

# The effect of temperature on reaction rate

## Topic

Rate of reaction.

## Timing

60 min.

## Description

Sodium thiosulfate solution is reacted with acid, a precipitate of sulfur forms. The time taken for a certain amount of sulfur to form is used to indicate the rate of the reaction. The effect of temperature on the rate of reaction can be investigated.

## Apparatus and equipment (per group)

- 250 cm<sup>3</sup> Conical flask
- 10 cm<sup>3</sup> Measuring cylinder
- 50 cm<sup>3</sup> Measuring cylinder.

## Chemicals (per group)

- Sodium thiosulfate solution 40 g dm<sup>-3</sup>
- Hydrochloric acid 2 mol dm<sup>-3</sup> (**Irritant**).

## Teaching tips

The method for this experiment is best understood when the teacher demonstrates it first. The end-point can be measured with a light sensor connected to a data-logger.

A light sensor set up as a colorimeter can be used to monitor the precipitation on a computer – clamp a light sensor against a plastic cuvette filled with the reactants. The result, in the form of graphs on the computer, provides very useful material for analysis using data logging software. The software shows the change on a graph and this tends to yield more detail than the end-point approach used in this experiment. The rate of change can be measured from the graph slope or the time taken for a change to occur.

## Background theory

Basic collision theory.

## Safety

Wear eye protection. Sulfur dioxide (**Toxic gas**) forms as a by-product. Ensure good ventilation. If there are asthmatics in the class, the risk assessment should take this into account and necessary adjustments made, such as working in a fume cupboard, reducing the scale etc



As soon as the reaction is complete pour the solutions away, preferably into the fume cupboard sink. Wash away with plenty of water. This is particularly important with solutions used at higher temperatures.

An alternative, microscale version of this experiment can be used to minimise the exposure to SO<sub>2</sub>. See CLEAPSS® Guide, L195 Safer chemicals, safe reactions p.43: *A safer procedure for the thiosulfate/acid reaction* or the SSERC website (<http://www.sserc.org.uk/chemistry-resources/microscale-chemistry/1477-microscale-experiments/3915-thiosulphate-acid-reaction-microscale>)

## Credits

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*Health & safety checked January 2018*

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