**AS PRACTICAL 9 – THE EFFECT OF TEMPERATURE ON RATE OF REACTION**

Sodium thiosulphate reacts with hydrochloric acid as follows:

Na2S2O3(aq) + 2HCl(aq) 🡪 S(s) + SO2(g) + H2O(l)

The sulphur produced in this reaction forms a precipitate which turns the mixture opaque. The rate of this reaction can be monitored by measuring the time taken for a cross under the reaction mixture to cease to be visible.

The aim of this experiment is to investigate whether the statement “a 10 OC rise in temperature approximately doubles the rate of reaction” is true.

1. Set up three water baths at 30 OC, 40 OC and 50 OC and place stock solutions of 0.2 moldm-3 HCl and 0.2 moldm-3 Na2S2O3 in each water bath until they have reached the desired temperature.
2. Take a piece of filter paper and use a thick pen to draw an X on it.
3. Take a 100 ml conical flask and place it on top of the X on the filter paper.
4. Take a 50 cm3 measuring cylinder and label it “HCl”. Take another 50 cm3 measuring cylinder and measure it “Na2S2O3”.
5. From the 50 oC water bath, measure out 20 cm3 of Na2S2O3 into the labelled measuring cylinder and then pour it into the conical flask.
6. Measure out 20 cm3 of HCl into the other labelled measuring cylinder. Pour it into the conical flask and start the stopclock immediately.
7. Record the time taken for the cross to disappear.
8. Then record the temperature of the solution.
9. Rinse out the conical flask and repeat the experiment using solutions from the water baths at 40 oC, 30 oC at room temperature.
10. Plot a graph of time taken (on the y-axis) against temperature (on the x-axis)
11. Hence comment on the validity of the statement that “a 10 OC rise in temperature approximately doubles the rate of reaction”.
12. Calculate the percentage apparatus error in the first experiment you carried out.
13. State the controlled variables in this experiment.
14. State two ways in which the accuracy of this experiment could be improved.