**UNIT 5 PRACTICAL 1**

**Determining orders of reaction**

Aqueous thiosulphate ions react with aqueous acid as follows:

S2O32-(aq) + 2H+(aq) 🡪 S(s) + SO2(g) + H2O(l)

The rate of this reaction can be followed by observing the precipitation of sulphur. You can time how long it takes for a fixed amount of sulphur to appear – just enough to prevent a cross under the reaction mixture from being visible.

**Part 1 – finding the order of reaction with respect to Na2S2O3**

1. Pour 5 cm3 of 2.0 moldm-3 HCl into a 10 cm3 measuring cylinder, and then pour it into a conical flask
2. Pour 50 cm3 of 0.15 moldm-3 Na2S2O3 into a measuring cylinder.
3. Add the Na2S2O3 to the conical flask and immediately start the stopwatch. Record the time taken for the cross to disappear.
4. Repeat steps 1 – 3 but using different volumes of Na2S2O3 and water as shown in the table below. Mix the sodium thiosulphate and the water before adding them to the conical flask.
5. Complete the results table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experiment | Volume of S2O32-/cm3 | Volume of water/cm3 | Time taken/s | 1/time taken/s-1 |
| 1 | 25 | 0 |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

**Part 2 – finding the order of reaction with respect to HCl**

1. Repeat steps 1 – 3 but using the following volumes:

10 cm3 Na2S2O3

15 cm3 HCl

30 cm3 water

1. Repeat steps 1 – 3 but using different volumes of HCl and water in such a way that allows you to investigate the order of reaction with respect to HCl.
2. Complete the results table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experiment | Volume of HCl/cm3 | Volume of water/cm3 | Time taken/s | 1/time taken/s-1 |
| 1 | 15 | 30 |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

**Part 3 – Analysis**

1. Plot a graph of (1/time taken) against volume of Na2S2O3. Hence deduce the order of reaction with respect to Na2S2O3.
2. Plot a graph of (1/time taken) against volume of HCl. Hence deduce the order of reaction with respect to HCl.
3. Hence write the rate equation for the reaction.

**Equipment List per group**

1 x 10 cm3 measuring cylinder

1 x 50 cm3 measuring cylinder

3 x 100 cm3 beakers

Plain white paper

Stopclocks

2 moldm-3 HCl – 100 cm3 per group

0.15 moldm-3 Na2S2O3 – 500 cm3 per group

Dropping pipettes