

How acids, bases and salts behave

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

Two acids can have the same concentration and still behave very differently. This lab compares hydrochloric acid with ethanoic acid by measuring pH and the time magnesium takes to react, then asks you to explain the results using ionisation.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C4, IGCSE 7

Aim

To compare a strong acid with a weak acid of the same concentration by measuring pH and the rate of reaction with magnesium.

Equipment

- 0.100 mol/dm³ hydrochloric acid and 0.100 mol/dm³ ethanoic acid
- Two 100 cm³ beakers, two 10.0 cm³ measuring cylinders
- pH meter or universal indicator solution with a colour chart
- Magnesium ribbon, two pieces of 2.0 cm
- Stopwatch, safety goggles

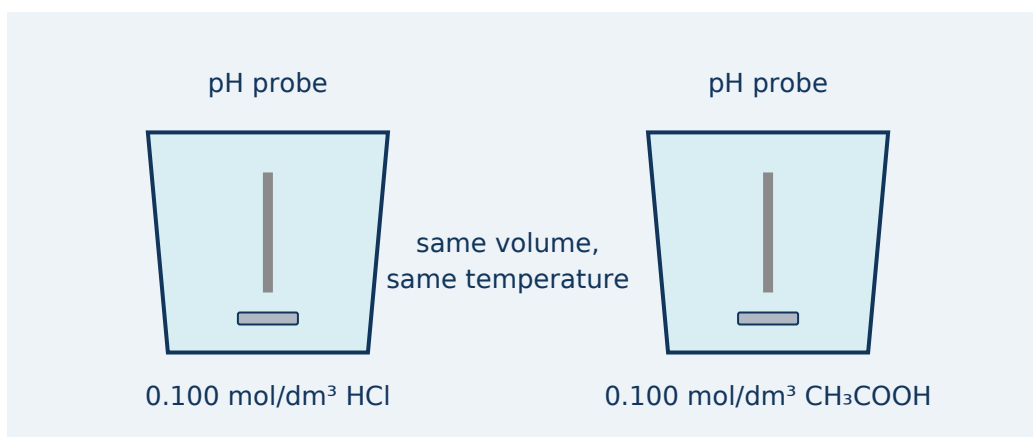
Safety

Safety

Wear goggles. The acids are dilute, but wash splashes with water. Hydrogen gas is flammable, so keep naked flames away. Rinse the probe between solutions.

Method

1. Measure 10.0 cm³ of hydrochloric acid into one beaker and 10.0 cm³ of ethanoic acid into the other.
2. Measure the pH of each acid and record it.
3. Drop a 2.0 cm piece of magnesium ribbon into the first beaker and start the stopwatch.
4. Stop the watch when the ribbon has disappeared and record the time.
5. Repeat with the second acid, using the same size of ribbon.
6. Record the brightness of bubbling as fast, slow or very slow.



The two acids are compared under identical conditions.

Results

Measurement	Hydrochloric acid	Ethanoic acid
pH of 0.100 mol/dm ³	1.0	2.9
Time for 2.0 cm Mg to disappear (s)	85	640
Bubbling	Vigorous	Slow
Volume of 0.100 mol/dm ³ NaOH to neutralise 10.0 cm ³ (cm ³)	10.0	10.0

Analysis questions

Question 1 Compare the pH

State which acid has the lower pH and which has more H⁺ ions.

Question 2 Hydrogen ion concentration

pH 1.0 means [H⁺] = 0.10 mol/dm³ and pH 2.9 means [H⁺] = 0.0013 mol/dm³. Calculate the percentage of ethanoic acid molecules that have ionised.

Question 3 Rate of reaction

Explain why magnesium reacts faster with hydrochloric acid.

Question 4 Equal neutralisation

Both acids need 10.0 cm³ of sodium hydroxide. Explain what this shows about the amount of acid in each beaker.

Question 5 Strong or concentrated

State why the experiment keeps the concentration the same.

Question 6 Control variables

Name three variables that must stay the same.

Question 7 Sources of error

Suggest two sources of error in the timing and how to reduce them.

Question 8 Extend the investigation

Describe how you would show that the weak acid still gives the same total amount of hydrogen.