

Chemistry2, HW8

The rate of chemical reaction is determined by measuring the amount of reactant used or the amount of product formed in a certain period of time. Average rate = change in concentration/time

Units – mol/L s

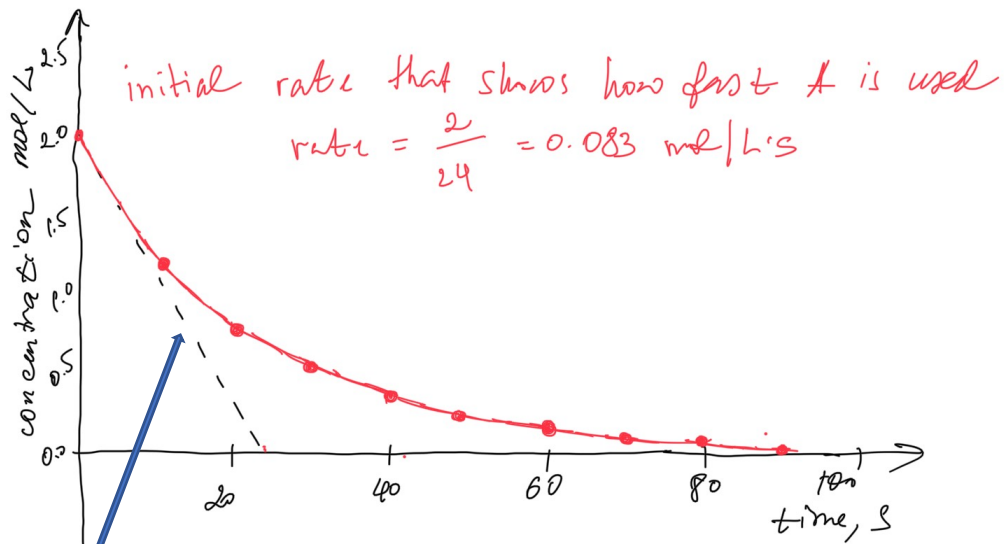
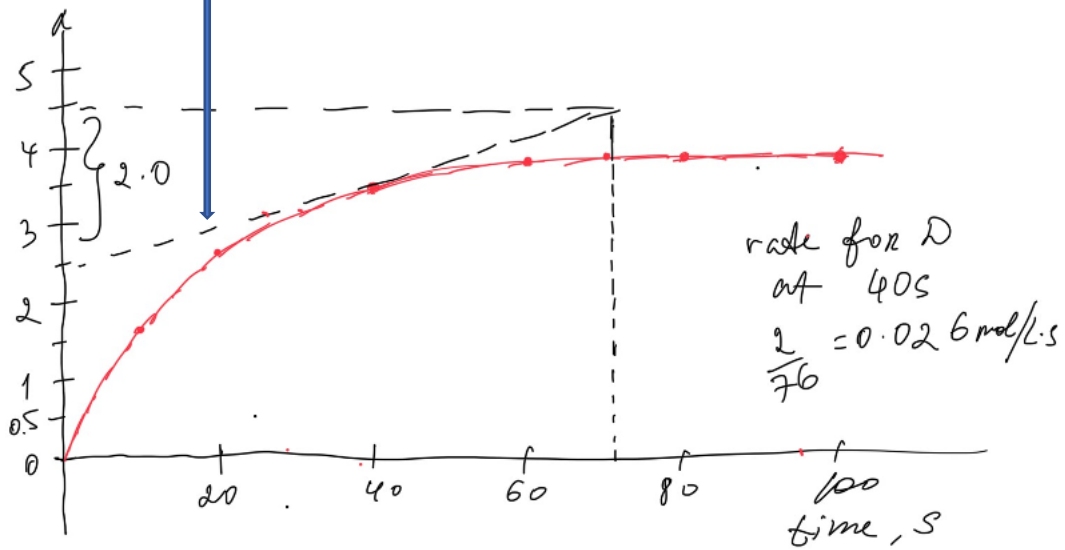
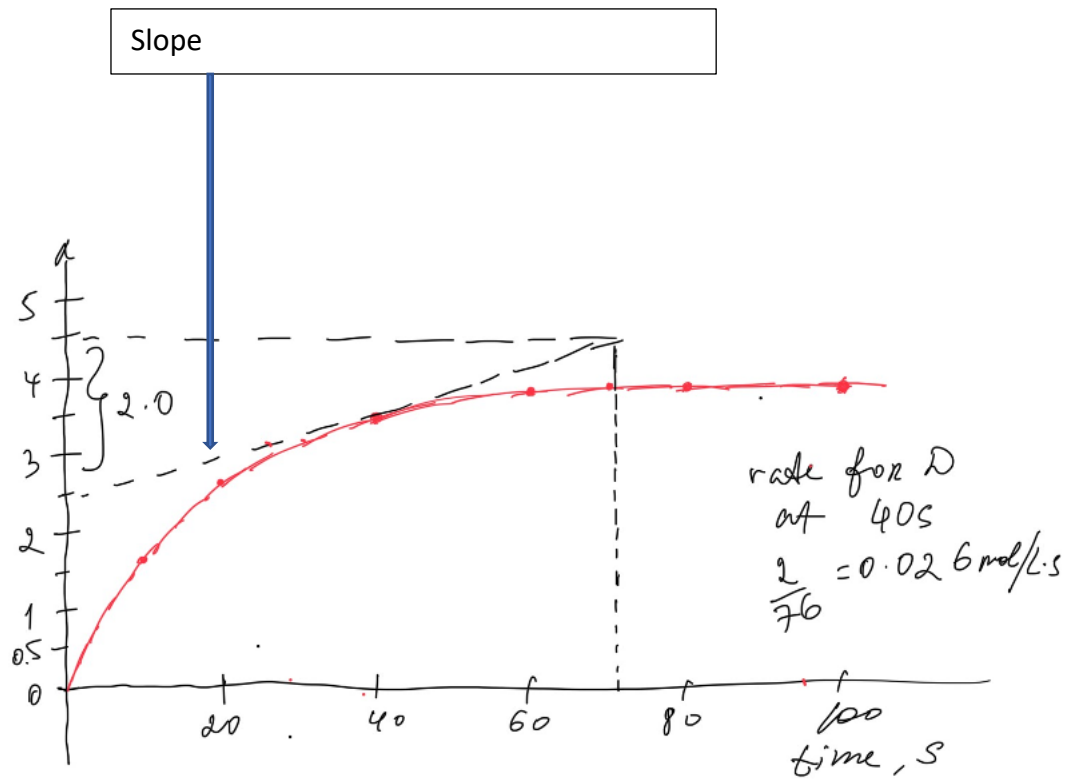
The rate of reaction at any time can be found from a graph of concentration against time and finding gradient (slope) of the tangent.

Let's consider reaction $A \rightarrow 2D$

We can monitor (we experimentally measure the concentration of the substances at particular times, we have several point on the graphs) the disappearance of A (lower graph) or production of D (upper graph) at different time points. Note that for this reaction, the rate at which D is produced is twice the rate at which A is used up. For example, if the rate of disappearance of A is 0.16 mol/L s, the rate of reaction with respect to D will be 0.32 mol/L s.

The rate of reaction at any time can be found from a graph of concentrations against time by drawing a tangent at the particular time. Tangent here - at any chosen point on the curve (our data points graphed) we draw a straight line that just touch the curve. Using this slope we can find the rate of the reaction at this particular time. On the upper graph we chose data point at 40 s. We can see that change in concentration for D is 2 mol/L s at this point (it started from 2.5 and ended at 4.5, look at the y axe), $t = 76$ s.

The lower graph shows how the concentration of A varies in the reaction over time. And it shows the slope that helps us to calculate the initial rate of the reaction. We draw the slope from the starting point of the graph.



Slope

Questions

1. How much grams of MgCl_2 in 100 ml of solution you have to dissolve to get 0.5 mol/L concentration of MgCl_2 ..

2. The following reaction was monitored $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$

The volumes of hydrogen gas were recorded at different times. The data:

| Time, s | Volume of gas/ cm^3 |
|---------|------------------------------|
| 0 | 0.0 |
| 15 | 18.6 |
| 30 | 32.2 |
| 45 | 44.3 |
| 60 | 54.8 |
| 75 | 62.7 |
| 90 | 68.4 |
| 105 | 72.6 |
| 120 | 74.9 |
| 135 | 75.4 |
| 150 | 75.6 |
| 165 | 75.6 |
| 180 | 75.6 |

Draw a graph of these data. How the rate of reaction change over time?

Calculate the initial rate of the reaction.

Calculate the rate of the reaction at 120 s.