

## GCSE CHEMISTRY REQUIRED PRACTICAL

### TEMPERATURE CHANGES WHEN AN ACID IS NEUTRALISED BY AN ALKALI

**Risk assessment** - Safety goggles should be worn throughout.

#### **Apparatus**

- \* 2 M dilute hydrochloric acid
- \* expanded polystyrene cup and lid
- \* 10 cm<sup>3</sup> measuring cylinder
- \* thermometer.
- \* 2 M sodium hydroxide solution
- \* 250 cm<sup>3</sup> beaker
- \* 50 cm<sup>3</sup> measuring cylinder

#### **METHOD - Read these instructions carefully before you start work.**

1. Use the 50 cm<sup>3</sup> measuring cylinder to put 30 cm<sup>3</sup> dilute hydrochloric acid into the polystyrene cup.
2. Stand the cup inside the beaker. This will make it more stable.
3. Use the thermometer to measure the temperature of the acid. Record it in the first blank column of the table such as the one below.
4. Put 5 cm<sup>3</sup> sodium hydroxide solution into the 10 cm<sup>3</sup> measuring cylinder.
5. Pour the sodium hydroxide into the cup. Fit the lid and gently stir the solution with the thermometer through the hole. When the reading on the thermometer **stops changing**, write the temperature in the next space in the table.
6. Repeat steps **4** and **5** to add further 5 cm<sup>3</sup> amounts of sodium hydroxide to the cup. A total of 40 cm<sup>3</sup> needs to be added. The last few additions should produce a temperature fall rather than a rise.
7. Repeat steps **1–6** and record the results in the second blank column of the table.
8. Calculate the **mean** maximum temperature reached for each of the sodium hydroxide volumes. Record these means in the third blank column.

Total volume of sodium hydroxide added in cm <sup>3</sup>	Maximum temperature in °C		
	First trial	Second trial	Mean
0			
5			
10			
15			
20			
25			
30			
35			
40			

9. Plot a graph with:

- 'Mean maximum temperature in °C' on the y-axis
- 'Total volume of sodium hydroxide added in cm<sup>3</sup>' on the x-axis.

Draw two straight lines of best fit:

- one through the points which are increasing
- one through the points which are decreasing

Ensure the two lines are extended so they cross each other.

10. Use the graph to estimate how much sodium hydroxide solution was needed to neutralise 25 cm<sup>3</sup> dilute hydrochloric acid.