

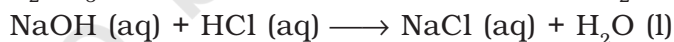
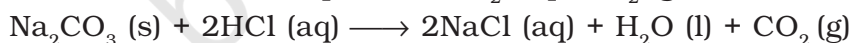
## Experiment 4

### Aim

To study the reactions of hydrochloric acid with zinc metal, sodium carbonate, and sodium hydroxide.

### Theory

An acid (HCl) reacts (i) with zinc metal to produce hydrogen gas, (ii) with carbonates and hydrogen carbonates to form carbon dioxide gas, and (iii) with sodium hydroxide (base) to neutralise and to produce sodium chloride (salt) and water.



### Materials Required



Zinc metal granules, dil. hydrochloric acid, sodium carbonate, sodium hydroxide solution, freshly prepared lime water, red and blue litmus papers, distilled water, four test tubes, a delivery tube, single bore cork to be fixed on a test tube, and a piece of sand paper.

### Procedure

#### (i) Reaction with Zinc Metal

1. Take a clean zinc granule in a clean and dry test tube.

- Put about 5 mL of dil. hydrochloric acid into it.
- Effervescence will come out from the reaction mixture.
- Successively bring wet blue and red litmus papers to the mouth of the test tube. Note and record the observation.

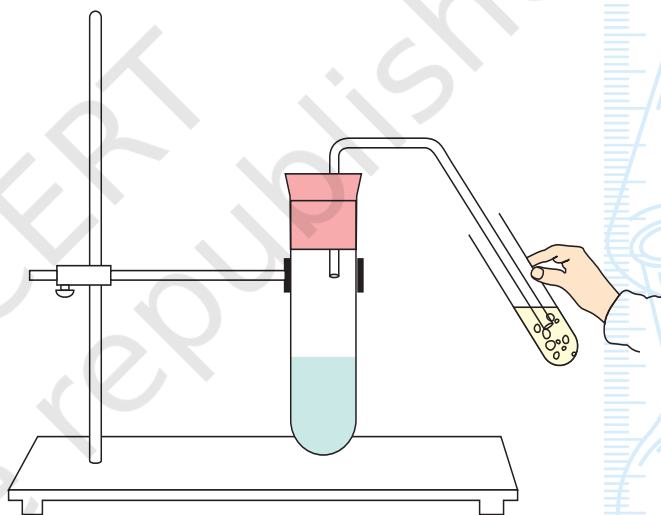
## OBSERVATIONS



Sl.No.	Experiment	Observations	Inference
1.	Litmus test: Action on red litmus Action on blue litmus		

### (ii) Reaction with Sodium Carbonate

- Take about 1 g of sodium carbonate in a clean and dry test tube.
- Add about 2 mL of dil. hydrochloric acid to it.
- Effervescence will start coming from the reaction mixture.
- Fix a delivery tube through a cork to the mouth of the test tube and pass the liberated gas through the freshly prepared lime water (Fig. 4.1). Observe what happens? Do you see bubbles of it in lime water? Does it turn milky? If yes, it shows the presence of carbon dioxide.



**Fig. 4.1 :** Passing of liberated gas through the freshly prepared lime water

## OBSERVATIONS



Sl. No.	Experiment	Observations	Inference
1.	Lime water test		

### (iii) Reaction with Sodium Hydroxide

- Take about 5 mL dil. hydrochloric acid in a test tube and label it as A.
- Similarly, take 5 mL of 10% sodium hydroxide solution in another test tube and label it as B.

- ## OBSERVATIONS

# OBSERVATIONS

Sl. No.	Activity	Observations	Inference
1.	<p><b>Litmus Paper Test</b></p> <p><i>In the beginning of experiment:</i></p> <p>Dip blue litmus paper in test tube A</p> <p>Dip red litmus paper in test tube B</p> <p>After adding <u>n</u> drops of dil. HCl from test tube A in dil. NaOH in test tube B</p> <p>(i) <math>n = \underline{\hspace{1cm}}</math> ; <i>action on red litmus paper</i>  <i>action on blue litmus paper</i></p> <p>(ii) <math>n = \underline{\hspace{1cm}}</math> ; <i>action on red litmus paper</i>  <i>action on blue litmus paper</i></p> <p>(iii) <math>n = \underline{\hspace{1cm}}</math> ; <i>action on red litmus paper</i>  <i>action on blue litmus paper</i></p> <p>(iv) <math>n = \underline{\hspace{1cm}}</math> ; <i>action on red litmus paper</i>  <i>action on blue litmus paper</i></p> <p>... <math>n = \underline{\hspace{1cm}}</math> ; <i>action on red litmus paper</i>  <i>action on blue litmus paper</i></p>	<p>No change</p> <p>No change</p>	<p>The solution in test tube B is neutralised</p>
2.	<p><b>Thermal Change</b></p> <p>After the completion of litmus test, touch the test tube B from outside</p> <p>Heat absorbed/evolved during the reaction</p>	<p>Cold/Warm</p>	<p>Reaction is endothermic/exothermic</p>

## RESULTS AND DISCUSSION



State and discuss the performance of each test in all reactions performed in this experiment.

## PRECAUTIONS



- Always carry out the test for hydrogen with a very small volume of gas.
- Handle hydrochloric acid and sodium hydroxide solutions very carefully.
- Shake the solutions and reaction mixtures carefully without spilling.
- Care must be taken while performing the combustion test.

## NOTE FOR THE TEACHER

- *Preparation of lime water:* Shake 5 g calcium hydroxide  $\text{Ca(OH)}_2$ , with 100 mL water. Allow it to stand for about 24 hours. Decant the supernatant liquid and use it for the tests. It is suggested to always use freshly prepared limewater.

## QUESTIONS

- What will be the colour of a blue litmus paper on bringing it in contact with a drop of dil. hydrochloric acid?
- Explain why hydrogen gas is not collected by the downward displacement of air?
- What will happen to a lighted candle if it is brought near the mouth of a gas jar containing hydrogen gas?
- Which gas is produced when zinc metal reacts with hydrochloric acid?
- Which gas is liberated when sodium carbonate reacts with hydrochloric acid?
- Hydrogen gas is neutral to litmus paper. Explain how?
- What is the utility of the reaction between  $\text{NaHCO}_3$  and  $\text{HCl}$  in daily life situation?
- How can the deposits of carbonates and hydrogencarbonates on the metal surface be cleaned?