**5.1.1 Exercise 1 - CONCENTRATION-TIME GRAPHS**

1. Sulphur dichloride dioxide, SO2Cl2, decomposes according to the equation:

SO2Cl2(g) 🡪 SO2(g) + Cl2(g)

In an experiment, the concentration of the reactant SO2Cl2 was measured over a period of time. The results are shown below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Time/s | 0 | 500 | 1000 | 2000 | 3000 | 4000 |
| [SO2Cl2]/moldm-3 | 0.50 | 0.43 | 0.37 | 0.27 | 0.2 | 0.15 |

Plot a graph to show how concentration varies with time and use your graph to calculate the rate of reaction:

1. Initially
2. After 1000 s
3. After 2500 s
4. Explain why the rate of reaction decreases with time.
5. Work out the rate of reaction when [SO2Cl2]= 0.25 moldm-3. Hence deduce the order of reaction with respect to SO2Cl2.
6. Hence write the rate equation, calculate a value for the rate constant and give its units.
7. Hydrogen peroxide, H2O2, decomposes according to the equation:

2H2O2(g) 🡪 2H2O(g) + O2(g)

In an experiment, the concentration of the reactant H2O2 was measured over a period of time. The results are shown below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Time/s | 0 | 15 | 30 | 60 | 100 | 180 |
| [H2O2]/moldm-3 | 0.40 | 0.28 | 0.19 | 0.07 | 0.03 | 0.01 |

Plot a graph to show how concentration varies with time and use your graph to calculate the rate of reaction:

1. Initially
2. After 20 s
3. After 90 s
4. Work out the rate of reaction when [H2O2]= 0.20 moldm-3. Hence deduce the order of reaction with respect to H2O2.
5. Hence write the rate equation, calculate a value for the rate constant and give its units.
6. The decomposition of nitrogen dioxide 2NO2(g) 🡪 2NO + O2(g) was measured and the following data was collected.

|  |  |
| --- | --- |
| Time, s | [NO2], moldm-3 |
| 0 | 0.0100 |
| 50 | 0.00787 |
| 100 | 0.00649 |
| 200 | 0.00481 |
| 300 | 0.00380 |
| 400 | 0.00318 |
| 500 | 0.00275 |
| 600 | 0.00234 |

Use the graph to determine the order of reaction with respect to nitrogen dioxide.