Practical No. 3

Aim : To observe the following reactions and to classify them into the types combination, displacement, decomposition and double displacement.

Reaction :

1. Reaction of water with (Calcium Oxide) lime.
2. Effect of heat on ferrous sulphate.
3. Reaction of copper sulphate solution with iron nail.
4. Reaction of solutions of sodium sulphate and barium chloride with each other.

Apparatus : 250 ml beaker, china dish, asbestos sheet, dropper, hard glass test tube, test tube holder, test tube stand, sand paper, burner / spirit lamp, filter paper etc.

Chemicals : Calcium oxide, water, crystals of ferrous sulphate, iron nail / wire scrubber, solution of copper sulphate.

Procedure :

A. Reaction of water with slaked lime.

1. Take about 10 gm lime in a clean and dry china dish, place this dish on an asbestos sheet.
2. Take a little water in a beaker, using dropper sprinkle some water on the lime in the dish. Record your observations.

Observation :

Sr.No.	Experimental procedure	Obsertvations
1	Note the heat absobed or evolved during the reaction by touching the dish.	Heat will be evolved during this reaction
2	Note whether a gas or vapour is given away in the reaction.	Steam is given away
3	Note the noise, if, any, produced during the reaction.	Hissing sound is Produced
4	Note the change in the physical state	The aques solution is make

Reaction :

$$CaO(S) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$$

calcium oxide + water → calcium hydroxide

Inference / Conclusion :

The reaction of water with lime is Combination reaction. Here calcium oxide and water react to form the calcium hydroxide

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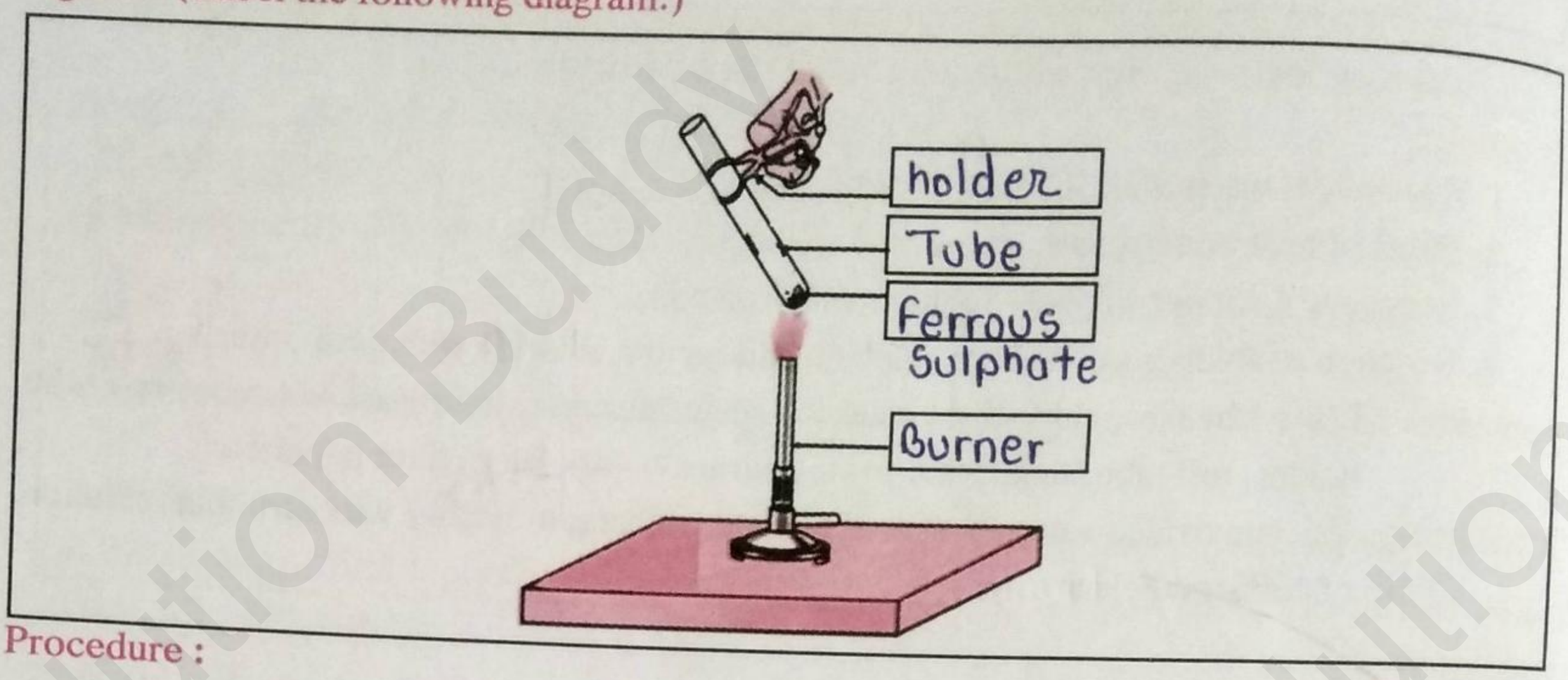
Procedure :

B. Effect of heat on crystals of ferrous sulphate

Figure : (Label the following diagram.)



Procedure :

1. Take about 10 gm of powdered crystals of ferrous sulphate in a test tube.
2. Clamp the test tube to a stand and heat it with burner /spirit lamp for 10 minutes.
3. Note the colour of the gas evolved. (Do not smell the gas).
4. Continue heating until the colour of the substance in the test tube changes.
5. Keep the hot test tube on an asbestos sheet. Observe the colour of the substance in it after cooling.

Observation :

Sr.No.	Experiment procedure	Obsertvations
1	Note the original colour of ferrous sulphate.	light green.
2	Note the colour of the gas evolved on heating.	Reddish brown
3	Observe the colour of the substance in the cold test tube and note it.	Red

Reaction :

$$2(FeSO_4.7H_2O)\ (s) \xrightarrow{Heat} Fe_2O_3\ (s) + SO_2(g) + SO_3(g) + 14H_2O(g)$$

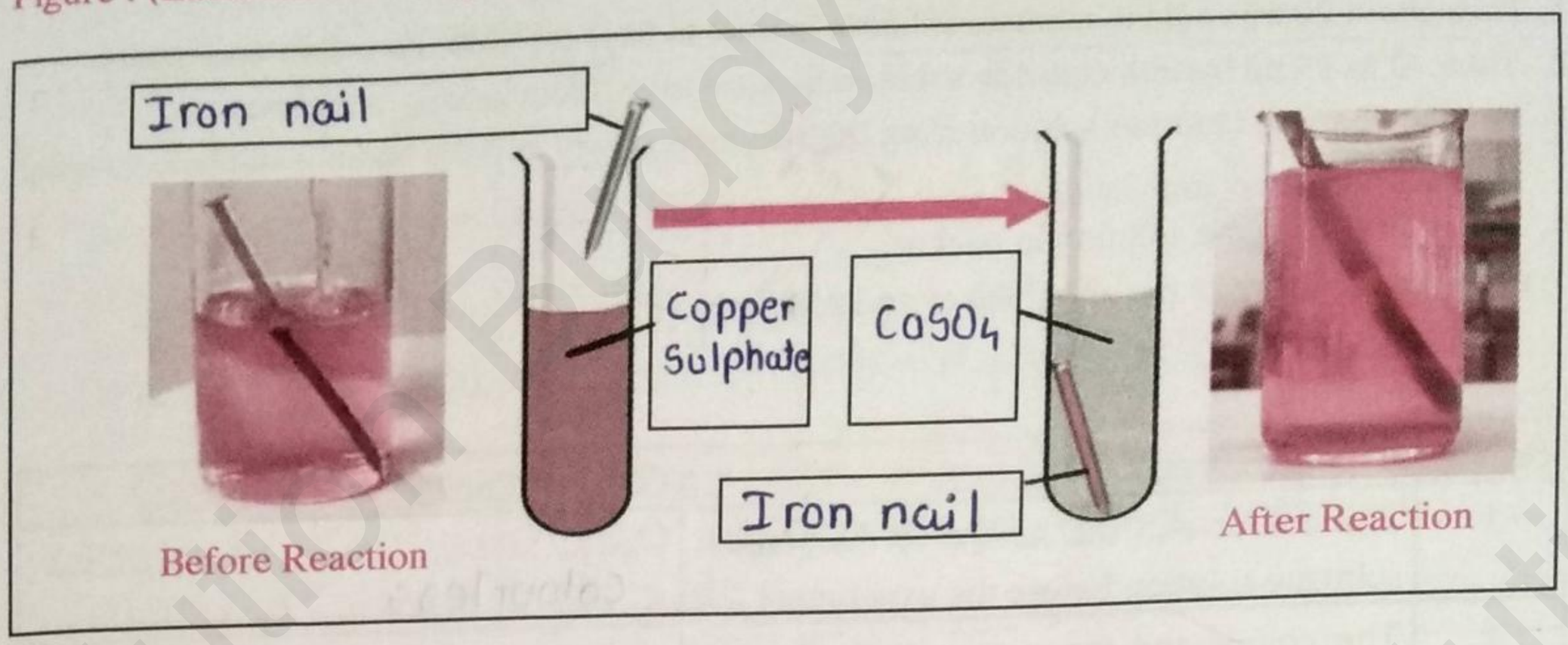
Inference / Conclusion :

1. On heating the pale green coloured crystals of ferrous sulphate undergo decomposition. A mixture of $FeSO_4$ and H_2O gases formed.
2. A residue of White colour remains in the test tube.

This is a decomposition reaction. In which two or more products are formed from the single reactants.

Procedure : C. Reaction of solution of copper sulphate with iron nail.

Figure : (Label the following diagram.)



Procedure :

1. Take about 100 ml solution of copper sulphate in a beaker. Note its colour.
2. Take two-three unrusted iron nails. Clean them by rubbing with sand paper and wash with water. Note the colour of the nails.
3. Keep the nails immersed in the copper sulphate solution for about fifteen minutes.
4. Observed the change in the colour of the nails and the solution.
5. Remove the nails from the solution after fifteen minutes. Wash them and keep them on a filter paper. Note the changed colour of the nails and the solution.

Observation Table:

Sr.No.	Experiment procedure	Obsertvations
1	Colour of $CuSO_4$ soln. before the experiment.	React with Fe.
2	Colour of iron nail before the experiment.	Blue
3	Colour of $CuSO_4$ soln. after the experiment.	White
4	Colour of iron nail after the experiment.	White raddish.

Reaction :

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

Inference / Conclusion :

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

.....

.....In which the irons are displace from most reactive to less reactive element.....

Procedure :

D. The reaction between sodium sulphate and barium chloride :

1. Take about 20 ml sodium sulphate solution in a clean beaker. Note the colour and nature.
2. Take 10 to 15 ml barium chloride solution in a test tube. Note its colour and nature.
3. Pour the barium chloride solution from the test tube slowly into the sodium sulphate solution in the beaker.
4. Keep on stirring the solution in beaker.
5. Observe the changes occur in beaker and note it down.

Observation Table :

Sr.No.	Experiment procedure	Obsertvations
1	The colour and the nature of the sodium sulphate solution before the experiment.	..... Colourless .....
2	The colour and the nature of the barium chloride solution before the experiment.	..... Colourless .....
3	The colour and the nature of the mixture resulting on mixing the two solution into each other.	..... curdy white .....

Reaction :

$$BaCl_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(aq) + 2NaCl(aq)$$

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.

Inference / Conclusion :

1. In this reaction white coloured insoluble ..BaSO4... is formed. As a result of a white coloured precipitate is formed in the beaker.

Multiple Choice Questions

1. The reaction of water with slaked lime is studied by .....
   a. putting slaked lime into water taken in a test tube.
   b. putting a lot of water into slaked lime.
   c. sprinkling a little water on slaked lime.
   d. None of the above method.
2. When ferrous sulphate crystals are heated, the residue obtained in the test tube is .....
   a. red coloured b. blue coloured c. green coloured d. colourless
3. When sodium sulphate solution reacts with barium chloride solution, the solution after the reaction contains mainly .....
   a. barium sulphate b. sodium chloride c. a and b both d. none of a and b
4. The reaction of iron nail with copper sulphate solution is ..... reaction.
   a. combination b. decomposition c. displacement d. double displacement

5. The reddish brown colour obtained on the iron nail placed in copper sulphate solution is of .....

a. Cu_2O b. CuO c. Cu d. CuS

: Exercise :

1. "To pour water on calcium oxide." Which is another way to classify this reaction? Explain.

$CaO + H_2O \longrightarrow Ca(OH)_2 + Heat$

calcium oxide + Water $\longrightarrow$ calcium hydroxide + Δ

this is a combination reaction because in this reaction CaO and H_2O is combined and formed $Ca(OH)_2$ [Calcium hydroxide]

2. In experiment (C), speed of reaction increases if we use iron wire scrubber instead of iron nail. Which factor do you observe that affects the rate of reaction? Explain.

In experiment (c), speed of reaction increases Because iron wire scrubber is used instead of iron nail. iron wire scrubber react fastly as capared iron nail. so, this all affectet the rate of reaction

3. Name the substance which remains in a test tube after heating ferrous sulphate.

$FeOSO_4 + 7H_2O \rightarrow FeSO_4 + 7H_2O$

$2FeSO_4 + O \rightarrow Fe_2O_4 + SO_4 + SO_3$

4. Observe double displacement reactions given in the text book and write down the similarities.

The reaction in which the ions in the ruminants are exchanged to form a precipitate are called 'double displacement Reaction'

Eg,

$K_2CrO_4 + BaSO_4 \longrightarrow K_2SO_4 + BaCrO_4 \downarrow$

Remark and Signature