

► Activity 8.3

Action of Dilute Acids on Carbonates



Aims

Suggested duration	2 periods 70 minutes
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- To investigate the effect of acids on carbonates
- To investigate the presence of carbonates in common substances around us



Skills

You will learn to:

- **show an understanding** of the products formed when dilute acids react with carbonates
- **infer** the presence of carbonates in substances



Apparatus and Materials

- five test tubes
- a delivery tube with stopper
- a wooden splint
- a test tube rack
- a test tube holder
- baking powder
- a plastic spatula
- eggshell / seashells (washed and dried) – pupils may bring their own
- aqueous sodium carbonate
- limewater (calcium hydroxide solution)
- unknown “substance X”
- dilute sulphuric acid
- dilute hydrochloric acid
- copper carbonate
- calcium carbonate
- potassium carbonate

► Part A | Investigating the Effect of Acids on Carbonates



Procedure and Observations

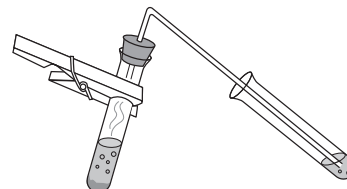
1. Divide the class so that half of the class works with dilute sulphuric acid while the other half works with dilute hydrochloric acid.
2. Pour limewater into a clean test tube until it is about 2 cm in depth.
3. Place three spatulas of copper carbonate into another clean test tube.
4. Pour in the dilute acid until it covers the solid (about 3 cm in depth). Shake the test tube to mix the acid and carbonate well.

5. Record your observations.

Effervescence was observed. Tiny bubbles were produced. The amount of copper carbonate reduced.

Colourless solution turned blue gradually.

6. Stopper the mouth of the test tube (containing carbonate and acid) with the delivery tube and dip the longer end of the delivery tube into the test tube of limewater. What do you observe?



The limewater turned milky. A white precipitate was formed in the limewater.

7. Name the gas produced in step 6. Carbon dioxide gas.
8. Pour the contents of the test tube away and wash the test tube. Repeat steps 1 to 6 with other carbonates and record your observations in the table provided. For aqueous sodium carbonate, pour about 4 cm³ (2 cm in depth) into a clean test tube, followed by an equal volume of the acid.

Carbonate	Observation	Colour of solution at end of experiment
Copper carbonate	Effervescence of colourless, odourless gas	Blue
Calcium carbonate	Effervescence of colourless, odourless gas	Colourless
Potassium carbonate	Effervescence of colourless, odourless gas	Colourless
Aqueous sodium carbonate	Effervescence of colourless, odourless gas	Colourless

9. What can you conclude about the property of acids in their reaction with carbonates?

Acids react with carbonates to produce carbon dioxide gas.

10. What is the colour of copper chloride solution/copper sulphate solution?

Blue.

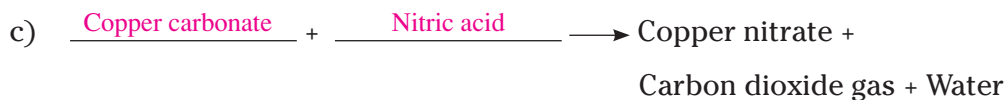
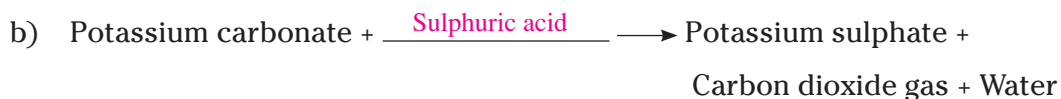
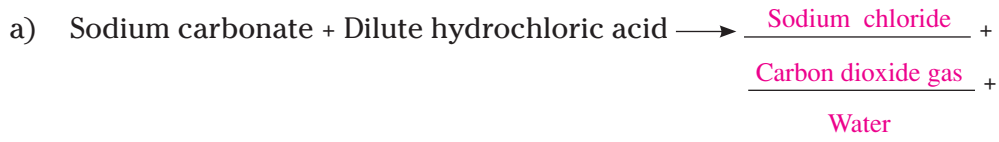
11. State the solubility of each of the carbonate provided.

Carbonate	Solubility
Copper carbonate	Insoluble
Calcium carbonate	Insoluble
Potassium carbonate	Soluble
Sodium carbonate	Soluble



Discussion

Complete the equations for the following reactions.



► Part B | Investigating the Presence of Carbonates in Common Substances Around Us

Some substances such as seashells, eggshell and baking powder contain carbonates. Design an experiment to investigate the presence of carbonates in these substances. You are also given a sample of unknown “substance X”. Find out whether “X” contains a carbonate.

1. List the steps you would carry out in your experiment.

2. Record your observations here.

3. What can you conclude from your experiment?



Discussion

1. What is the purpose of adding baking powder when baking a cake?

It produces bubbles of carbon dioxide gas, which expand during baking and help the cake to rise and become lighter.

2. Some buildings and stone statues are made of marble, which contains calcium carbonate. What happens to these buildings and statues when acid rain falls on them?

Calcium carbonate reacts with the acid rain and dissolves away. Hence, the buildings and stone statues become corroded.