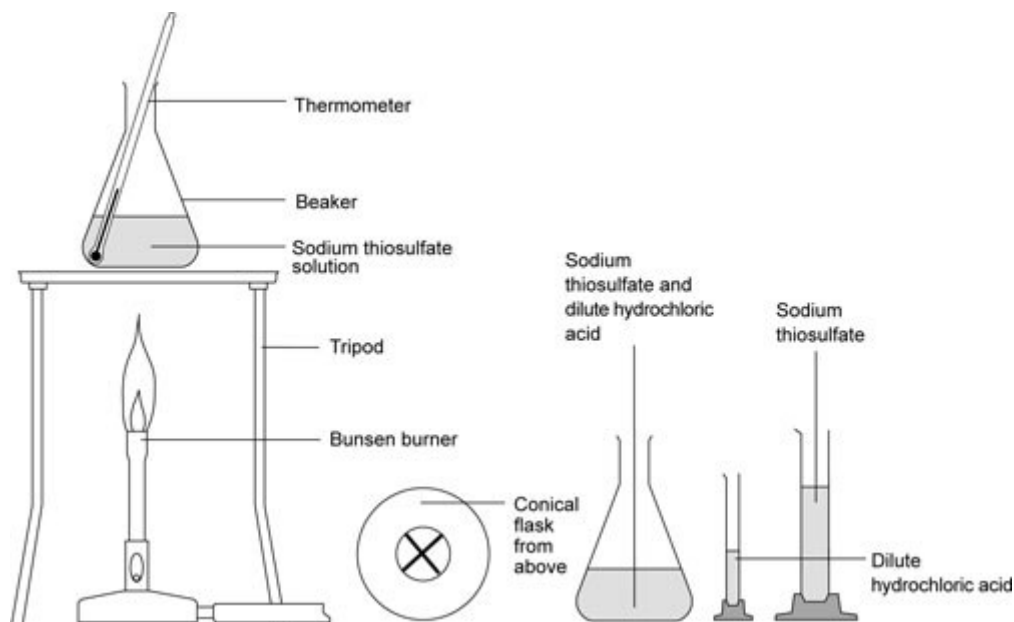## The effect of temperature on reaction rate – student sheet

Introduction

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.

Equipment

Apparatus

- Eye protection.
- Conical flask, 250 cm^3
- Measuring cylinder, 10 cm^3
- Measuring cylinder, 50 cm^3

Chemicals

- Sodium thiosulfate solution 40 g dm^{-3}
- Hydrochloric acid 2 mol dm^{-3}

Health, safety and technical notes

- Read our standard health and safety guidance here https://rsc.li/3iIGNVl
- Always wear eye protection.
- Ensure good ventilation, use fume cupboard if necessary.
- Sulfur dioxide is formed as a by-product, see CLEAPSS Hazcard HC097.
- For more information on sodium thiosulfate, see CLEAPSS Hazcards HC095a.
- Hydrochloric acid is an irritant, see CLEAPSS Hazcard HC047a.

Procedure

1. Put 10 cm^3 of sodium thiosulfate solution and 40 cm^3 of water into a conical flask. Measure 5 cm^3 of dilute hydrochloric acid in a small measuring cylinder.

2. Warm the thiosulfate solution in the flask if necessary to bring it to the required temperature. The object is to repeat the experiment five times with temperatures in the range 15–55 °C.
3. Put the conical flask over a piece of paper with a cross drawn on it.
4. Add the acid and start the clock. Swirl the flask to mix the solutions and place it on a piece of white paper marked with a cross. Take the initial temperature of the mixture
5. Look down at the cross from above. When the cross disappears, stop the clock and note the time taken. Record the final temperature of the mixture in the flask.
6. As soon as possible, pour the solution down the sink (in the fume cupboard if possible) and wash away.
7. Record your findings on the table provided.

Initial temperature of the mixture in the flask/°C	Final temperature of the mixture in the flask/°C	Average temperature of the mixture in the flask/°C	Time taken for the cross to disappear/s	1/time taken/s–1

Questions
1. For each set of results, calculate the value of 1/time. (This value can be taken as a measure of the rate of reaction for this experiment).
2. Plot a graph of 1/time on the vertical (y) axis and average temperature on the horizontal (x) axis.