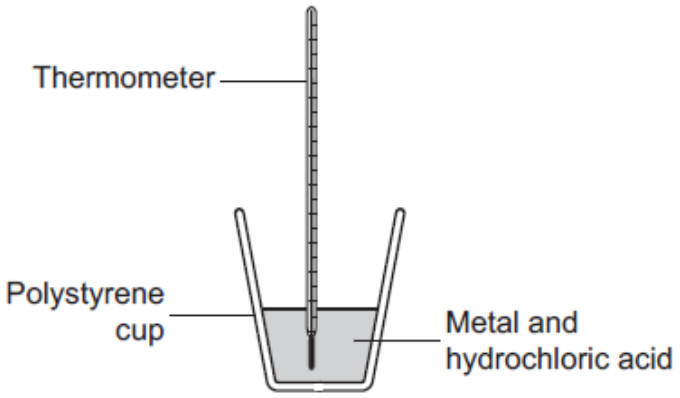
# GCSE Chemistry A (Gateway Science)

**J248/01** Chemistry A C1-C3 and C7 (Foundation Tier)

## Question Set 28

**1** A student investigates the reaction of different metals with hydrochloric acid.




**(a) (i)** The student notices that the **temperature rises** when a metal is added to the acid.

What name is given to this type of reaction when the temperature rises? **[1]**

exothermic

**(ii)** The metal magnesium reacts with hydrochloric acid, HC$l$, to form magnesium chloride, MgC$l_2$, and hydrogen.

Write a **balanced symbol** equation for this reaction. **[2]**

$2HCl + Mg \longrightarrow MgCl_2 + H_2$

**(iii)** The experiment is repeated with aluminium and hydrochloric acid.

Write down the **name** of the **salt** produced in this reaction. **[1]**

Aluminium chloride

**(b)** The student repeats the experiment with different metals.

She repeats the experiment three times for each metal.

She measures the temperature change in each experiment.

Look at her results.

| Metal | Temperature change (°C) | | |
|---|---|---|---|
| | Test 1 | Test 2 | Test 3 |
| **Magnesium** | 10.3 | 10.5 | 10.2 |
| **Zinc** | 8.6 | 8.7 | 7.6 |
| **Iron** | 5.2 | 4.9 | 5.1 |

**(i)** One of the student's results is anomalous.

Put a (ring) around the anomalous result in the table. **[1]**

**(ii)** Suggest a reason why the result could be anomalous. **[1]**

Didn't sufficiently stir the reactants compared to test 1 & 2

**(iii)** Calculate the **mean** temperature change for **magnesium**.

Give your answer to **1** decimal place.

$\frac{10.3 + 10.5 + 10.2}{3} = 10.3$

Mean temperature change = ..... 10.3 ..... °C **[2]**

**(c)** **(i)** The student wants to improve her experiment to get more **accurate** results.

Suggest an improvement to her experiment, which will give more accurate results.

Give a reason for the improvement.

Improvement ..... Place a lid with a small hole for thermometer .....

Reason ..... To reduce heat loss .....

**[2]**

**(ii)** The student concludes that the more reactive the metal is, the higher the temperature rise.

Describe further tests the student can do to confirm her conclusion. **[2]**

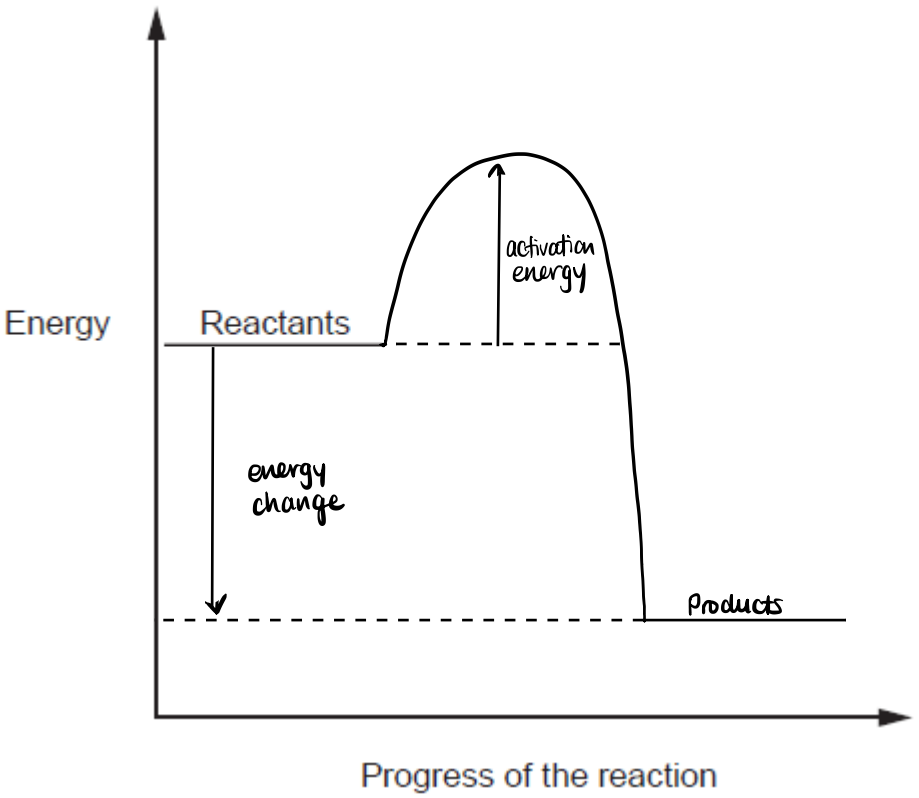
Add calcium (which is more reactive than magnesium) into acid and measure temperature change.

**(d)** A reaction profile shows the energy involved in a reaction.

Draw the reaction profile for the reaction between magnesium and hydrochloric acid.

Label the:

- products
- energy change
- activation energy.




**[3]**

## Total Marks for Question Set 28: 15