

Chemistry

CHM3T/Q13/task

Unit 3T AS Investigative Skills Assignment

Task Sheet

To investigate how changes in the concentration of sodium thiosulfate solution affect its rate of reaction with dilute hydrochloric acid

An aqueous solution of sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) reacts slowly with dilute hydrochloric acid to form a precipitate of sulfur.

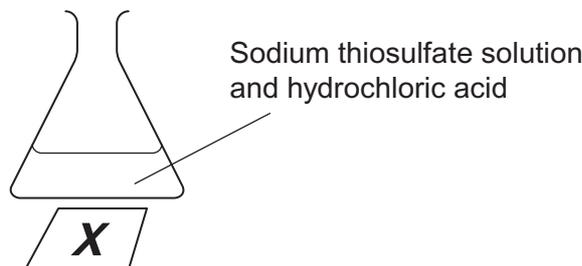
The rate of this reaction can be studied by measuring the time that it takes for a fixed amount of precipitate to form.

The fixed amount of precipitate is the amount needed for an **X** on a card to disappear from view.

A conical flask containing the mixture of sodium thiosulfate solution and hydrochloric acid is placed onto a piece of card that has been marked with an **X**.

The method involves timing how long it takes for the **X** to disappear when viewed from above the flask.

Observer viewing from above



The **X** disappears from view when the fixed amount of precipitate is formed during the following reaction between sodium thiosulfate and hydrochloric acid.



You are provided with a 0.20 mol dm^{-3} solution of sodium thiosulfate and 2.0 mol dm^{-3} hydrochloric acid.

In this task, you will do a series of experiments that use different concentrations of sodium thiosulfate solution.

Procedure

- **Wear eye protection at all times.**
- **Assume that all solutions are toxic and corrosive.**

Read **all** of the following procedure before you start.

- 1 Draw a table of your own design on your Candidate Results Sheet to record the concentration of $\text{Na}_2\text{S}_2\text{O}_3(\text{aq})$ and the time taken in each experiment.
- 2 Use the 50 cm^3 measuring cylinder to measure out 10 cm^3 of the 0.20 mol dm^{-3} sodium thiosulfate solution. Dilute this solution by adding deionised or distilled water up to the 50 cm^3 mark.
- 3 Pour the contents of the 50 cm^3 measuring cylinder into a clean 250 cm^3 conical flask.
- 4 Use the 10 cm^3 measuring cylinder to measure out 5 cm^3 of the 2.0 mol dm^{-3} hydrochloric acid. **Ask your teacher to check the volume in the measuring cylinder for one of your experiments.**
- 5 Add the hydrochloric acid to the sodium thiosulfate solution in the conical flask and **immediately** start the timer. Swirl the contents of the flask once to ensure mixing and place the flask onto the card marked with an **X**.
- 6 Observe the **X** from above and stop the timer as soon as the **X** disappears from view.
- 7 Measure the time taken (t) in **seconds** for the **X** to disappear from view. Record the time taken to the nearest whole number of seconds.
- 8 **You must dispose of the contents of the flask as instructed by your teacher.**
- 9 Repeat the experiment for the four other concentrations shown in the table. Make sure that you rinse the conical flask thoroughly with deionised or distilled water before each experiment. You do not need to dry the empty flask between each experiment.

Volume of $\text{Na}_2\text{S}_2\text{O}_3(\text{aq}) / \text{cm}^3$	10	20	30	40	50
Volume of water / cm^3	40	30	20	10	0
Concentration of $\text{Na}_2\text{S}_2\text{O}_3(\text{aq}) / \text{mol dm}^{-3}$	0.04	0.08	0.12	0.16	0.20

When you have recorded all of your results in your table, you are **not** required to do any further work in this Task.

You will use your results in **Section A** of the Written Test.

ISA CHM3T/Q13 Candidate Results SheetCentre Number

--	--	--	--	--

Teacher Group

Candidate Name Candidate Number

--	--	--	--

Results

Record your results in an appropriate table in the space below.

(8 marks)

For Teacher's use only			
M		R	
P		A	