



### Your teacher may watch to see if you can...

- carefully control variables during investigations
- measure change accurately

### Aim

To investigate the effect of changing the temperature on the rate of reaction between sodium thiosulfate and hydrochloric acid, by observing a colour change in the solutions.

### Method

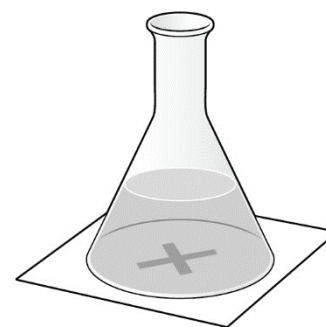
#### Apparatus

- |   |                               |
|---|-------------------------------|
| • eye protection                        | • test tube and rack          |
| • 250 cm <sup>3</sup> conical flask     | • water bath                  |
| • 10 cm <sup>3</sup> measuring cylinder | • white paper with cross      |
| • 50 cm <sup>3</sup> measuring cylinder | • sodium thiosulfate solution |
| • stop clock                            | • dilute hydrochloric acid    |

#### Safety

Wear eye protection at all times.  
Care is needed with acid solutions. Wash off splashes immediately.

- Decide on four temperatures between 20 °C and 50 °C, which you are going to investigate.
- Place 10 cm<sup>3</sup> of sodium thiosulfate solution and 40 cm<sup>3</sup> of water into a 250 cm<sup>3</sup> conical flask.
- Measure 5 cm<sup>3</sup> of dilute hydrochloric acid into a test tube.
- Clamp the conical flask in place in a water bath at your first chosen temperature. Place the test tube in a rack in the same water bath.
- Record your chosen temperature.
- After five minutes, remove the flask and place it on a piece of white paper marked with a cross, as shown opposite.
- Add the acid to the thiosulfate and start the stop clock.
- Looking down from above, stop the clock when the cross disappears.
- Note this time and the final temperature of the mixture.
- Repeat steps **A–I** for the other chosen temperatures.



### Recording your results

- Draw a table with two columns: one for average temperature, and the other for the time taken for the cross to disappear. Record the results of your experiments.

### Considering your results/conclusions

- Draw a scatter graph of your results, with temperature on the x-axis.) Draw a line of best fit.
- Describe how temperature affects the rate of the reaction.
  - Explain your answer to part **a** by referring to the shape of your graph.
- If the rate of reaction doubled, what would happen to the time taken for the cross to disappear?
- What temperature rise roughly doubles the rate of the reaction?
  - Use the values from your graph to explain your answer to part **a**.

### Evaluation

- Describe two possible sources of error in this investigation.
- Suggest a way of reducing one of these errors.