GCSE Required Practicals

Chemistry

How to write a method...just think of CIDER!

Control variables

Independent variable

Dependent variable

Equipment

Repeats

Chemistry Practical 4 | Temperature Changes

Investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals.

Investigation of the temperature changes which take place when an acid is neutralised by an alkali.

1. Use the 50 cm^3 measuring cylinder to put 30 cm^3 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^3 sodium hydroxide solution into the 10 cm^3 measuring cylinder.
5. Pour the sodium hydroxide into the cup. Fit the lid and gently stir the solution with the thermometer through the hole.
6. When the reading on the thermometer **stops changing**, write the temperature in the next space in the table.
7. Repeat steps **4** and **5** to add further 5 cm^3 amounts of sodium hydroxide to the cup. A total of 40 cm^3 needs to be added.
8. The last few additions should produce a temperature fall rather than a rise.
9. Repeat steps **1–6** and record the results in the second blank column of the table.
10. Calculate the **mean** maximum temperature reached for each of the sodium hydroxide volumes. Record these means in the third blank column.
11. Plot a graph with:
    'Mean maximum temperature in ºC' on the y-axis
    'Total volume of sodium hydroxide added in cm^3' on the x-axis.
12. Draw two straight lines of best fit:
    one through the points which are increasing
    one through the points which are decreasing.
13. Ensure the two lines are extended so they cross each other.
14. Use the graph to estimate how much sodium hydroxide solution was needed to neutralise 25 cm^3 dilute hydrochloric acid.

Can you find the cider?

1. Control
2. Independent
3. Dependent
4. Equipment
5. Repeats

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Extras

Students may need to be reminded to keep thermometer bulbs fully immersed whilst making measurements.

Additional guidance may need to be provided to students regarding the drawing of the two lines of best fit so that they intersect.

The solutions used are quite concentrated in order to produce reasonable temperature changes. 2M sodium hydroxide is particularly hazardous to the eyes. The risk assessment should take account of the ability and behaviour of the group and concentrations lowered if necessary. For example, $10cm^3$ portions of 1M sodium hydroxide could be substituted.

Total volume of sodium hydroxide added in cm³	Maximum temperature in °C		
	First trial	Second trial	Mean
0			
5			
10			
15			
20			
25			
30			
35			
40			