

**Task 10: Chemical Kinetics Validation**

**Question/Answer Booklet**

**CHEMISTRY UNIT 2**

Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# TIME ALLOWED FOR THIS PAPER

Reading time for the paper: 3 minutes

Working time for the paper: 25 minutes

# MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER

**To be provided by the supervisor:**

This Question/Answer Booklet

Chemistry Data Book

**To be provided by the candidate:**

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, eraser, correction tape/fluid, ruler, highlighters

Special items: up to three non-programmable calculators approved for use in the WACE examinations

# IMPORTANT NOTE TO CANDIDATES

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further

Tiela was doing an experiment to determine the rate at which iodine was produced from iodide in an iodine clock reaction. Any iodine that was made would react with starch to slowly produce a dark blue colour that eventually became completely opaque and could not be seen through. Tiela’s incomplete table of results is shown below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Trial | Volume of 1.0M iodide solution (mL) | Total Volume (mL) | Concentration of iodide in final solution (mol L-1) | Time taken (s) | 1/time (s-1) |
| 1 | 5.0 | 50.0 |  | 100 |  |
| 2 | 15.0 | 50.0 |  | 34 |  |
| 3 | 20.0 | 50.0 |  | 25 |  |
| 4 | 30.0 | 50.0 |  | 15 |  |
| 5 | 35.0 | 50.0 |  | 12 |  |
| 6 | 45.0 | 50.0 |  | 9 |  |

1. Calculate the final concentration of iodide in the first trial. Round your answer to the appropriate amount of significant figures.(3 marks)
2. Calculate 1/time for the first trial. Round your answer to 2 significant figures.(3 marks)
3. Complete the above table.(2 marks)
4. Explain why we calculate and graph ‘1/time’ against concentration, rather than ‘time’. (1 mark)

1. Give one method Tiela could have used to ensure her experiment was repeatable.(1 mark)
2. Using the grid below, create a graph that showcases Tiela’s results. Make sure to draw a line of best fit.(5 marks)

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1. If the concentration of iodide is doubled, what happens to the rate of reaction? Interpolate data from your graph to provide specific evidence.(3 marks)

To conduct the experiment, Tiela wanted to ensure consistency of results. To make sure she was stopping the stopwatch at the same point of the reaction, she placed the conical flask on an ‘X’, and stopped timing when she could no longer see the ‘X’. Tiela began timing the reaction after the addition of the catalyst, giving the conical flask a quick swirl as the timer started. Tiela measured all of the volumes using measuring cylinders.

1. Note two (2) sources of random errors that could be present from Tiela’s methodology. How could she reduce each source of error?(4 marks)
2. Mark wanted to run a similar experiment to measure the rate of the decomposition of hydrogen peroxide according to the following equation:
3. Could Mark use the same method as Tiela to determine when the experiment was over (i.e., use the ‘X’ method as an end point)? Why or why not?(1 mark)
4. Describe another method that Mark could use to determine an ‘end point’ for the reaction.(2 marks)