the different parts in the given diagram.



4. Telophase

(1) What change takes place in the chromosomes during this phase?

The chromosomes are seen assembled at the poles in the form of long coiled thread-like structures.

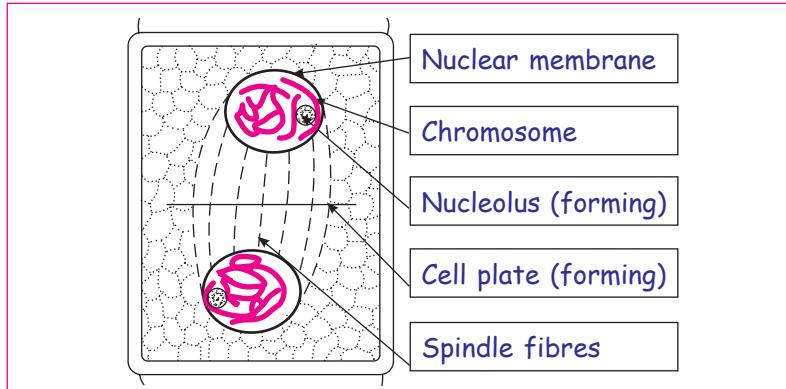
(2) What are important changes during telophase?

During telophase the chromosomes reorganise to form two daughter nuclei at opposite poles.

(3) The nuclear membrane and nucleolus reappear at the end of telophase forming two daughter nuclei.

The process of cytokinesis takes place at the end forming two daughter cells.

Diagram : Label the different parts in the given diagram.



II. STUDY OF MEIOSIS

Meiosis is also called reduction division because the chromosome number is reduced to half.

Requirements : Slides of grasshopper testis showing meiosis, compound microscope.

Procedure : Focus the permanent slides of meiosis under the high power of a compound microscope. Observe the slides carefully and note the details.

Observations :

(1) What are the main divisions of the meiosis?

(A) Meiosis I (B) Meiosis II

(2) Which is the most elaborate phase of the meiosis I? What are its substages?

Prophase 'I' is the most elaborate phase of the meiosis I.

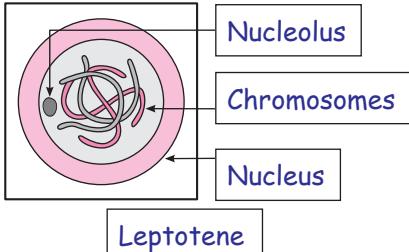
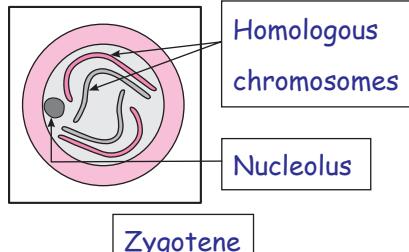
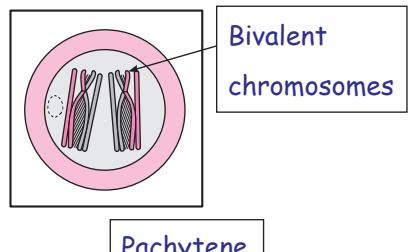
5 substages of prophase I are as follows : Leptonene, Zygote, Pachytene, Diplotene, Diakinesis.

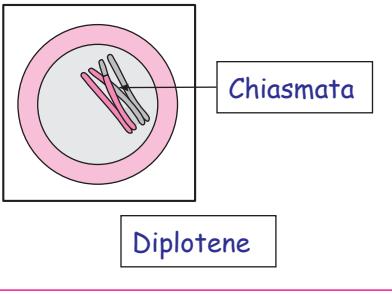
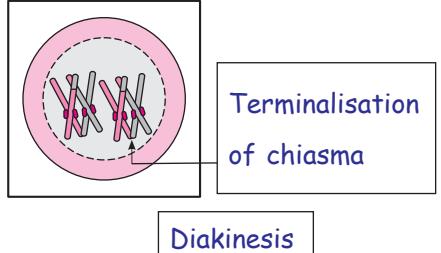
(3) At the end of Meiosis I, **diads**, i.e. 2 distinct cells are visible. The chromosome number is reduced to half.

(4) At the end of Meiosis II, **tetrads**, i.e. 4 distinct daughter cells are visible.

Meiosis I

Identify the diagrams of different phases of Prophase-I and name them. Label the different parts of each phases and write atleast two characteristics of each phases.

Prophase – I	Characteristics
 <p>Nucleolus Chromosomes Nucleus Leptonene</p>	Chromosomes appear as thin and long threads. Nuclear envelope and nucleolus are distinct.
 <p>Homologous chromosomes Nucleolus Zygote</p>	Homologous chromosomes form pairs. They are known as bivalents. This pairing is called synapsis.
 <p>Bivalent chromosomes Pachytene</p>	The chromosomes clearly show two similar chromatids. A bivalent becomes tetrad. Exchange of chromatid segments between homologous chromosomes takes place. This is known as crossing over. Recombination nodule or chiasmata are formed.

Prophase – I	Characteristics
	<p>The recombined homologous chromosomes start separating. They remain attached only at the points of crossing over i.e., chiasmata.</p>
	<p>Terminalisation of chiasmata is complete. Chromosomes appear as thick 'X', 'L' or ring shaped ('o') structures. Nucleolus and nuclear envelope disappears.</p>

Write the important events occurring in each of the remaining phases after Prophase I :

<p>Metaphase I Bipolar spindle is formed. Homologous chromosomes (bivalents) arranged at equatorial plane by centromere.</p>	<p>Anaphase I The homologous chromosomes are pulled away from each other. They move to the opposite poles.</p>
<p>Telophase I Chromosomes reach to the respective poles. Nucleolus and nuclear envelope reappear. The cell shows two daughter nuclei.</p>	<p>Cytokinesis I A cell plate or furrow appears in the middle and extends on its side. Two haploid daughter cells are formed.</p>

Meiosis II

Write the important events occurring in the phases of Meiosis II.

Prophase II	The chromosomes of daughter cells become thick and distinct. Nucleolus and nuclear envelope disappear.
Metaphase II	Bipolar spindle formation takes place in both the cells. The chromosomes get attached at the equator of the spindle.
Anaphase II	The sister chromatids separate. The separated chromatids (daughter chromosomes) start migrating towards the opposite poles. The separation occurs at the centromere.
Telophase II	Daughter chromosomes reach poles. The nucleolus and nuclear envelope reappear. Two daughter nuclei are now clearly seen in each cell. These will later form 4 cells. Thus, total 4 cells are formed from original one cell.

Cytokinesis II	Formation of cell plate takes place in plant cells. Animal cell divides by formation of a constriction in plasma membrane. At the end, four daughter cells are formed, each with haploid number of chromosomes.
----------------	---

Inferences :

- (1) By mitotic division, cells **multiply** in number without changing the **chromosome** number.
 - (2) Meiosis is **reduction** division in which chromosome number of the cell is reduced to **half**.

Multiple Choice Questions

Date : _____

Teacher's Signature : _____

10

Remember :

- (1) Mitosis takes place both in somatic cells and germinal cells.
 - (2) Meiosis takes place only in germinal cells. It does not take place in somatic cells.



Experiment 2

Study of Binary Fission in *Amoeba* and Budding in *Hydra*

Aim : To study (1) Binary fission in *Amoeba* and (2) Budding in *Hydra* with the help of permanent slides.

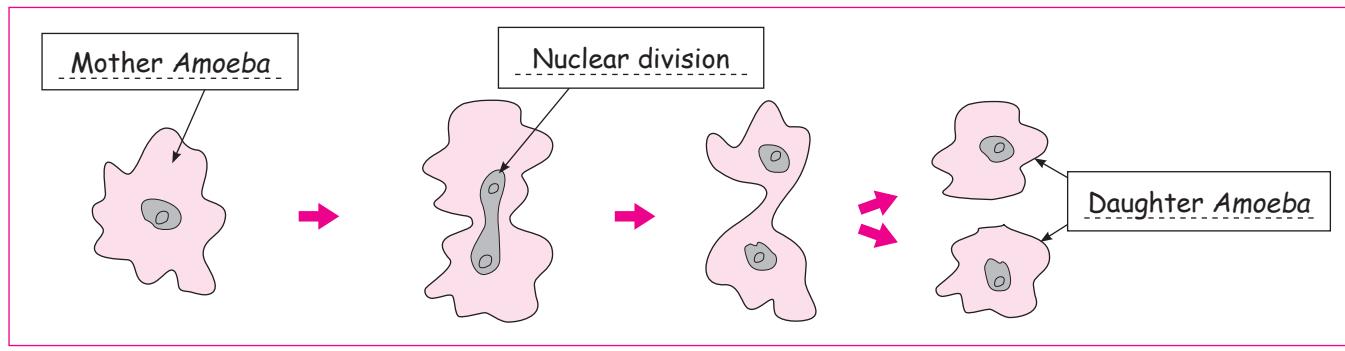
Requirements : Slides of binary fission in *Amoeba* and budding in *Hydra*, compound microscope.

Procedure :

- (1) Observe the slides showing binary fission in *Amoeba* and budding in *Hydra* under a compound microscope.
- (2) Arrange the mirror and the objective lens of the compound microscope.
- (3) First, adjust the slides under low power objective lens. If needed shift to high power objective lens. Note down the observations.

1. Binary fission in *Amoeba*

Diagram : Label the different parts in the given diagram.



Binary fission in *Amoeba*

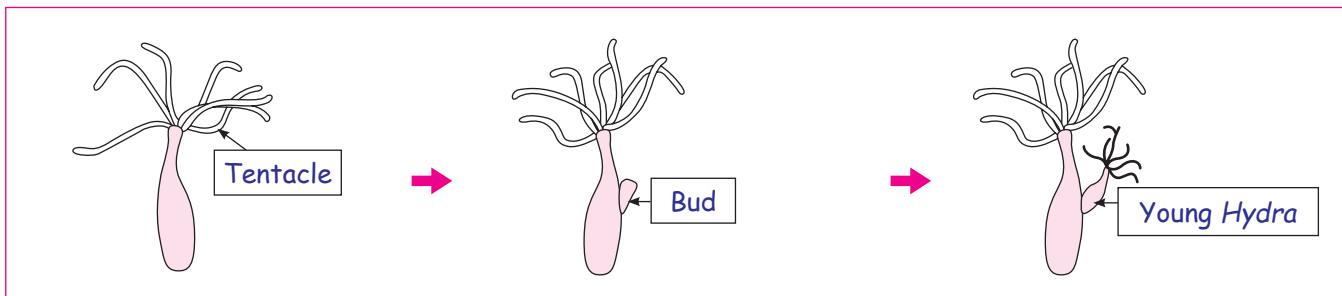
Observations : Strike out the incorrect word :

- (1) Binary fission of *Amoeba* starts with the division of nucleus/cell wall.
- (2) Binary fission is type of mitotic/meiotic cell division.
- (3) By binary fission one *Amoeba* gives rise to two/four daughter *Amoebae*.

Inference : Binary fission and budding are types of asexual reproduction.

2. Budding in Hydra

Diagram : Label the different parts in the given diagram.



Budding in Hydra

Observations : Strike out the incorrect word :

- (1) During reproduction, outgrowth developed on body of *Hydra* is called bud/~~tentacle~~.
- (2) The bud of *Hydra* is multicellular/~~unicellular~~.
- (3) Young *Hydra* remain~~/~~ attached on/detaches from parent *Hydra* and starts independent life.

Inference : Both binary fission and budding are **asexual** modes of reproduction.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. For observation of the *Hydra* bud clearly, first focus under the low power lens and then under the high power lens in order to observe _____.

- (A) the minute part in less area (B) the wide area
(C) more buds (D) all of these

A

2. Which stain will clearly show *Amoeba* and *Paramecium* in a drop of water taken on a slide and observed under a microscope?

- (A) Methylene blue (B) Iodine
(C) Safranin (D) Eosin

A

3. What is the type of reproduction in *Hydra*?

- (A) Binary fission (B) Budding
(C) Multiple fission (D) None of these

B

4. A slide of *Amoeba* with elongated nuclei represents which of the following?

- (A) Budding (B) Multiple fission
(C) Binary fission (D) Regeneration

C

5. Which of the following is a unicellular fungus that shows budding?

- (A) *Mucor* (B) *Yeast*
(C) *Amoeba* (D) None of these

B

6. Which of the following is a mode of asexual reproduction ?

- (A) *Fission*
(C) *Spore formation*

- (B) *Budding*
(D) *All of these*

D

Date : _____

Teacher's Signature : _____



Remember :

- (1) Binary fission is usually performed by living organisms during favourable conditions i.e. availability of abundant food material.
- (2) Asexual reproduction occurs by budding in yeast – a unicellular fungus.



Experiment 3

Study of *Hibiscus* flower

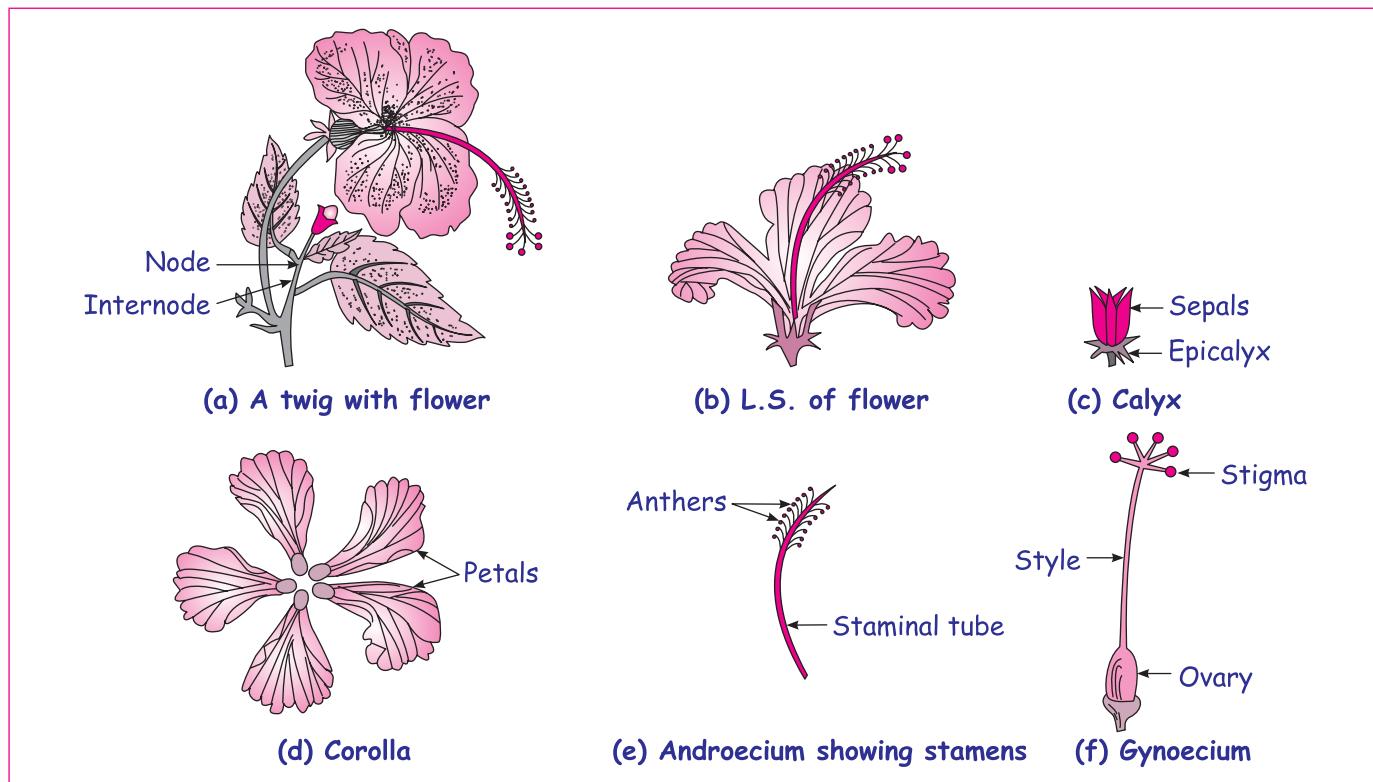
Aim : To study flower of *Hibiscus* with reference to reproductive structures.

Requirements : Flowers of *Hibiscus*, forceps, razor or blade, slides, two needles (pointed and arrow headed), cover slips, dissecting microscope, compound microscope, paper, glycerine, etc.

Procedure :

- (1) Take an open flower of *Hibiscus* and observe the different floral whorls, namely calyx, corolla, androecium and gynoecium.
- (2) Separate out each floral whorl carefully with the help of needles and forceps.
- (3) Arrange the members of each whorl separately on a white paper or a glass slide.
- (4) Count the members of each whorl.
- (5) Observe the separated members under a dissecting microscope.
- (6) Carefully separate stigma from staminal tube by taking longitudinal section.
- (7) Draw diagrams of the members of each whorl.

Diagram : Draw neat and labelled diagram of L.S. of *Hibiscus* flower.



Observation : Observe different parts of *Hibiscus* flower and enter your observations in the following table :

Whorl of flower	Number/Member	Description	Functions
Epicalyx	5 to 8 free bracteoles	Green in colour	To protect inner delicate parts in bud condition
Calyx	5 sepals	Green in colour	Protective, keeping all the parts safely covered during bud condition.

Whorl of flower	Number/Member	Description	Functions
Corolla	5, large petals	Red or different coloured, bright and large petals.	To attract insects for pollination.
Androecium	Many stamens	Filaments of stamens are fused to form staminal tube. It bear anthers at its tip.	To produce pollen grains which form male gametes for sexual reproduction.
Gynoecium	5 carpels	Consists of ovary, style and stigma.	To produce ovules which forms female gametes for sexual reproduction.

Inference : What is the function of a flower?

Ans. Flower is the structural unit of sexual reproduction in plants. It attracts insect for pollination.

Multiple Choice Questions

Date : _____

Teacher's Signature : _____



Remember : Flower is a reproductive organ of a plant. Androecium and gynoecium are the reproductive whorl of a flower which help in formation of fruit and seeds.



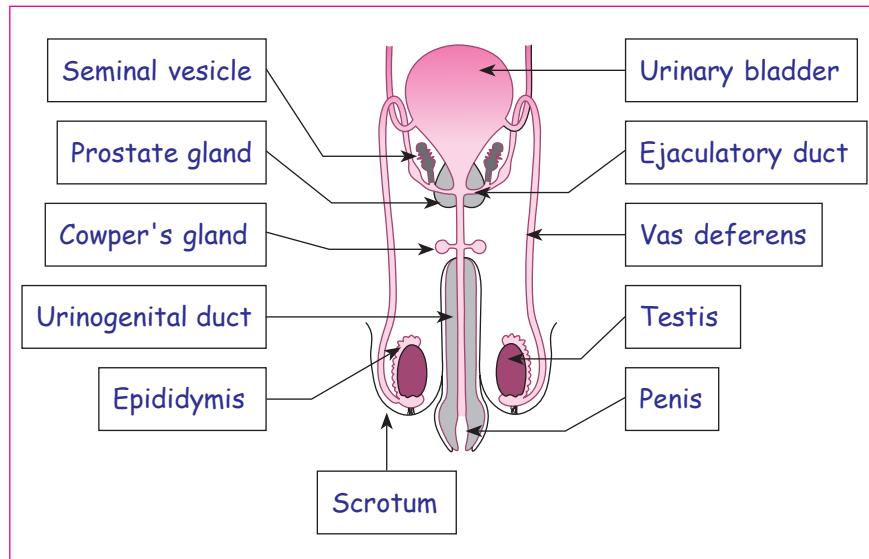
Aim : To study structure and functions of human reproductive system.

Requirements : Models or photographs of human male and female reproductive system.

Procedure : Observe the structure of the reproductive system of human male and female from the models or photographs given in the laboratory. Note down the details of structure and function of each part. Enter the information in the tabulation.

1. Human male reproductive system

Diagram : Label the different parts in the given diagram.



Human male reproductive system

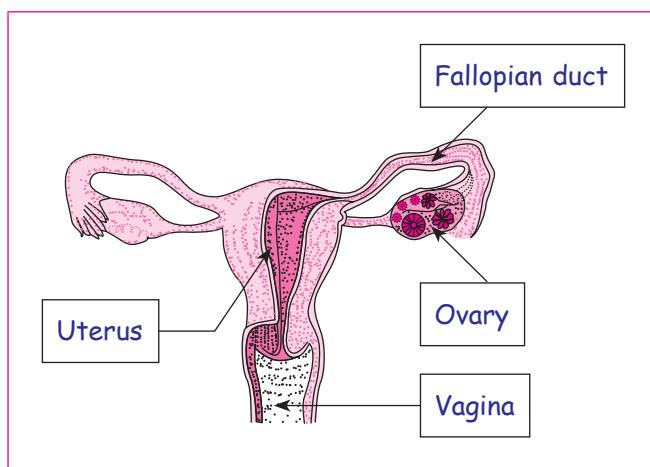
Observation table : Complete the given observation table.

Organ	Structure	Function
Testis (Pair)	Location : Located below the abdominal cavity in the scrotum.	(1) Contain numerous seminiferous tubules. Each has germinal epithelium. The cells of germinal epithelium divide meiotically to produce sperm (2) Testes also produce testosterone.
Different tubules / ducts	2 rete testes 2 vas efferens 2 epididymis 2 vas deferens 1 ejaculatory duct 1 urethra	(1) Sperms travel from one tubule to next. During this, they become mature and able to fertilize the ovum. (2) Which out of these ducts are cut off while performing family planning operation? In family planning operations, vas deferens are cut off so that sperms do not enter the semen.

Organ	Structure	Function
Accessory glands associated with male reproductive system.	(1) 2 seminal vesicles (2) Single prostate gland (3) 2 cowper's glands or Bulbourethral gland	Secretions released in urethra. All secretion + sperms = semen
Penis (Urethra passes through Penis)	Passage of urine as well as sperms.	(1) Penis transfers the semen during intercourse. (2) Urine stored in urinary bladder is released in Urethra running through penis.

2. Human female reproductive system

Diagram : Label the different parts in the given diagram.



Human female reproductive system

Observation table : Complete the given observation table.

Organ	Structure	Function
2 Ovaries	Situated in lower abdominal cavity.	Produce ova, secrete female hormones.
2 Fallopian ducts (called oviducts in lower animals)	Consists of three parts. (1) Infundibulum (2) Ampulla (3) Isthmus	Transport of ovum to uterus.
1 Uterus	In the middle of lower abdomen.	(1) Development of foetus (2) Birth process
1 Vagina	The passage of uterus to outside.	(1) Passage for intercourse (2) Acts as birth canal (3) Passage for menstrual flow
Bartholin's glands	In the vaginal wall.	For lubrication and protection of vagina.

Inferences :

- (1) The important function of human reproductive system is to produce **gametes** and **hormones**.
- (2) The male hormone, **testosterone** is produced by testis.
- (3) The two important female hormones **estrogen** and **progesterone** are produced by ovaries.
- (4) The sperm and ovum are produced by **meiotic** division.
- (5) There are **23** chromosomes each in sperm and ovum. By fertilization of these gametes **zygote** is formed which contains **46** chromosomes.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box :

Ans.

1. Which gland in human male reproductive system is single?

- (A) Testis (B) Prostate gland
(C) Epididymis (D) Cowper's gland

B

2. Which sugar is present in the semen?

- (A) Fructose (B) Glucose
(C) Maltose (D) Lactose

A

3. Which sex chromosomal combination in the zygote is responsible for the formation of testes?

- (A) XX (B) XO (C) XXY (D) XY

D

4. Which part of the human female reproductive system is under the direct control of pituitary hormones?

- (A) Uterus (B) Vagina (C) Ovary (D) Fallopian ducts

C

5. Why does women get menopause, but man does not have such stage?

- (A) Female hormones stop working in 45+ age, but male hormones' secretion do not cease.
(B) Females are weak, and males are strong.
(C) Females cannot sustain the pregnancy in late age and hence they get menopause. Males have no such problem.
(D) Males have better food and exercise, female do not get such facilities.

A

6. Which part of female reproductive system that provides the space for fertilization of the egg?

- (A) Uterus (B) Fallopian ducts (C) Vagina (D) Ovary

B

7. Which group of hormones are essential for a female to become a mother?

- (A) Testosterone, estrogen and progesterone
(B) Estrogen and progesterone
(C) FSH, LH, LTH, estrogen and progesterone
(D) ICSH, LH and FSH

C

Date : _____

Teacher's Signature : _____



Remember :

- (1) Reproductive system of male continues to work even in old age.
- (2) Reproductive system of female works only till the menopause.



Aim : To study different ecosystems in the surrounding for a comparative understanding.

Requirements : Writing material, binoculars, shovel, troughs, beakers or any other containers for collection.

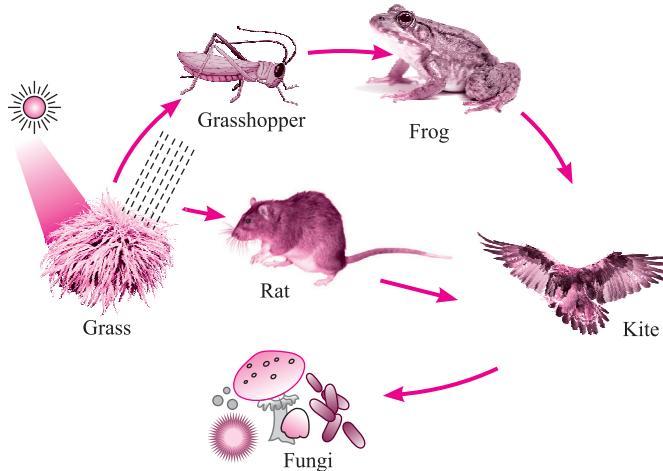
Procedure :

- (1) Try to understand the concept of ecosystem before you choose the same for study.
- (2) A huge tree, a lake, a pond, certain area of field, our own school playground, a butterfly garden if it is present in your school campus, a big aquarium, a coastal strip, a beach, etc. are some ecosystems which you can choose for study.
- (3) Always remember, never disturb any natural ecosystem by plucking the plant parts or killing the animals or insects. Thus, while performing your study, take care of all the resident fauna and flora, i.e. animals and plants in the area concerned. You may choose to photograph the specimens. You can also collect fallen leaves or flowers and seeds.
- (4) You can collect samples of soil with shovel so that at school laboratory you can analyse the pH, colour etc. of the soil. Enter the details in the tabulations given below.
- (5) Also think about conservation measures to protect these environments. In today's world all the natural ecosystems are destroyed in pursuit of development. You can focus your work on some conservation measures.

Observations :

Ecosystem	Ecosystem – 1	Ecosystem – 2
Date or Period of study	Rainy season	Rainy season
Name of Ecosystem	School play ground	Pond
Abiotic factors	Soil, water, sunlight, air	Water, sunlight, mud, stone
Biotic factors (Flora and Fauna)	Plants, grasshopper, frog, earthworm	Algae, frog, snake, aquatic plants
General description	Ecosystem of school playground is healthy.	Ecosystem in pond is also found healthy.
Conclusion	Conservation and plantation is required.	We can protect pond ecosystem by avoiding contamination.

Diagram : Draw a food web or food chain from the ecosystem that you have studied.



School playground ecosystem

Conclusion : Draw the inference about the health of ecosystem that you have studied. Check-up whether this ecosystem is sustaining or is threatened due to human activities.

Out of the ecosystems that I have studied, I found pond ecosystem as the most healthy and balanced and in good condition, because, Pond water was clean and without any garbage. People were taking care of pond ecosystem. Notice boards were displayed mentioning about not to throw garbage in pond and surrounding area. Polluting pond water by washing utensils, clothes, bathing, etc. was prohibited.

Balanced proportion of biotic as well as abiotic factors was observed in pond ecosystem.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. The aquatic ecosystems are worst affected by which of the following human interference?

- (A) Noise pollution (B) Plastic Pollution
(C) Deforestation (D) Construction activities

B

2. Which abiotic factor is the most important for the survival of animals?

- (A) Oxygen content (B) Nitrogen in air
(C) Carbon dioxide concentration (D) Soil structure

A

3. Which of the following are autotrophic organisms found in sea?

- (A) Whale (B) Phytoplanktons (C) Fishes (D) Turtles

B

Date : _____

Teacher's Signature : _____



Remember : An 'ecosystem' is a region with specific and recognizable landscape form such as forest, grassland, desert, wetland or coastal area.



Experiment 6

Characteristics of Non-chordate animals

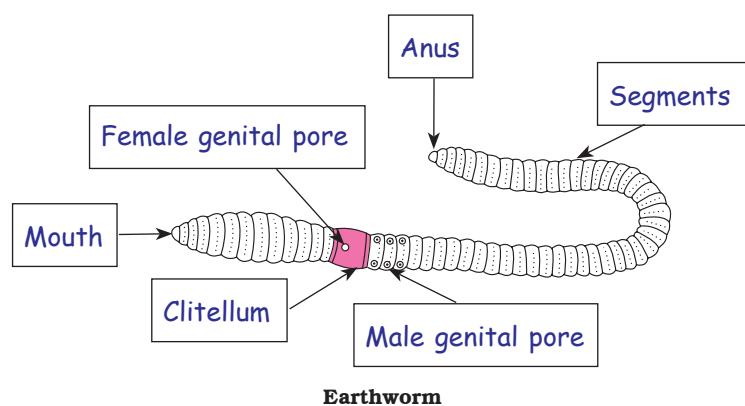
Aim : To study characteristics of non-chordates (1) Earthworm (2) Cockroach.

Requirements : Specimens of earthworm and cockroach.

Procedure : Observe the specimens. Write their characteristics and give the classification.

1. Earthworm

Diagram : Label the different parts in the given diagram.



Classification of Earthworm :

Kingdom : Animalia

Subkingdom : Non-chordata

Phylum : Annelida

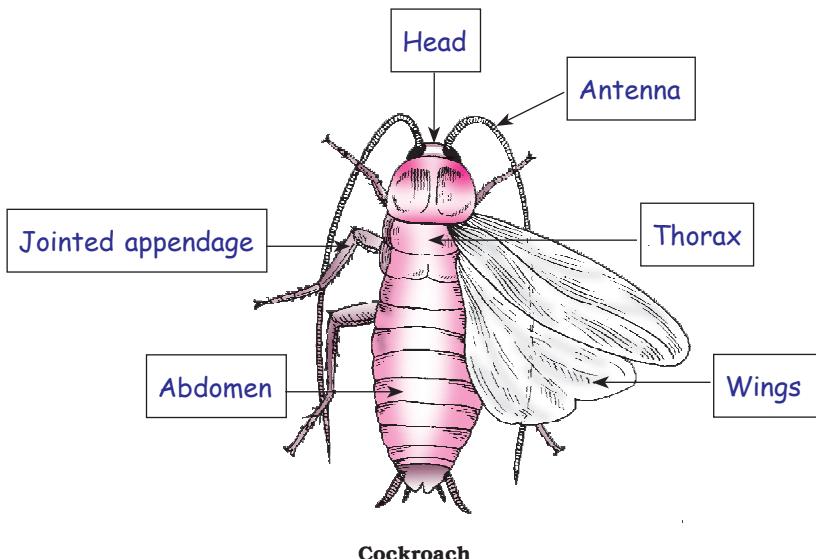
Scientific name : *Pheretima posthuma*

Observations : Characteristics of Earthworm.

- (1) The body of earthworm is **elongated** and **cylindrical**. It has **mouth** and **anus** at the opposite ends.
- (2) The body is **metamERICALLY** segmented, with about **100** to **125** segments in the body.
- (3) A prominent brown-coloured band called **clitellum** is present in the anterior region of the body covering the segments 14th, 15th and 16th.
- (4) Earthworm is a **bisexual** animal crawling in soil. It is said to be a **friend of farmer**.
- (5) It is used for **vermicompost**, therefore they play an important role in solid waste management.

2. Cockroach

Diagram : Label the different parts in the given diagram.



Cockroach

Classification of Cockroach :

Kingdom : Animalia

Subkingdom : Non-chordata

Phylum : Arthropoda

Class : Insecta

Scientific name : *Periplaneta americana*

Observations : Characteristics of cockroach :

- (1) The body of cockroach is **narrow, bilaterally symmetrical** and **dorsoventrally flattened**.
- (2) The whole body is covered externally by a **chitinous cuticle**.
- (3) The body of cockroach is divisible into three parts, viz., **head, thorax** and **abdomen**.
- (4) The head on its each side bears a large **compound eye** and a long, slender and segmented **antenna**.
- (5) There are **3** pairs of walking legs.
- (6) Cockroach is a **nocturnal** pest which is carrier of diseases.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box :

Ans.

1. To which phylum does Earthworm belong?

- (A) *Platyhelminthes* (B) *Aschelminthes*
(C) *Annelida* (D) *Arthropoda*

C

2. Cockroach is an insect but spider is not because

- (A) *cockroach and spiders belong to different phyla*.
(B) *cockroach has 3 pairs of legs and spider has 4 pairs of legs*.
(C) *cockroach has jointed appendages but spider does not have*.
(D) *spider can build a web but cockroach cannot*.

B

3. Earthworm is called a friend of farmer but cockroach is not. Why?

- (A) Cockroach is a pest and carrier of some human diseases.
- (B) Cockroach cannot dig the soil.
- (C) Cockroach is hard bodied insect.
- (D) Cockroaches do not stay on the fields.

A

4. The only common character between earthworm and cockroach is ...

- (A) both breathe by tracheae.
- (B) both excrete by nephridia.
- (C) both have spiracles.
- (D) both are non-chordates.

D

5. Clitellum of earthworm is present in which segments?

- (A) 8, 9, 10
- (B) 11, 12, 13
- (C) 14, 15, 16
- (D) 16, 17, 18

C

Date : _____

Teacher's Signature : _____



Remember : In Non-chordates, nerve cord is ventral, solid and double.



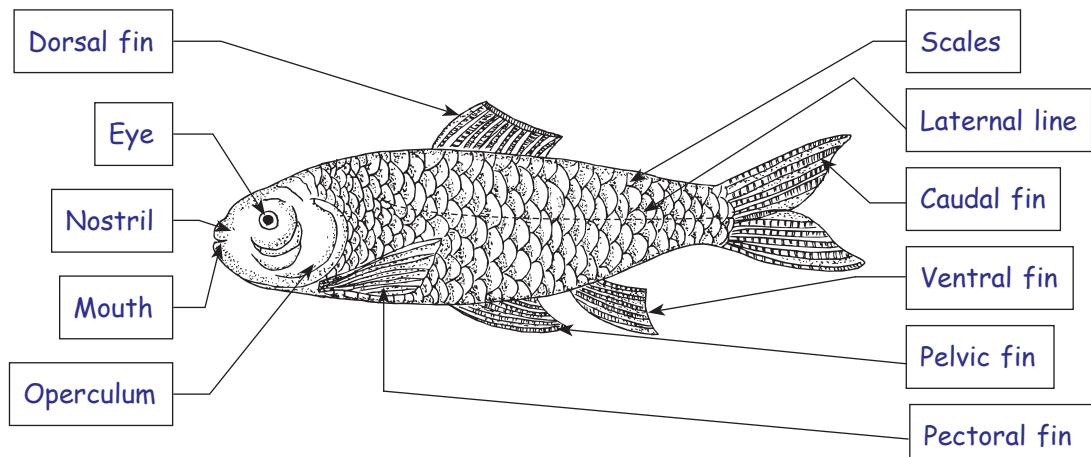
Aim : To study characteristics of chordate animals (1) Fish (2) Pigeon.

Apparatus : Specimens of any fish and a pigeon.

Procedure : Observe the specimens. Note down their characteristics and write down their classification.

1. Fish (Rohu)

Diagram : Label the different parts in the given diagram.



Fish (Rohu)

Classification of Rohu :

Kingdom : Animalia

Class : Pisces

Phylum : Chordata

Scientific name : *Labeo rohita*

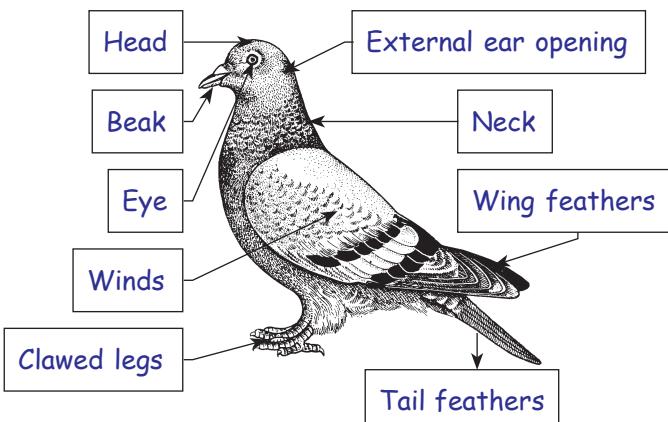
Subphylum : Vertebrata

Observations : Characteristics of Rohu :

- (1) Rohu is a **fresh water** fish having **bony** skeleton.
- (2) The body is **spindle shaped** with dark or **bluish black** dorsal side and **silvery white** ventral and lateral sides.
- (3) Exoskeleton is of **scales**.
- (4) The head is large with a **terminal** mouth. Eyes are large, without **eyelids**.
- (5) Gills are covered by bony **operculum**.
- (6) The **dorsal**, **ventral** and **caudal** fins are unpaired while the **pectoral** and **pelvic** fins are paired.
- (7) The **caudal** fin is used for changing the direction while swimming.

2. Pigeon

Diagram : Label the different parts in the given diagram.



Classification of Pigeon :

Kingdom : Animalia

Phylum : Chordata

Subphylum : Vertebrata

Class : Aves

Scientific name : *Columba livia*

Pigeon

Observations : Characteristics of Pigeon :

- (1) Pigeon's body is divisible into four parts, viz., **head**, **neck**, **trunk** and **tail**.
- (2) The head bears a pair of nostrils, a pair of eyes and a **stout** beak. There are no **teeth**.
- (3) The forelimbs are modified into **wings** which are used for **flying**.
- (4) The **hind limbs** are short used for perching.
- (5) Digits are provided with **claws**.
- (6) The exoskeleton is of **feathers**.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. Which is the common body characteristics in fish and bird?

- (A) 4 chambered heart
 (B) Stream-lined tapering body
 (C) Large eyes
 (D) Scales on the body

B

2. What are the locomotory organs in fish and bird respectively?

- | | |
|----------------|----------------|
| (A) Wings-Fins | (B) Fins-Wings |
| (C) Wings-Legs | (D) Legs-Fins |

B

3. In fish, which part of the body is used for changing direction while swimming ?

- | | |
|-------------------|-------------------|
| (A) Pectoral fins | (B) Caudal fins |
| (C) Dorsal fins | (D) None of these |

B

4. Which of the following is a group of warm blooded animals?

- | | |
|--------------|--------------|
| (A) Pisces | (B) Amphibia |
| (C) Reptilia | (D) Aves |

D

5. Which pair of respiratory organs is present in Rohu and Pigeon respectively?

- (A) Gills and lungs
- (B) Lungs and gills
- (C) Gills and Lungs aided with air sacs
- (D) Gills and Tracheae

C

Date : _____

Teacher's Signature : _____



Remember :

- (1) Fishes are cold-blooded animals which respire through gills.
- (2) Birds are warm-blooded animals which respire with the help of lungs.



Experiment 8

Study of different properties of acetic acid (ethanoic acid)

Aim : To study the following properties of acetic (ethanoic) acid :

- (1) Odour
- (2) Solubility in water
- (3) Effect on litmus
- (4) Reaction with sodium bicarbonate.

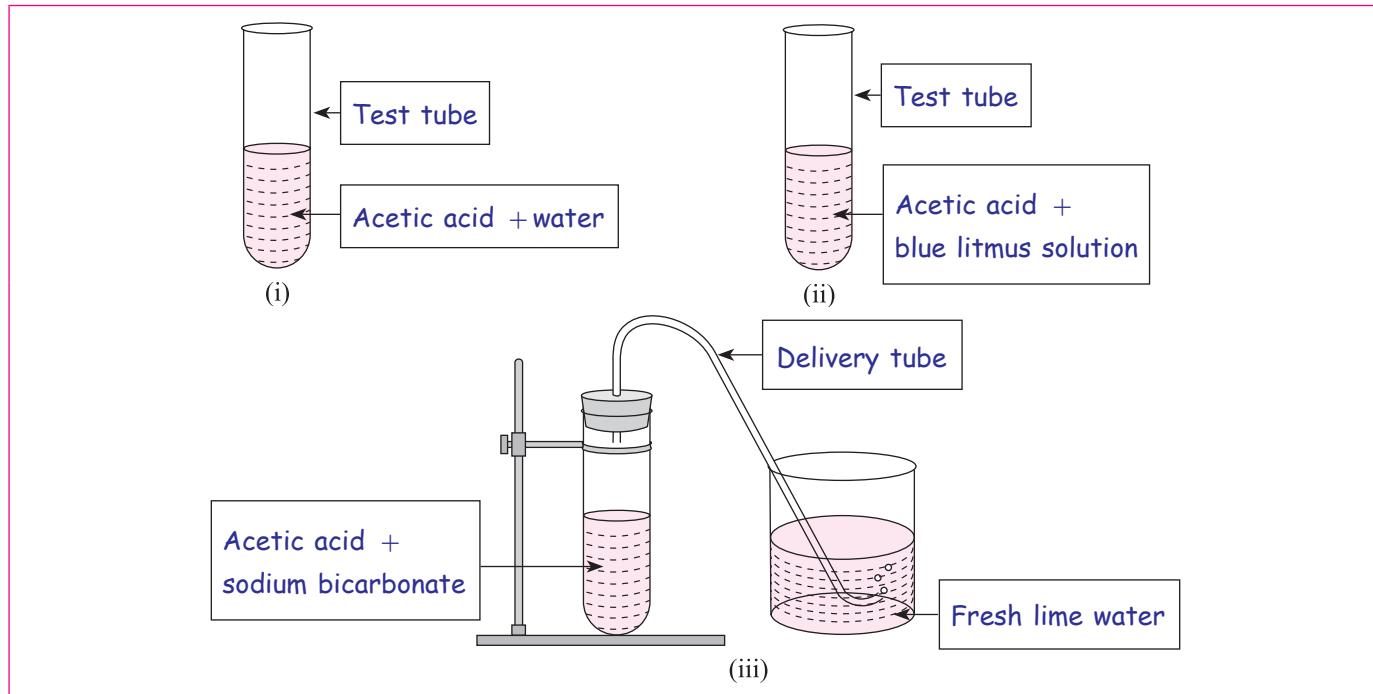
Requirements : Test tubes, test tube stand, cork, delivery tube, beaker, etc.

Chemicals : Acetic acid, red and blue litmus solution, sodium bicarbonate solution, distilled water, fresh lime water.

Procedure :

- (1) Take about 10 ml of acetic acid in a clean and dry test tube. Observe its colour and odour.
- (2) Add about 10 ml of water in same test tube and shake the test tube well. Observe the solution in test tube.
- (3) Add 2 to 3 drops of blue litmus solution to acetic acid taken in a separate test tube. Repeat the same procedure for red litmus solution.
- (4) Take about 10 ml of acetic acid in a test tube and add to it some drops of sodium bicarbonate solution. Pass the gas through fresh lime water.

Diagrams : Label the different parts in the given diagram.



Study of properties of acetic acid

Observation and Inference table :

Sr. No.	Test	Observation	Inference
1.	Odour	Peculiar odour of vinegar	Acetic acid has odour like vinegar
2.	Solubility	Soluble in water	Acetic acid is miscible with water
3.	Blue litmus solution test Red litmus solution test	Blue colour of litmus solution changes to red No change in colour	Acetic acid is acidic in nature
4.	Reaction with sodium bicarbonate solution	A colourless, odourless gas is liberated with brisk effervescence	Acetic acid liberates carbon dioxide gas on reacting with sodium bicarbonate solution.
	Pass the gas through fresh lime water	Lime water turns milky. After passing more gas it becomes clear.	

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. Ethanoic (Acetic) acid
 (A) is odourless (B) has a smell of ammonia
 (C) has smell of rotten eggs (D) has a vinegar smell D
-
2. Acetic (Ethanoic) acid
 (A) turns red litmus blue (B) has pungent odour
 (C) is red in colour (D) is odourless B
-
3. When sodium bicarbonate solution is added to dilute acetic acid
 (A) CO_2 gas is evolved
 (B) a solid settles at the bottom
 (C) the mixture becomes warm
 (D) the colour of the mixture becomes yellow A
-
4. is liberated when acetic acid reacts with sodium metal.
 (A) H_2 (B) O_2
 (C) CO_2 (D) NH_3 A
-
5. Ethanoic acid which solidifies below 290K is known as
 (A) ice (B) solid acetic acid
 (C) glacial acetic acid (D) ethyl acetate C
-

Date : _____

Teacher's Signature : _____



Remember : Ethanoic acid is a colourless liquid with boiling point 118°C. Ethanoic acid is commonly known as acetic acid.



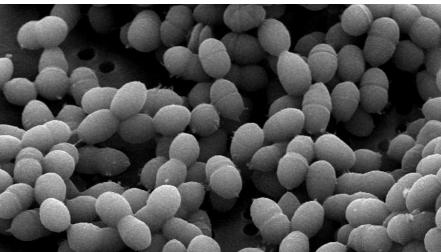
Aim : To study the microbes which are used in industrial processes.

Requirements : Compound microscope, permanent slides of following bacteria.

- (1) *Streptococcus thermophilus* (2) *Lactobacillus acidophilus*
- (3) *Saccharomyces cerevisiae* (4) *Acetobacter aceti*
- (5) *Aspergillus oryzae*

Procedure : Observe the permanent slides of the important microbes.

Observation table :

Organism	Industrial Use
<p>(1) <i>Streptococcus thermophilus</i></p>  <p>Underline the correct alternative : <i>Streptococcus thermophilus</i> is a <u>Gram positive</u>/Gram negative bacteria.</p>	<p>Cross out the wrong word :</p> <ol style="list-style-type: none"> <i>S. thermophilus</i> is one of the most widely used bacteria in the dairy/leather industry. Mozzarella/Amul cheese and yogurt are manufactured using this microbe. It turns milk sugar-lactose/glucose into lactic acid. The increase in lactic acid turns milk into the gel-like structure which is characteristic of yogurt/paneer.
<p>(2) <i>Lactobacillus acidophilus</i></p>  <p>Underline the correct alternative : <i>Lactobacillus acidophilus</i> is a <u>Gram positive</u>/Gram negative bacteria.</p>	<p>Cross out the wrong word :</p> <ol style="list-style-type: none"> <i>L. acidophilus</i> occurs naturally in the human and animal gastrointestinal/respiratory tract and mouth/brain. Some strains of <i>L. acidophilus</i> are probiotic/corrosive in nature. <p>Fill in the blanks : These strains are commercially used in many dairy products, sometimes together with <i>streptococcus thermophilus</i> and <i>Lactobacillus delbrueckii</i> subsp.</p>
<p>(3) <i>Saccharomyces cerevisiae</i></p>  <p>Underline the correct alternative : <i>Saccharomyces cerevisiae</i> is a type of <u>yeast/cyanobacteria</u>.</p>	<p>Cross out the wrong word :</p> <ol style="list-style-type: none"> <i>S. cerevisiae</i> used in wine/cheese making, baking, and brewing since ancient times. It is used as a source of vitamins and minerals. It is rich in B/D vitamins, chromium/sodium and selenium/lead. Due to this, health of hair, skin, mouth, liver and eyes/ears is maintained. <p>Fill in the blanks : They also aid in breaking down fats, proteins and carbohydrates for a quick supply of energy.</p>

Organism	Industrial Use
<p>(4) <i>Acetobacter aceti</i></p>  <p>Underline the correct alternative :</p> <ol style="list-style-type: none"> <i>Acetobacter aceti</i> is a <u>Gram positive</u> / <u>Gram negative</u> bacterium. <u>Louis Pasteur</u> / <u>Charles Darwin</u> proved that these bacteria cause conversion of ethanol to acetic acid in 1864. 	<p>Cross out the wrong word :</p> <ol style="list-style-type: none"> <i>A. aceti</i> is a bacterium that moves using its <u>pseudopodia</u> / <u>peritrichous flagella</u>. It is present everywhere in the environment, existing in ecological niches which include flowers, fruits, and honey bees, as well as in water and soil. It lives wherever sugar <u>translocation</u> / <u>fermentation</u> occurs. <i>A. aceti</i> is used for the mass production of <u>sulphuric acid</u> / <u>acetic acid</u> for manufacturing <u>vinegar/oil</u>. It is used for action on <u>wines/cheese</u> and <u>ciders/juices</u>.
<p>(5) <i>Aspergillus oryzae</i></p>  <p>Underline the correct alternative :</p> <p><i>Aspergillus oryzae</i> is <u>filamentous fungus</u> / <u>algae</u>.</p>	<p>Cross out the wrong word :</p> <ol style="list-style-type: none"> <i>A. oryzae</i>, is widely used in Chinese and other <u>East Asian/American</u> cuisine. It is used in fermentation of <u>soybeans/sugar/cane</u> for making soya sauce and fermented bean paste. Also used to saccharify <u>rice/wheat</u>, other grains, and potatoes in the making of alcoholic <u>beverages/vinegar</u>. <i>A. oryzae</i>, is also used for the production of rice <u>alcohol/vinegars</u>.

Inference : When microbiology is used for commercial purpose as well as for economic, social and environment related processes, then it is called industrial microbiology. By sustained research on various microbes, various products are produced on large scale by the industrial microbiology.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.
- Which of the following microbe is commonly used in baking and brewing?
 - Streptococcus thermophilus*
 - Saccharomyces cerevisiae*
 - Acetobacter*
 - Aspergillus oryzae*B
 - Which of the following is the microbe used in manufacturing vinegar?
 - Streptococcus thermophilus*
 - Saccharomyces cerevisiae*
 - Acetobacter*
 - Aspergillus oryzae*C

3. Which of the following is the microbe used in manufacturing soya sauce?

- (A) *Streptococcus thermophilus*
- (B) *Saccharomyces cerevisiae*
- (C) *Acetobacter*
- (D) *Aspergillus oryzae*

D

Date : _____

Teacher's Signature : _____



Remember : Various food items are produced with the help of fermentation process. For Example, Bread, Cheese, Wine, etc. Microbes are also used in production of enzymes, medicines, biofuel, pollution central and sewage management.



Aim : To study biofertilizers such as *Azotobacter*, *Nostoc*, *Anabaena* and *Azolla*.

Requirements : Specimens of *Azolla* and permanent slides of *Azotobacter*, *Nostoc* and *Anabaena*.

Procedure : Observe the specimens of *Azolla* and the permanent slides of remaining organisms.

(**Note :** Enter your observations and the uses of these organisms from the viewpoint of agriculture.)

Observation table :

Organism and their classification	Characteristics	Uses
<p>1. Azotobacter</p>  <p>Kingdom : <i>Monera</i> Division : <i>Proteobacteria</i></p>	<p>Underline the correct word :</p> <ul style="list-style-type: none"> • Oval and <u>round/rectangular</u> in shape. • Develop hard <u>cyst/crust</u> around. • <u>Freely living/parasitic</u> in soil. 	<ol style="list-style-type: none"> 1. Ability to fix <u>molecular nitrogen/nitrogen</u> compounds and therefore increase the soil fertility and stimulate <u>overall growth/only height</u> of plant. 2. <i>Azotobacter</i> species are widely used in agriculture, particularly in nitrogen-fixing biofertilizers such as <u>azotobacterin / antibiotic bacterin</u>.
<p>2. Nostoc</p>  <p>Kingdom : <i>Monera</i> Division : <i>Cyanobacteria</i></p>	<ul style="list-style-type: none"> • Found in <u>water/various environments</u> that forms colonies. • Found in soil, on <u>dry / moist</u> rocks, at the bottom of lakes and springs, both fresh and saltwater. It is <u>free living/parasitic</u>. • Also grows <u>parasitically/symbiotically</u> in the plants' tissues. 	<ol style="list-style-type: none"> 1. <i>Nostoc</i> contains two <u>pigments/proteins</u>, <u>blue/black</u> phycocyanin and <u>red/yellow</u> phycoerythrin, as well as <u>brown/green</u> chlorophyll. 2. It can fix nitrogen in specialized cells called <u>heterocysts/rhizoids</u>. 3. Also used as <u>tasty/supplementary</u> food due to vitamins and <u>proteins/carbohydrates</u> in them.
<p>3. Anabaena</p>  <p>Kingdom : <i>Monera</i> Division : <i>Cyanobacteria</i></p>	<ul style="list-style-type: none"> • Filamentous cyanobacteria that exist as <u>phytoplankton/zooplankton</u>. • Can live symbiotically with <u>Azolla/mushroom</u>. 	<ol style="list-style-type: none"> 1. Found in paddy as <u>natural/chemical</u> fertilizer. 2. They produce toxic <u>neurotoxins/haemotoxins</u> and hence are useful to keep away the grazing <u>animals/birds</u> from farms.

Organism and their classification	Characteristics	Uses
<p>4. Azolla</p>  <p>Kingdom : Plantae Division : Pteridophyta</p>	<ul style="list-style-type: none"> • Azolla <u>sinks in deep water/floats on the surface of water</u> by means of numerous, small, closely overlapping scale-like leaves. • Their roots are hanging in the <u>water/air</u>. 	<ol style="list-style-type: none"> 1. They can fix atmospheric <u>nitrogen/carbon dioxide</u> 2. <u>Traditional/Modern</u> cultivation as a biofertilizer for paddy. 3. Used as <u>livestock/infant</u> feed. 4. Azolla is rich in proteins, essential <u>amino acids/carbohydrates</u>, vitamins and minerals.

Inference : Biofertilizers are non-polluting option for increasing crop production.

Multiple Choice Questions

- Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.
1. Which of the following has the wormicidal properties?
(A) Azolla (B) Anabaena (C) Nostoc (D) Azotobacter A
 2. Which of the two show symbiotic relationship with each other?
(A) Nostoc and Anabaena (B) Nostoc and Azotobacter
(C) Azolla and Anabaena (D) Azolla and Nostoc C
 3. Find the odd one out from the viewpoint of classification.
(A) Azolla (B) Anabaena (C) Nostoc (D) Azotobacter A
 4. Which of the following is autotrophic bacteria?
(A) Azolla (B) Anabaena (C) Nostoc (D) Azotobacter A
 5. Why these organisms are said to be important in agriculture?
(A) They do not cause pollution.
(B) They increase the yield of the crops.
(C) They are natural and biofertilizers.
(D) All of the above. D

Date : _____

Teacher's Signature : _____



Remember : Biofertilizers are microbes which promote plant growth by increasing nutrient availability in soil.



Aim : To perform survey of our premises or school in case of disaster and to understand the preparedness in case of possible disaster.

Requirements : Writing material, survey charts.

Procedure :

- (1) Any type of disaster can strike on any day. All the disasters result into loss of property and life. But by keeping preparedness, we can tackle with these calamities in advance.
- (2) For this purpose, one should undertake survey regarding the construction of building, electrical installations, the vicinity of police station and fire brigade. We should also know the relevant contact information in case of medical emergencies.
- (3) Initially take into consideration all the possible disasters, natural as well as man-made.
- (4) Prepare a survey sheet in the form of questionnaire for some kinds of disasters which can be possible in your area. E.g. certain coastal regions are always prone to floods, cyclones or tsunamis, while those in the dry regions may face the disaster of drought and famines. Particular areas are prone to earthquakes, special care has to be taken in such areas.
- (5) Based on all such facts, prepare questionnaire. Interview responsible persons in your building or in your school.
- (6) Collect all the information and the viewpoints of the elders.
- (7) Prepare a project booklet which can be made available in the school office or with the housing secretary.
- (8) Keep the preparedness for combating the disaster.

Observation :

Sr. No.	Criteria	Remarks
1.	Is the structural audit for the school/residential building done by proper engineers?	Yes / No
2.	Is the doorway and corridors suitable for rapid evacuation of students/people?	Yes / No
3.	Are there any chances of short circuit or electrical malfunctioning?	Yes / No
4.	Are there emergency exits in the building?	Yes / No
5.	Are the contact numbers of local police station, fire brigade, ambulance, hospitals etc. kept ready for emergency situations?	Yes / No
6.	Is first aid box kept ready in each classroom/in every house?	Yes / No
7.	Is there machinery in the form of volunteers to help in case of emergency situations?	Yes / No
8.	Is the stock of drinking water and dry snacks kept ready for the use in case of emergency?	Yes / No
9.	Are the people with special needs taken into consideration? E.g. old and disabled persons, pregnant women, young children and infants, mentally challenged people residing in the society.	Yes / No
10.	Is the committee appointed to help in the rescue work?	Yes / No

Inference : The structural audit for residential building is done by proper engineers. Following are the positive things observed during our survey :

- (1) There was emergency exit in the building.
- (2) All the safety precautions were taken at the place from where electricity is supplied to the building.
- (3) We found the note of all emergency contact number.
- (4) The stock of drinking water and dry snacks was kept ready for the use in case of emergency.
- (5) We found the committee appointed to help in the rescue work.

However, we also found few things which needs to be taken care :

- (1) First aid box was not there in each house.
- (2) Volunteers to help in case of emergency situations were not there.
- (3) There was no arrangement for the people with special needs.

Hence, it is necessary for the society to take care of such things and act accordingly.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box : Ans.

1. Which of the following is exclusively man-made disaster?

- (A) Bomb explosion (B) Fire (C) Floods (D) Famine

A

2. When the gas cylinder is leaking what is the first thing that you should do?

- (A) Put on all the lights and observe the hole through which the gas is escaping.
(B) Open all the windows and switch on the fans of the house.
(C) Leave house and call the emergency number to fix the problem.
(D) Close all the windows so that gas does not escape to the surroundings.

C

3. If there is fire in the house and you are alone with your baby sister what will you do immediately?

- (A) Take her away from fire and shout for help. Try calling fire brigade too.
(B) Run away to neighbours and ask them to rescue her.
(C) Try to put off the fire with help of your sister.
(D) Call parents and wait for help from them.

A

4. It is raining heavily and there is lightning and thunderstorm. You are caught in the rain and cannot proceed to a safe place. What will you do in such situation?

- (A) Pick up a mobile and tell your friends to come there.
(B) Sit under a tree for shelter.
(C) Enjoy the rains, only shut your ears.
(D) Move to a safer place, never use mobile in such case.

D

5. When you see a stranger leaving a bag on the bus stop and hurriedly moving away what should you do?

- (A) Take that bag and run away.
- (B) Call police immediately and move away from the bag as soon as possible.
- (C) Invite people to see what is there in this bag.
- (D) Neglect it completely and move on to your work.

B

Date : _____

Teacher's Signature : _____



Remember : Disaster management is divided into pre-disaster management and post-disaster management through scientific and careful observations and analysis of previous data.



**Experiment
12**

To show that carbon dioxide is given out during respiration

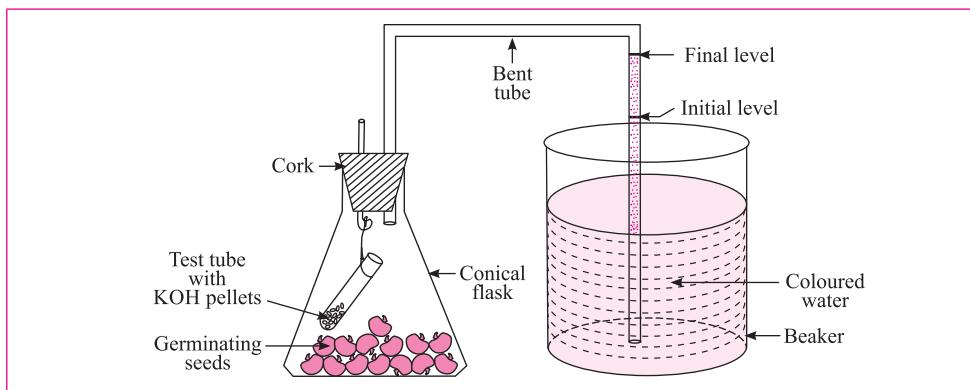
Aim : To show that carbon dioxide is given out during respiration.

Requirements : A conical flask, beaker, test tube, KOH pellets, a tube bent at right angles, one hole rubber stopper, thread, soaked gram seeds, coloured water, cotton wool, etc.

Procedure :

- (1) Soak gram seeds overnight in water and germinate them by placing the seeds in moist cotton wool for 1 to 2 days.
- (2) Place moist germinated seeds in conical flask so that respiration may continue for longer time.
- (3) Suspend a test tube with KOH pellets in the conical flask.
- (4) Fit the cork with bent glass tube to the conical flask. Keep the connection air tight.
- (5) Dip the free end of the bent glass tube in a beaker containing coloured water. Mark the initial level of water in the bent tube.
- (6) Keep this set up undisturbed for about 15 minutes and mark the final level of water in the bent tube.
- (7) Note down the observations.

Diagram :



Experiment to show that CO_2 is given out during respiration

Observation : Water in the bent tube rises/falls down. (Underline the correct option and justify your answer.)

Ans. The gas evolved during respiration of germinating seeds is absorbed by KOH pellets. This creates a partial vacuum in the conical flask due to which the water level in the bent tube rises.

Inference : Carbon dioxide gas is given out during respiration in plants.

Multiple Choice Questions

• Choose the correct alternative and write its letter (A), (B), (C), (D) in the box :

Ans.

1. Arrange the steps in correct order to demonstrate that carbon dioxide is produced during respiration.

- (i) Soak gram seeds overnight and place them in a conical flask.
 - (ii) Fit a cork and U tube into the conical flask.
 - (iii) Suspend a test tube containing KOH pellets in the conical flask.
 - (iv) Keep the set up undisturbed for some time.
- | | |
|-----------------------|-----------------------|
| (A) i – ii – iii – iv | (B) i – ii – iv – iii |
| (C) i – iii – ii – iv | (D) i – iii – iv – ii |

C

2. Fermentation is a type of

(A) aerobic respiration (B) anaerobic respiration

(C) endothermic reaction (D) none of these

B

3. Before setting up the experiment to show that seeds release CO₂ during respiration, the seeds should be

(A) dried completely (B) boiled to make them soft

(C) soaked in vinegar (D) kept moist till they germinate

D

4. The use of KOH pellets in the experiment is for

(A) providing O₂ required by the seeds for respiration

(B) absorbing CO₂ and creating partial vacuum in the flask

(C) absorbing water from the seeds to make them dry

(D) making the air present in the flask alkaline

B

5. The process of release of energy from the nutrients is called

(A) respiration (B) photosynthesis (C) nutrition (D) absorption

A

6. The cellular respiration takes place in

(A) lysosome (B) mitochondrion (C) chlorophyll (D) ribosome

B

Date : _____

Teacher's Signature : _____



Remember : There are two types of respiration — aerobic and anaerobic respiration. Germinating seeds respire aerobically (in presence of oxygen).