

CLASS X- PRACTICAL WORKSHEET

Different types of chemical reactions

Experiment No:1(a)

Date:

Combination reaction**Objectives:** To study the Combination reaction of Quick lime (CaO) in water**Requirements:** CaO, water, beaker, thermometer, stirrer, etc.**Points to remember:**

1. CaO is a white powder
2. It reacts with water to form slaked lime $[\text{Ca}(\text{OH})_2]$
3. This process is called slaking of lime
4. Slaked lime is a suspension of $\text{Ca}(\text{OH})_2$ in water.
5. Clear solution of $\text{Ca}(\text{OH})_2$ in water is known as lime water
6. Slaking of lime is an exothermic reaction releasing a lot of heat energy.
7. $\text{CaO}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{Ca}(\text{OH})_{2(s/aq)}$

Procedure:

1. Take about 50 ml of water in a beaker and note its temperature and record as $T_1^\circ\text{C}$
2. Add 2 spatula of CaO to it.
3. Stir well
4. Note the temperature again and record the same as $T_2^\circ\text{C}$
5. Compare the temperature. (Which is greater? T_1 or T_2 ?)

Observations:

1. Initial temperature: $T_1^\circ\text{C} = \dots\dots\dots^\circ\text{C}$
2. Final Temperature: $T_2^\circ\text{C} = \dots\dots\dots^\circ\text{C}$

Result: Reaction between CaO and water is an example of combination reaction and it is an exothermic combination reaction.**Precautions:**

1. Water used may boil due to chemical reaction and hence touching the hot beaker with bare hand should be avoided.
2. Use goggles and lab coat
3. Hg thermometer should be handled with care.

Answer the following questions:

1. What is meant by combination reaction?
 2. What is the colour of CaO or quick lime?
 3. How do you know that dissolution of CaO in water is exothermic?
 4. What are exothermic reactions?
 5. Does this reaction belong to REDOX type? (Ans: No. No electron exchange takes place)
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Experiment No:1 (b) **Decomposition reaction**

Date:

Objectives: To study the decomposition reaction of FeSO_4 **Requirements:** Iron sulphate hepta hydrate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$), test tube, spatula, Bunsen burner, etc.**Points to remember:**

1. Ferrous sulphate hepta hydrate crystals are light green (pale green) in colour.
2. On heating iron sulphate undergoes decomposition to form solid iron oxide and sulphur dioxide and sulphur trioxide gases. $(2\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3 + 14\text{H}_2\text{O})$
3. The gases formed has smell of burning sulphur
4. Iron sulphide is brown in colour.
5. The sulphur oxide gases produced are acidic and can be tested using moist blue litmus paper.
6. Both SO_2 and SO_3 are soluble in water
7. $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$ (Sulphurous acid)
8. $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$ (Sulphuric acid)
9. SO_2 will dissolve in water and can be tested using acidified potassium dichromate solution (Yellow solution turns green)
10. The seven water molecules present in the crystal are known as water of crystallisation.

Procedure:

1. Take a few crystals of iron sulphate hepta hydrate in a clean dry test tube.
2. Heat the test tube strongly on a Bunsen burner.
3. Introduce a moist blue litmus paper near the mouth of the test tube

Observations:

1. Green colour of the substance gradually changes to brown
2. The white fuming kind of gas released has smell of burning sulphur
3. Blue litmus paper turns to red.

Result: Light green iron sulphate undergoes decomposition to form brown iron oxide and acidic SO_2 and SO_3 gases. It also loses its water of crystallisation.**Precautions:**

1. Do not inhale the gases that are released.
2. Avoid your eyes getting exposed to the gases.
3. Wear goggle and lab coat.

Answer the following questions:

1. What are decomposition reactions?
2. What is the colour of hydrated FeSO_4 ?
3. What is the colour of the residue formed after the experiment? What is it chemically?
4. The gases emitted are oxides.

Experiment No: ...1 (c) **Displacement reaction**

Date:

Objectives: To study the Displacement reaction of iron in copper sulphate**Requirements:** Iron nails, thread, test tubes, copper sulphate, distilled water, spatula, TT stand, sand paper, etc.**Points to remember:**

1. Colour of pure iron is greyish
2. Colour of pure copper is brownish.
3. Aqueous solution of copper sulphate is blue due to the presence of Cu^{2+} ions and ferrous sulphate is light green due to the presence of Fe^{2+} ions.
4. Fe is more reactive than Cu. Due to their difference in reactivity, copper gets deposited on iron when iron is kept in a solution of copper sulphate and metallic iron dissolves in water to form iron sulphate.

- Due to the above mentioned reactions, the colour of the solution gradually changes from blue to light green.
- $\text{Fe}_{(s)} + \text{Cu}^{2+}_{(aq)} \rightarrow \text{Fe}^{2+}_{(aq)} + \text{Cu}_{(s)}$.
- This is an example of a single displacement reaction. (Fe^{2+} ions displace Cu^{2+} ions)

Procedure:

- Take 10 ml each of copper sulphate solution in two test tubes and keep on a TT stand.
- Take two iron nails and clean them using a sand paper to remove any rust.
- Put one iron nail in one of the test tubes.
- After 15 minutes, take out the iron nail keep it on a filter paper next to the clean iron nail and compare them. Compare also the solutions in both the test tubes.
- Record your observation in the following table.

Nature of the:	Observation	Inference
Iron nail before the experiment	Silvery grey in colour and lustrous	Metals are lustrous.
Iron nail after the experiment	Brown deposit on the nail	Copper is deposited on the nail due the displacement reaction that takes place between Fe & Cu.
Solution before the experiment	Light blue and transparent	Copper sulphate solution is peacock blue in colour
Solution after the experiment	Light green and dirty	Due to the chemical reaction, Fe displaces Cu from CuSO_4 and FeSO_4 is formed in the solution. Dirtiness is due to the rusting of iron.

Conclusions:

Fe displaces Cu from CuSO_4 and forms FeSO_4 in the solution hence the colour of the solution changes from light blue to pale green. The displaced copper gets deposited on iron nail. It appears as brown coating on iron nail.

- Iron nail should be clean; otherwise impurity such as rust will cause interference to the expected reaction.
- During the experiment the test tube should not be disturbed. (The deposit of copper might fall off)
- More the time taken better will be the result.

Questions:

- What is meant by displacement reaction? (Ans: A stronger element displaces a weaker element from its compound)
- Which is more reactive? Copper or iron and why? (Ans: Fe is more reactive as it displaces Cu from its compounds)
- Name the reaction that takes place, when an iron nail is kept in copper sulphate solution. (Single displacement or REDOX)
- What happens when (write also the chemical equations involved):
 - Zn strip is kept in copper sulphate solution? (Blue solution becomes colourless and brown deposit of Cu)
 - Copper wire is kept in ferrous sulphate solution? (No visible change as Cu cannot displace Fe)
 - Copper wire is kept in silver nitrate solution? (Black deposit of Ag and colourless solution becomes blue)
 - Copper sulphate solution is stored in iron vessel? (Hole will be formed on Fe vessel as Fe displaces Cu from Copper sulphate. Precious copper sulphate solution will be lost)
- What is the colour of copper sulphate solution before the experiment? (Blue/Peacock blue)
- Which out of the following get coated on iron nail? What is its colour?
(Copper oxide, copper sulphate, copper sulphide, copper metal) [Reddish brown copper metal]
- What is the type of reaction that takes place in this experiment? (Chemical displacement)

Double displacement reaction

Experiment No: ...1(d)

Date.....

Objectives: To study the chemical reaction between Sodium sulphate and Barium Chloride.**Requirements:** Solutions of Na_2SO_4 & BaCl_2 , test tubes etc.**Points to remember:**

1. Sodium sulphate contains 2 sodium ions and one sulphate ion.
2. On mixing the solutions a double displacement reactions takes place.
3. $\text{Na}_2\text{SO}_{4(aq)} + \text{BaCl}_{2(aq)} \rightarrow 2\text{NaCl}_{(aq)} + \text{BaSO}_{4(aq)}$.

EXPERIMENT	OBSERVATION	INFERENCE
Take 1 ml of Sodium sulphate solution in a test tube and add 1 ml of BaCl_2 solution to it. Record the change observed.	A white precipitate is formed	The white precipitate formed is BaSO_4 $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
Add 1 ml of con. HCl acid to one portion of the precipitate taken in another test tube.	The precipitate remains insoluble.	Confirms the presence of BaSO_4 .

Questions:

1. What is meant by displacement reaction?
2. What is meant by double displacement reaction?
3. Write the formulae of sodium sulphate, barium chloride and barium sulphate.
4. What is the valency of:
 - a. Sodium in sodium sulphate
 - b. Barium ion in barium sulphate and barium chloride
 - c. Chloride ion in barium chloride and sodium chloride.
 Ans: (a) +1, (b) +2+ and (c) -1
5. What is the colour of barium chloride solution? What is the colour of barium sulphate precipitate?

Multiple choice type questions

1.	A student took solid quick lime in a china dish and added a small amount of water. He heard <ol style="list-style-type: none"> a) A popping sound b) A crackling sound c) A hissing sound d) No sound at all
2.	On heating ferrous sulphate crystals one would get <ol style="list-style-type: none"> a) Sweet smell b) Rotten egg smell c) Irritating choking smell d) None of the above

3.	<p>Iron nails were dipped in a solution kept in a test tube. After half an hour, it was observed that the colour of the solution had changed. The solution in the test tube was that of</p> <ul style="list-style-type: none"> a) Zinc sulphate b) Copper sulphate c) Iron sulphate d) Aluminium sulphate
4.	<p>Which of the following will give a white precipitate with sodium sulphate solution?</p> <ul style="list-style-type: none"> a) Barium sulphate b) Barium carbonate c) Barium chloride d) Sodium chloride
5.	<p>Iron nails were dipped in a solution of copper sulphate. After 10 minutes, it was observed that the blue colour of the solution changes and a layer gets deposited on iron nails. The colour of the solution and that of the coating would respectively be</p> <ul style="list-style-type: none"> a) Yellow and green b) Brown and blue c) Red and greenish blue d) Green and reddish brown
6.	<p>The solution obtained after the reaction of water on calcium oxide is</p> <ul style="list-style-type: none"> a) Neutral b) Acidic c) Amphoteric d) Basic
7.	<p>Although a group of the students dipped the iron nails for 10 minutes in the copper sulphate solution they could not get the result. The possible reason could be</p> <ul style="list-style-type: none"> a) Copper sulphate was freshly prepared b) The iron nail did not provide enough area for reacting c) The iron nails have to be kept in solution atleast for 24 hr d) Iron nails were not rubbed clean with sand paper.
8.	<p>The first change observed when crystals of ferrous sulphate are heated is</p> <ul style="list-style-type: none"> a) Evolution of brown fumes b) Pale green colour fades c) Crystals turn green d) Yellow fumes evolve.
9.	<p>The colour of fumes observed on heating ferrous sulphate in a test tube is</p> <ul style="list-style-type: none"> a) White b) Reddish brown c) Dark brown d) Black.
10.	<p>When you place an iron nail in copper sulphate, the reddish brown coating formed is</p> <ul style="list-style-type: none"> a) Soft and dull b) Hard and flaky c) Smooth and shiny d) Rough and granular

Experiment No:1 (b) Decomposition reaction

Date:

Objectives: To study the decomposition reaction of FeSO_4 **Requirements:** Iron sulphate hepta hydrate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$), test tube, spatula, Bunsen burner, etc.**Points to remember:**

11. Ferrous sulphate hepta hydrate crystals are light green (pale green) in colour.
12. On heating iron sulphate undergoes decomposition to form solid iron oxide and sulphur dioxide and sulphur trioxide gases. $(2\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3 + 14\text{H}_2\text{O})$
13. The gases formed has smell of burning sulphur
14. Iron sulphide is brown in colour.
15. The sulphur oxide gases produced are acidic and can be tested using moist blue litmus paper.
16. Both SO_2 and SO_3 are soluble in water
17. $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$ (Sulphurous acid)
18. $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$ (Sulphuric acid)
19. SO_2 will dissolve in water and can be tested using acidified potassium dichromate solution (Yellow solution turns green)
20. The seven water molecules present in the crystal are known as water of crystallisation.

Procedure:

4. Take a few crystals of iron sulphate hepta hydrate in a clean dry test tube.
5. Heat the test tube strongly on a Bunsen burner.
6. Introduce a moist blue litmus paper near the mouth of the test tube

Observations:

4. Green colour of the substance gradually changes to brown
5. The white fuming kind of gas released has smell of burning sulphur
6. Blue litmus paper turns to red.

Result: Light green iron sulphate undergoes decomposition to form brown iron oxide and acidic SO_2 and SO_3 gases. It also loses its water of crystallisation.**Precautions:**

4. Do not inhale the gases that are released.
5. Avoid your eyes getting exposed to the gases.
6. Wear goggle and lab coat.

Answer the following questions:

5. What are decomposition reactions?
6. What is the colour of hydrated FeSO_4 ?
7. What is the colour of the residue formed after the experiment? What is it chemically?
8. The gases emitted are oxides.

Experiment No: ...1 (c) Displacement reaction

Date:

Objectives: To study the Displacement reaction of iron in copper sulphate

Requirements: Iron nails, thread, test tubes, copper sulphate, distilled water, spatula, TT stand, sand paper, etc.

Points to remember:

8. Colour of pure iron is greyish
9. Colour of pure copper is brownish.
10. Aqueous solution of copper sulphate is blue due to the presence of Cu^{2+} ions and ferrous sulphate is light green due to the presence of Fe^{2+} ions.
11. Fe is more reactive than Cu. Due to their difference in reactivity, copper gets deposited on iron when iron is kept in a solution of copper sulphate and metallic iron dissolves in water to form iron sulphate.
12. Due to the above mentioned reactions, the colour of the solution gradually changes from blue to light green.
13. $\text{Fe}_{(s)} + \text{Cu}^{2+}_{(aq)} \rightarrow \text{Fe}^{2+}_{(aq)} + \text{Cu}_{(s)}$.
14. This is an example of a single displacement reaction. (Fe^{2+} ions displace Cu^{2+} ions)

Procedure:

6. Take 10 ml each of copper sulphate solution in two test tubes and keep on a TT stand.
7. Take two iron nails and clean them using a sand paper to remove any rust.
8. Put one iron nail in one of the test tubes.
9. After 15 minutes, take out the iron nail keep it on a filter paper next to the clean iron nail and compare them. Compare also the solutions in both the test tubes.
10. Record your observation in the following table.

Nature of the:	Observation	Inference
Iron nail before the experiment	Silvery grey in colour and lustrous	Metals are lustrous.
Iron nail after the experiment	Brown deposit on the nail	Copper is deposited on the nail due the displacement reaction that takes place between Fe & Cu.
Solution before the experiment	Light blue and transparent	Copper sulphate solution is peacock blue in colour
Solution after the experiment	Light green and dirty	Due to the chemical reaction, Fe displaces Cu from CuSO_4 and FeSO_4 is formed in the solution. Dirtiness is due to the rusting of iron.

Conclusions:

Fe displaces Cu from CuSO_4 and forms FeSO_4 in the solution hence the colour of the solution changes from light blue to pale green. The displaced copper gets deposited on iron nail. It appears as brown coating on iron nail.

4. Iron nail should be clean; otherwise impurity such as rust will cause interference to the expected reaction.
5. During the experiment the test tube should not be disturbed. (The deposit of copper might fall off)

6. More the time taken better will be the result.

Questions:

8. What is meant by displacement reaction? (Ans: A stronger element displaces a weaker element from its compound)
9. Which is more reactive? Copper or iron and why? (Ans: Fe is more reactive as it displaces Cu from its compounds)
10. Name the reaction that takes place, when an iron nail is kept in copper sulphate solution. (Single displacement or REDOX)
11. What happens when (write also the chemical equations involved):
 - a. Zn strip is kept in copper sulphate solution? (Blue solution becomes colourless and brown deposit of Cu)
 - b. Copper wire is kept in ferrous sulphate solution? (No visible change as Cu cannot displace Fe)
 - c. Copper wire is kept in silver nitrate solution? (Black deposit of Ag and colourless solution becomes blue)
 - d. Copper sulphate solution is stored in iron vessel? (Hole will be formed on Fe vessel as Fe displaces Cu from Copper sulphate. Precious copper sulphate solution will be lost)
12. What is the colour of copper sulphate solution before the experiment? (Blue/Peacock blue)
13. Which out of the following get coated on iron nail? What is its colour?
(Copper oxide, copper sulphate, copper sulphide, copper metal) [Reddish brown copper metal]
14. What is the type of reaction that takes place in this experiment? (Chemical displacement)

Double displacement reaction

Experiment No: ...1(d)

Date.....

Objectives: To study the chemical reaction between Sodium sulphate and Barium Chloride.

Requirements: Solutions of Na_2SO_4 & BaCl_2 , test tubes etc.

Points to remember:

4. Sodium sulphate contains 2 sodium ions and one sulphate ion.
5. On mixing the solutions a double displacement reactions takes place.
6. $\text{Na}_2\text{SO}_{4(aq)} + \text{BaCl}_{2(aq)} \rightarrow 2\text{NaCl}_{(aq)} + \text{BaSO}_{4(aq)}$.

EXPERIMENT	OBSERVATION	INFERENCE
Take 1 ml of Sodium sulphate solution in a test tube and add 1 ml of BaCl_2 solution to it. Record the change observed.	A white precipitate is formed	The white precipitate formed is BaSO_4 $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
Add 1 ml of con. HCl acid to one portion of the precipitate taken in another test tube.	The precipitate remains insoluble.	Confirms the presence of BaSO_4 .

Questions:

6. What is meant by displacement reaction?
7. What is meant by double displacement reaction?
8. Write the formulae of sodium sulphate, barium chloride and barium sulphate.
9. What is the valency of:
 - a. Sodium in sodium sulphate
 - b. Barium ion in barium sulphate and barium chloride
 - c. Chloride ion in barium chloride and sodium chloride.

Ans: (a) +1, (b) +2+ and (c) -1

10. What is the colour of barium chloride solution? What is the colour of barium sulphate precipitate?

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Multiple choice type questions

1.	<p>A student took solid quick lime in a china dish and added a small amount of water. He heard</p> <p>e) A popping sound f) A crackling sound g) A hissing sound h) No sound at all</p>
2.	<p>On heating ferrous sulphate crystals one would get</p> <p>e) Sweet smell f) Rotten egg smell g) Irritating choking smell h) None of the above</p>
3.	<p>Iron nails were dipped in a solution kept in a test tube. After half an hour, it was observed that the colour of the solution had changed. The solution in the test tube was that of</p> <p>e) Zinc sulphate f) Copper sulphate g) Iron sulphate h) Aluminium sulphate</p>
4.	<p>Which of the following will give a white precipitate with sodium sulphate solution?</p> <p>e) Barium sulphate f) Barium carbonate g) Barium chloride h) Sodium chloride</p>
5.	<p>Iron nails were dipped in a solution of copper sulphate. After 10 minutes, it was observed that the blue colour of the solution changes and a layer gets deposited on iron nails. The colour of the solution and that of the coating would respectively be</p> <p>e) Yellow and green f) Brown and blue g) Red and greenish blue h) Green and reddish brown</p>
6.	<p>The solution obtained after the reaction of water on calcium oxide is</p> <p>e) Neutral f) Acidic g) Amphoteric</p>

	h) Basic
7.	<p>Although a group of the students dipped the iron nails for 10 minutes in the copper sulphate solution they could not get the result. The possible reason could be</p> <ul style="list-style-type: none">e) Copper sulphate was freshly preparedf) The iron nail did not provide enough area for reactingg) The iron nails have to be kept in solution atleast for 24 hrh) Iron nails were not rubbed clean with sand paper.
8.	<p>The first change observed when crystals of ferrous sulphate are heated is</p> <ul style="list-style-type: none">e) Evolution of brown fumesf) Pale green colour fadesg) Crystals turn greenh) Yellow fumes evolve.
9.	<p>The colour of fumes observed on heating ferrous sulphate in a test tube is</p> <ul style="list-style-type: none">e) Whitef) Reddish browng) Dark brownh) Black.
10.	<p>When you place an iron nail in copper sulphate, the reddish brown coating formed is</p> <ul style="list-style-type: none">e) Soft and dullf) Hard and flakyg) Smooth and shinyh) Rough and granular

Objectives: To study the Displacement reaction of iron in copper sulphate

Requirements: Iron nails, thread, test tubes, copper sulphate, distilled water, spatula, TT stand, sand paper, etc.

Points to remember:

15. Colour of pure iron is greyish
16. Colour of pure copper is brownish.
17. Aqueous solution of copper sulphate is blue due to the presence of Cu^{2+} ions and ferrous sulphate is light green due to the presence of Fe^{2+} ions.
18. Fe is more reactive than Cu. Due to their difference in reactivity, copper gets deposited on iron when iron is kept in a solution of copper sulphate and metallic iron dissolves in water to form iron sulphate.
19. Due to the above mentioned reactions, the colour of the solution gradually changes from blue to light green.
20. $\text{Fe}_{(s)} + \text{Cu}^{2+}_{(aq)} \rightarrow \text{Fe}^{2+}_{(aq)} + \text{Cu}_{(s)}$.
21. This is an example of a single displacement reaction. (Fe^{2+} ions displace Cu^{2+} ions)

Procedure:

11. Take 10 ml each of copper sulphate solution in two test tubes and keep on a TT stand.
12. Take two iron nails and clean them using a sand paper to remove any rust.
13. Put one iron nail in one of the test tubes.
14. After 15 minutes, take out the iron nail keep it on a filter paper next to the clean iron nail and compare them. Compare also the solutions in both the test tubes.
15. Record your observation in the following table.

Nature of the:	Observation	Inference
Iron nail before the experiment	Silvery grey in colour and lustrous	Metals are lustrous.
Iron nail after the experiment	Brown deposit on the nail	Copper is deposited on the nail due the displacement reaction that takes place between Fe & Cu.
Solution before the experiment	Light blue and transparent	Copper sulphate solution is peacock blue in colour
Solution after the experiment	Light green and dirty	Due to the chemical reaction, Fe displaces Cu from CuSO_4 and FeSO_4 is formed in the solution. Dirtiness is due to the rusting of iron.

Conclusions:

Fe displaces Cu from CuSO_4 and forms FeSO_4 in the solution hence the colour of the solution changes from light blue to pale green. The displaced copper gets deposited on iron nail. It appears as brown coating on iron nail.