UNIT TEST – 1 (2023-24)

Subject – SCIENCE SET 1

Class- 10th

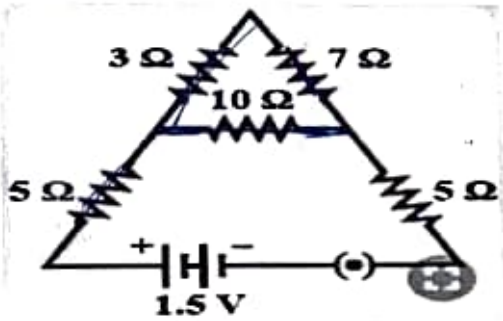
Time- 1 hour **Max. Marks- 40**

INSTRUCTIONS-

- All questions are compulsory.
- Question paper contains three sections.
- Attempt each section separately
- Draw well labelled diagram wherever necessary

SECTION – A (PHYSICS – 14 marks)

1. Give two advantages of parallel arrangement. (1)
2. Write down the S I unit of resistivity. (1)
3. Write two factors on which joules heating effect depends (1)
4. A copper wire has diameter 0.5 mm and resistivity of $1.6 \times 10^{-8}\ \Omega$ m. What will be the length of this wire to make its resistance 10 Ω ? How much does the resistance change if the diameter is doubled ? (3)
5. Find the equivalent resistance. (2)



6. An electric bulb of 50 W, a tube of 40 W and a water filter of 200 W, all are connected in parallel. If all are operating on 200V, then calculate the current and resistance of water filter. (3)
7. If a copper wire of resistance R is folded on itself , then what will be new resistance and resistivity of the wire? (3)

SECTION – B (CHEMISTRY – 13 marks)

8. What are antioxidants? Give any example. (1)
9. Give the chemical formula and name of the substance whose solution is used in white wash . (1)

10. A substance X on heating gives rise to its oxide along with the smell of burning Sulphur. Give the name of substance X, its chemical equation along with the name of reaction. (2)
11. What do you mean by precipitate give such type of equation in which it is formed? (2)
12. How will you obtain silver from silver nitrate? Explain with chemical equation. Also name the type of reaction. (2)
13. (a)A shiny brown metal X on heating changes into its oxide, but in the presence of hydrogen gas it regains its identity. Name substance X , equation for (i) its oxide and (ii)regaining of its colour. (2.5)
14. What happens when lead nitrate is treated with potassium iodide? Give balanced chemical equation along with the name of reaction. (2.5)

SECTION – C (BIOLOGY – 13 marks)

15. What is called assimilatory power? (1)
16. What is hypotension? Write down the blood pressure during this stage. (1)
17. Draw the anatomical view of human heart and label the following (4)
    (a) Blood vessels which collect deoxygenated blood from body
    (b) blood vessels which supply deoxygenated blood to pulmonary system
    (c)Bicuspid and tricuspid valves
18. What do you mean by respiratory substrate? Give its example. What happens to it in
    i) cytoplasm of cell
    ii) in muscles and
    iii) In mitochondria ;Explain. (3)
19. How small intestine is designed to absorb chyle? Explain with its functional units. (2)
20. What do you mean by succus entricus? Name any two enzymes. (2)

$CaO + H_2O \rightarrow Ca(OH)_2$

UNIT TEST – 1 (2023-24)

Subject – SCIENCE SET 2

Class- 10th

Time- **Max. Marks- 40**

INSTRUCTIONS-

- All questions are compulsory.
- Question paper contains three sections.
- Attempt each section separately
- Draw well labelled diagram wherever necessary

SECTION – A (PHYSICS – 14 marks)

1. Give two disadvantages of series arrangement. (1)
2. Define specific resistance. (1)
3. Write two factors on which joules heating effect depends (1)
4. A copper wire has diameter 0.5 mm and resistivity of $1.6 \times 10^{-8}\ \Omega$ m. What will be the length of this wire to make its resistance 10 Ω ? How much does the resistance change if the diameter is doubled ? (3)
5. Find the equivalent resistance. (2)

6. An electric bulb of 50 W, a tube of 40 W and a water filter of 200 W, all are connected in parallel. If all are operating on 200V, then calculate the current and resistance of water filter. (3)
7. If a copper wire of resistance R is stretched to double its length, then what will be new resistance and resistivity of the wire? (3)

SECTION – B (CHEMISTRY – 13 marks)

8. Give the chemical formula and name of the substance whose solution is used in white wash . (1)
9. What are antioxidants? Give any example. (1)

$V = \frac{W}{Q}$ $V = W/Q$

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

10. A substance X on heating gives its oxide and produces brown fumes. Name the substance X along with the balanced chemical equation. Name the type of reaction. (2)
11. What do you mean by precipitate give such type of equation in which it is formed? (2)
12. How will you obtain silver from silver nitrate? Explain with chemical equation. Also name the type of reaction. (2)
13. (a)A shiny brown metal X on heating changes into its oxide, but in the presence of hydrogen gas it regains its identity. Name substance X , equation for (i) its oxide and (ii)regaining of its colour. (2.5)
(b) Name the chemical used in black and white photography, what happens to its colour when it is placed in sunlight ; give chemical equation. (2.5)

SECTION – C (BIOLOGY – 13 marks)

14. Name any two components of food absorbed in stomach (1)
15. What is hypertension? Name the device used to measure it. (1)
16. Draw the anatomical view of human heart and label the following (4)
(a) Blood vessels which collect deoxygenated blood from body
(b) blood vessels which supply deoxygenated blood to pulmonary system
(c)Bicuspid and tricuspid valves
17. What do you mean by respiratory substrate? Give its example. What happens to it in
i) cytoplasm of cell
ii) in muscles and
iii) In mitochondria , Explain. (3)
18. How lungs are designed for exchange of respiratory gases ? Explain with diagram. (2)
19. What do you mean by succus entricus? Name any two enzymes. (2)

EXPERIMENT 1

Aim

To find the pH of the following samples using pH paper/universal indicator:

(i) Dilute hydrochloric acid (HCl)

(ii) Dilute solution of sodium hydroxide (NaOH)

(iii) Dilute solution of ethanoic acid (CH_3COOH)

(iv) Lemon juice

(v) Water

(vi) Dilute solution of sodium hydrogen carbonate ($NaHCO_3$)

Requirements

Samples of dilute hydrochloric acid, dilute solution of sodium hydroxide, dilute solution of ethanoic acid, lemon juice, water, dilute solution of sodium hydrogen carbonate, test tubes, pH paper (or universal indicator), droppers, glazed white tile.

Basic Principles Involved

- pH is a measure of the hydrogen ion concentration $[H^+]$ of a solution.
- For an acidic solution $[H^+] > 10^{-7}$. Therefore, its pH value is less than seven (pH < 7). For examp the pH values of dilute hydrochloric acid, ethanoic acid and lemon juice are less than 7.
- For a basic (alkaline) solution $[H^+] < 10^{-7}$. Therefore, its pH value is greater than sev (pH > 7). For example, the pH values of dilute solutions of NaOH and $NaHCO_3$ are greater than
- For a neutral solution $[H^+] = 10^{-7}$. Therefore, its pH value is equal to seven (pH = 7). For examp the pH value of pure water (preferably distilled water) is 7 at 298 K.
- The pH of a sample can be measured by the use of pH paper or by the use of universal indicat

Experimental Steps

- Take the given samples of HCl, NaOH, ethanoic acid, lemon juice, water and $NaHCO_3$ in separa clean test tubes and mark them as A, B, C, D, E and F respectively.
- Remove a strip from the packet of the pH paper and place it on a clean and dry glazed white til This strip of pH paper is called **test strip.**

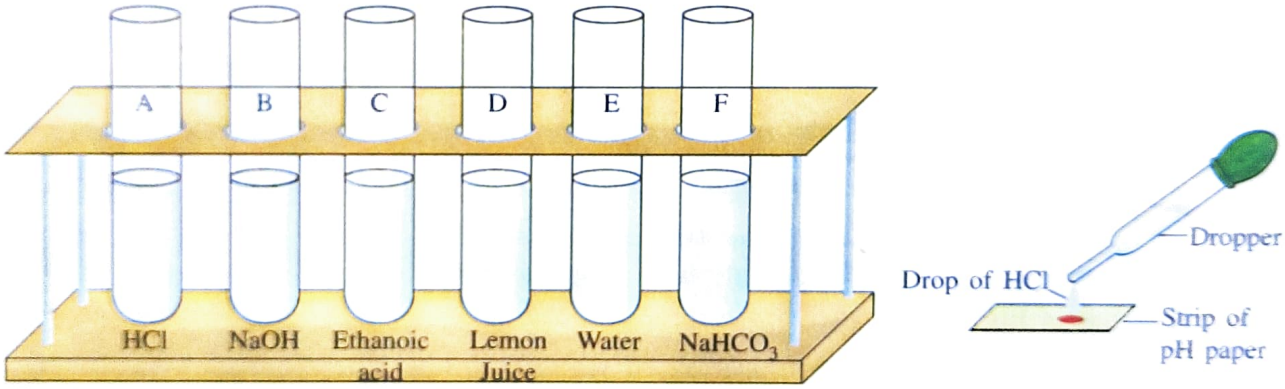


Fig. 1. Experimental set-up to measure the pH of different samples

- Withdraw the solution from test tube A in a clean dropper and put one drop of it on the pH paper.
- Note the colour developed on the pH paper.
- Compare the colour developed on the test strip with the colour given on the chart of the pH paper.
- Record the pH value corresponding to the colour.
- Perform similar experiments with the other samples and record your observations as shown in the table.

Observations

S.No.	Name of sample	Colour developed on pH paper	pH value (from chart)	Nature of the sample
A	Dilute hydrochloric acid			Acidic
B	Dilute solution of sodium hydroxide			Basic
C	Dilute solution of ethanoic acid			Acidic
D	Lemon juice			Acidic
E	Water			Neutral
F	Dilute solution of sodium hydrogen carbonate			Basic

Results

In the given samples we have observed that:

- The pH values of dilute hydrochloric acid, dilute solution of ethanoic acid and lemon juice are less than 7. Therefore, these have acidic character.
- The pH values of dilute solution of sodium hydroxide and dilute solution of sodium hydrogen carbonate are more than 7. Therefore, these have basic character.
- The pH value of distilled water is 7. Therefore, it has neutral character.

Precautions

- Do not touch the pH paper with unclean or wet hands.
- Clean the dropper before removing each sample for testing.
- Do not waste the pH paper. One strip of pH paper should be cut into four or more parts and used by four students of the class.

More information

The pH of water depends on its source. For example :

(i) The pH of distilled water is 7 and it is neutral.

(ii) The pH of chlorinated water is less than 7 and it is acidic.

(iii) The pH of hard water is more than 7. Therefore, it is basic.

EXPERIMENT 3(A)

Aim

To perform and observe the reaction between water and quick lime.

Requirements

Beakers, glass rod, distilled water, quick lime (calcium oxide, CaO), test tubes, filtration set, red litmus paper.

Basic Principles Involved

- Action of water on quick lime is represented by the following chemical equation:

$$\underset{\text{Calcium oxide (Quick lime)}}{CaO\ (s)} + \underset{\text{Water}}{H_2O\ (l)} \longrightarrow \underset{\text{Calcium hydroxide (Slaked lime)}}{Ca(OH)_2\ (aq)} + \text{Heat}$$

- In this reaction two substances directly combine to form a new substance. Therefore, this reaction is an example of **combination reaction.**
- In the reaction between water and quick lime, heat is evolved. Therefore, it is an **exothermic reaction.**
- Slaked lime turns red litmus blue. Therefore, it has **basic nature**.
- When carbon dioxide gas is passed though lime water it becomes **milky**.

Experimental Steps

The experimental procedure to be followed is described in the table and shown in Fig. 1.

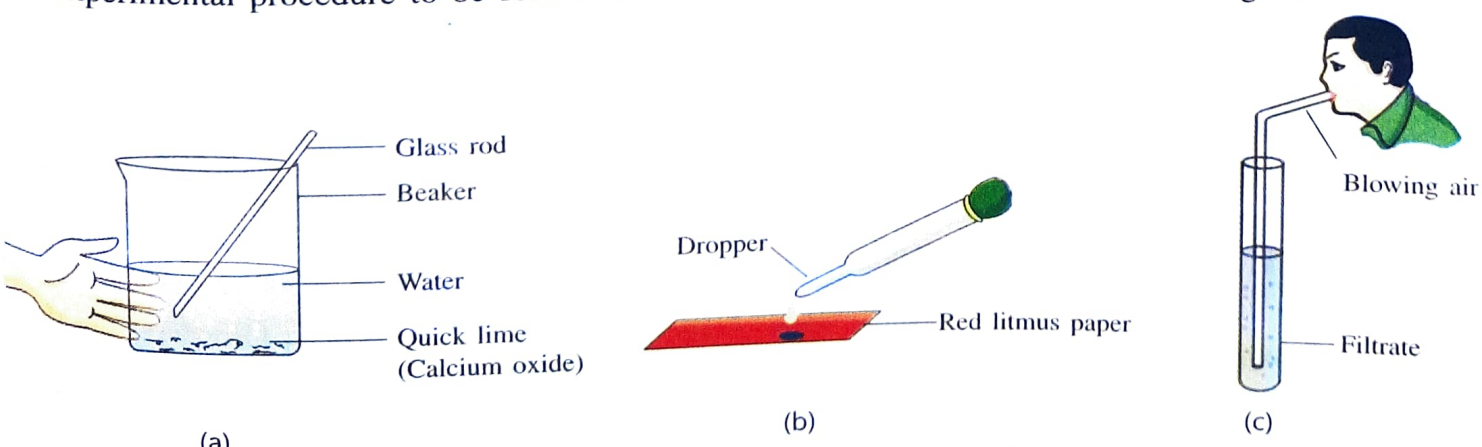


Fig. 1. Action of water on quick lime (Calcium oxide, CaO)

S.No.	Experiment	Observation	Inference
1.	Take about 40 mL of water in a clean beaker and touch its outer surface.	Outer surface of beaker is neither very cold nor very hot.	Water in the beaker is at room temperature.
2.	With the help of a plastic spoon add about 4 grams of calcium oxide (quick lime) in the water of the beaker and stir it with a clean glass rod.	Brisk reaction begins and a new substance is formed.	Water acts on quick lime to form a new substance.
3.	Touch the outer surface of the beaker after adding quick lime in the water [Fig. 1 (a)].	Outer surface of beaker is hot.	Heat is evolved due to the action of water on quick lime.
4.	With the help of a clean dropper, remove the liquid from the beaker and place its two drops on a red litmus paper [Fig. 1(b)].	Red litmus paper turns blue.	The new substance formed by the action of water on quick lime has basic nature.
5.	Filter the mixture of beaker, take about 10 mL of the filtrate in a clean test tube and pass carbon dioxide gas through it (by blowing air from your mouth into the test tube) [Fig. 1(c)].	Clear filtrate turns milky on passing CO_2 through it.	The new substance formed by the action of water on quick lime is calcium hydroxide.

Type of Reaction

Water and calcium oxide (two reactants) directly combine to form calcium hydroxide (a single new substance). Therefore, this reaction is an example of **combination reaction.**

Chemical Equation Involved in the Reaction

Calcium oxide and water combine directly to form calcium hydroxide. The reaction is highly exothermic.

$$\underset{\substack{\text{Calcium oxide}\\ \textit{(Quick lime)}}}{CaO\ (s)} + \underset{\text{Water}}{H_2O\ (l)} \longrightarrow \underset{\substack{\text{Calcium hydroxide}\\ \textit{(Slaked lime)}}}{Ca(OH)_2\ (aq)} + \text{Heat}$$

Precautions

- Quick lime should not be touched with hand, it causes severe burns.
- Quick lime should be added very carefully in water to avoid spurting of the reaction mixture because the reaction is highly exothermic and steam is formed.
- The filtrate collected in the test tube should be clear.
- Carbon dioxide should be passed through lime water only for a short duration.

EXPERIMENT 3(B)

Aim

To perform and observe the reaction when ferrous sulphate is heated.

Requirements

Sample of solid ferrous sulphate, test tubes, test tube holder, blue litmus paper, an acidified solution of potassium dichromate.

Basic Principles Involved

- When ferrous sulphate is heated the following changes are observed to take place.

(*i*) $FeSO_4.7H_2O\ (s) \xrightarrow{\text{Heat}} FeSO_4\ (s) + 7\ H_2O\ (v)$

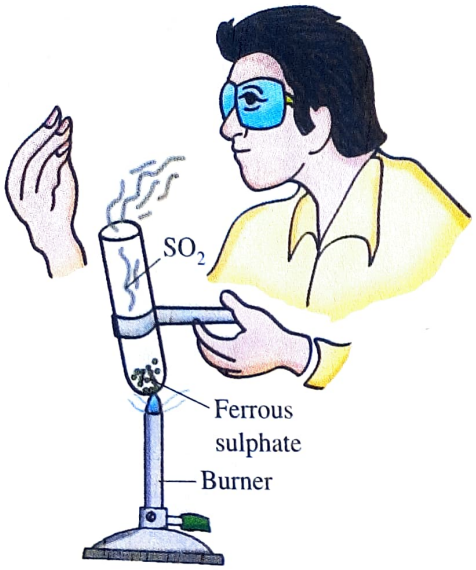
(*ii*) $2\ FeSO_4\ (s) \xrightarrow{\text{Heat}} Fe_2O_3\ (s) + SO_2\ (g) + SO_3\ (g)$

$2\ FeSO_4\ (s)$	$Fe_2O_3\ (s)$	$SO_2\ (g)$	$SO_3\ (g)$
Ferrous sulphate *(Light green)*	Ferric oxide *(Brown)*	Sulphur dioxide *(Colourless)*	Sulphur trioxide *(Colourless)*

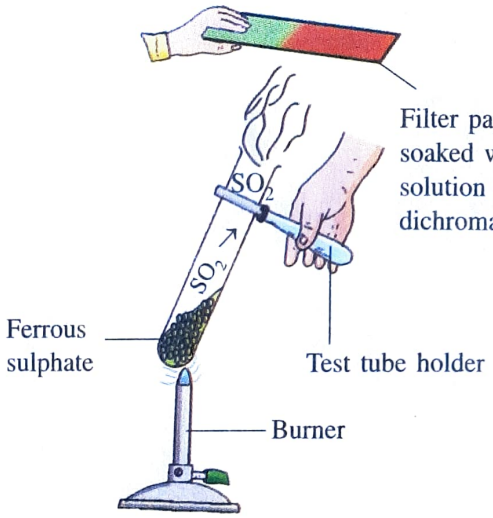
- In this reaction a single substance decomposes and gives three new substances. Therefore, it is an example of **decomposition reaction**.
- Oxides of sulphur (SO_2 + SO_3) turn blue litmus red. Therefore, these gases have acidic nature.
- Sulphur dioxide turns orange colour of acidified solution of potassium dichromate to green colour.
- SO_2 has reducing property.

Experimental Steps

The experimental procedure to be followed is described in the table and shown in Fig. 2.



(a) Heating ferrous sulphate and testing the smell of the gas.



(b) Heating ferrous sulphate and testing the reducing nature of the gas

Fig. 2. Thermal decomposition of ferrous sulphate

S.No.	Experiment	Observation	Inference
1.	Take about 2 grams of solid sample of ferrous sulphate in a clean and dry test tube and note its colour.	The sample is light green.	The colour of ferrous sulphate is light green.
2.	Heat the sample of ferrous sulphate in the test tube over the flame of a burner first slowly then strongly. (Fig. 2)	Water vapour and colourless gas are formed and brown yellow solid is left in the test tube.	Ferrous sulphate decomposes on heating to give H_2O, SO_2, SO_3 and Fe_2O_3.
3.	Test the smell of the gas liberated [Fig. 2 (a)]	The gas has irritating smell like burning sulphur.	The gases are oxides of sulphur.
4.	Bring a wet blue litmus paper in contact with the gas.	Wet blue litmus paper turns red.	Oxides of sulphur have acidic nature.
5.	Bring a strip of filter paper soaked with an acidified solution of potassium dichromate above the mouth of test tube [(Fig. 2 (b)].	The orange colour turns green.	Sulphur dioxide reduces acidified potassium dichromate.

Conclusion and Explanation

- When ferrous sulphate is heated, first water molecules are detached, then anhydrous ferrous sulphate decomposes into ferric oxide and oxides of sulphur.

$$FeSO_4.7H_2O\ (s) \xrightarrow{\text{Heat}} FeSO_4\ (s) + 7H_2O\ (v)$$

$$\underset{\text{Ferrous sulphate anhydrous}}{2\ FeSO_4\ (s)} \longrightarrow \underset{\substack{\text{Ferric oxide}\\ \textit{(Brown yellow)}}}{Fe_2O_3\ (s)} + \underset{\substack{\text{Sulphur dioxide}\\ \textit{(Colourless)}}}{SO_2\ (g)} + \underset{\substack{\text{Sulphur trioxide}\\ \textit{(Colourless)}}}{SO_3\ (g)}$$

- The gas produced is a mixture of sulphur dioxide and sulphur trioxide which reduces an acidified solution of potassium dichromate.

$$\underset{\substack{\text{Potassium dichromate}\\ \textit{(Orange)}}}{K_2Cr_2O_7\ (aq)} + \underset{\substack{\text{Sulphuric}\\ \text{acid}}}{H_2SO_4\ (aq)} + 3\ \underset{\substack{\text{Sulphur}\\ \text{dioxide}}}{SO_2\ (g)} \longrightarrow \underset{\substack{\text{Chromium (III)}\\ \text{sulphate}\\ \textit{(Green)}}}{Cr_2(SO_4)_3\ (aq)} + \underset{\substack{\text{Potassium}\\ \text{sulphate}}}{K_2SO_4\ (aq)} + \underset{\text{Water}}{H_2O\ (l)}$$

Type of Reaction

The reaction is called **thermal decomposition** of ferrous sulphate.

EXPERIMENT 3(C)

Aim

To perform and observe the reaction between iron nails and copper sulphate solution.

Requirements

Iron nails, sand paper, test tubes, solution of copper sulphate, stand and thread.

Basic Principles Involved

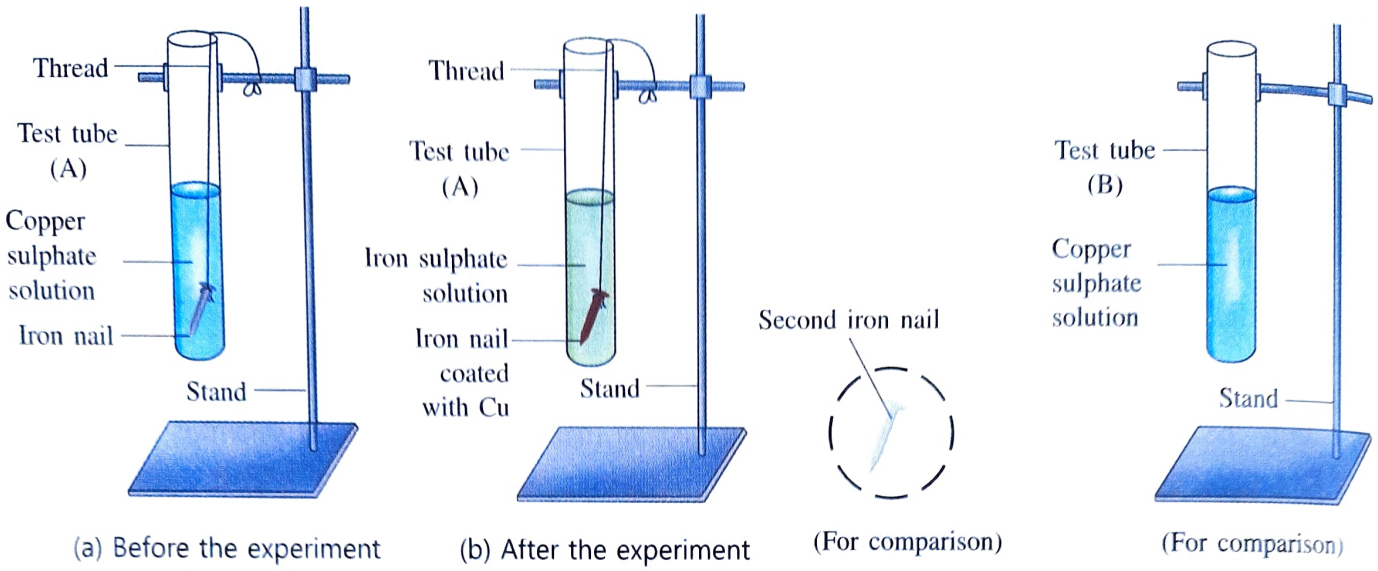
- When an iron nail is kept in a solution of copper sulphate for a longer time the changes observed are represented by the following equation.

$$\underset{\substack{\text{Iron}\\ \textit{(Grey)}}}{Fe\ (s)} + \underset{\substack{\text{Copper sulphate}\\ \textit{(Blue)}}}{CuSO_4\ (aq)} \longrightarrow \underset{\substack{\text{Ferrous sulphate}\\ \textit{(Light green)}}}{FeSO_4\ (aq)} + \underset{\substack{\text{Copper}\\ \textit{(Reddish brown)}}}{Cu\ (s)}$$

- In this reaction iron ion (Fe^{2+}) has replaced copper ion (Cu^{2+}) from the solution. Therefore, it is an example of **displacement reaction**.
- In the reaction between iron and copper sulphate, iron metal is oxidised to Fe^{2+} ion and Cu^{2+} ion is reduced to copper metal.

Experimental Steps

- Take two iron nails and clean each one by rubbing with sand paper.
- Take 10 mL of a solution of copper sulphate in a test tube marked A. Clamp the test tube in position as shown in Fig. 3.
- Take 10 mL of copper sulphate solution in test tube marked B for comparison.



(a) Before the experiment (b) After the experiment (For comparison) (For comparison)

Fig. 3. To perform and observe the reaction between iron nail and solution of copper sulphate.

- Tie one clean iron nail with a thread and carefully immerse it in the solution of copper sulphate of test tube A. Tie the other end of thread to the stand.
- Keep the second clean iron nail on a clean sheet of paper for comparison.
- After about 20 minutes of experiment look at the colour of the solution and coating on the iron nail.
- Compare the colour of the two nails.
- Record your observations.

Observations before the Experiment

- The initial colour of the solution of copper sulphate was blue.
- The initial colour of iron nail was grey.

Observations after the Experiment

- The solution in test tube A has turned light green, but the solution of test tube B (without iron nail) is still blue.
- There is a brown coating on iron nail which was dipped in the solution of test tube A, but the iron nail kept outside is still grey.

Conclusion

- A brown coating on iron nail after the experiment shows that copper metal is deposited on iron nail.
- A light green colour in test tube A demonstrates that ferrous ions (Fe^{2+}) are present in the solution. Iron has displaced copper from the solution of copper sulphate.
- A displacement reaction has taken place between iron and copper sulphate.

$$\underset{\substack{\text{Iron}\\(grey)}}{Fe\ (s)} + \underset{\substack{\text{Copper sulphate}\\(blue)}}{CuSO_4\ (aq)} \longrightarrow \underset{\substack{\text{Copper}\\(brown)}}{Cu\ (s)} + \underset{\substack{\text{Ferrous sulphate}\\(light\ green)}}{FeSO_4\ (aq)}$$

- Iron is more reactive than copper.

Type of Reaction

The reaction $Fe\ (s) + CuSO_4\ (aq) \longrightarrow Cu\ (s) + FeSO_4\ (aq)$ is a **displacement reaction** in which Cu^{2+} is displaced by Fe^{2+}.

Precautions

- The iron nails should be cleaned by rubbing them with sand paper.
- A clean iron nail should be kept outside to compare the colour of the iron nails before and after the experiment.
- A portion of the solution of copper sulphate should be kept in another test tube B to compare the colour of the solutions before and after the experiment.
- During the experiment the test tube A containing iron nail and copper sulphate solution should not be disturbed.
- After completing the experiment and removing the coated iron nail it should not be touched.

VIVA VOCE

T. *What is the colour of the solution of copper sulphate? What is the colour of iron nail?*

S. Blue, Grey

T. *When you dip an iron nail in the blue solution of copper sulphate and wait for about 20 minutes, what is the change in the colour of the solution?*

S. Blue colour fades slowly and finally becomes light green.

T. *What is the final colour of the iron nail when it is kept in the blue solution of copper sulphate for about 20 minutes?*

S. There is a brown coating on the iron nail.

T. *Name the reaction which takes place in this case. Give reason for your answer.*

S. Displacement reaction.

During the reaction, Cu^{2+} ions of copper sulphate solution are displaced by the Fe^{2+} ions and ferrous sulphate is formed in the solution.

T. *Give a balanced chemical equation for this displacement reaction.*

S. $Fe\ (s) + CuSO_4\ (aq) \longrightarrow Cu\ (s) + FeSO_4\ (aq)$

or, $Fe + Cu^{2+} \longrightarrow Fe^{2+} + Cu$ *Redox*

EXPERIMENT 3(D)

Aim

To perform and observe the reaction between sodium sulphate and barium chloride in aqueous solutions.

Requirements

Sodium sulphate solution, barium chloride solution, test tubes, conical flask.

Basic Principles Involved

- On mixing the solutions of sodium sulphate and barium chloride a white precipitate of barium sulphate is formed. It is represented by the following chemical equation:

$$\underset{\text{Sodium sulphate}}{Na_2SO_4\ (aq)} + \underset{\text{Barium chloride}}{BaCl_2\ (aq)} \longrightarrow \underset{\text{Barium sulphate}}{BaSO_4\ (s)} + \underset{\text{Sodium chloride}}{2\ NaCl\ (aq)}$$

- In this reaction sodium sulphate and barium chloride exchange their ions. Therefore, it is an example of **double displacement reaction**.

Experimental Steps

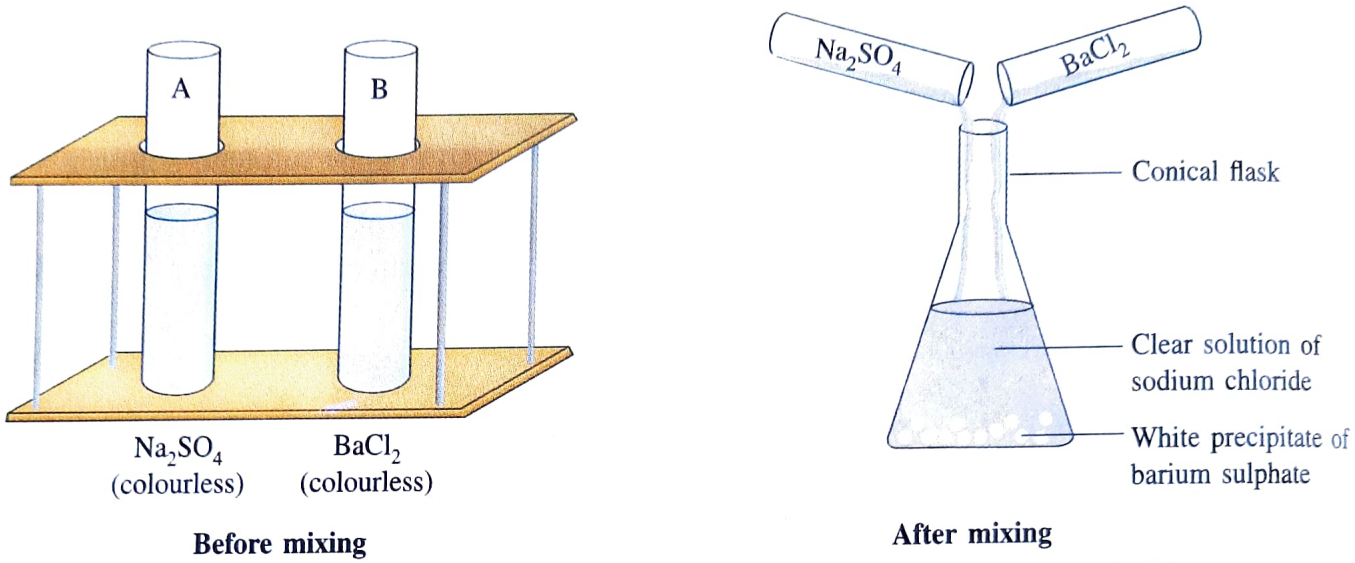


Fig. 4. Double displacement reaction between sodium sulphate and barium chloride

- Take 10 mL solution of sodium sulphate (Na_2SO_4) in a clean test tube marked A.
- Take 10 mL solution of barium chloride ($BaCl_2$) in another clean test tube marked B.
- Mix carefully the solutions of test tubes A and B in a conical flask.
- Stir the mixture in the conical flask with a clean glass rod and leave it undisturbed for some time.
- Record your observations.

Observation before the Experiment

- Solution of sodium sulphate is colourless and clear in test tube A.
- Solution of barium chloride is colourless and clear in test tube B.

Observation after the Experiment

- A white precipitate is formed and settles at the bottom of the conical flask.
- There is clear and colourless solution above the white solid in the conical flask.

Conclusion

- When a solution of sodium sulphate is mixed with a solution of barium chloride double displacement reaction takes place, a white precipitate of barium sulphate is formed and sodium chloride appears in the solution.

$$\underset{\text{Sodium sulphate}}{Na_2SO_4\ (aq)} + \underset{\text{Barium chloride}}{BaCl_2\ (aq)} \longrightarrow \underset{\text{Barium sulphate}}{BaSO_4\ (s)} + \underset{\text{Sodium chloride}}{2\ NaCl\ (aq)}$$

Type of Reaction

The reaction between sodium sulphate and barium chloride is an example of **double displacement reaction**.