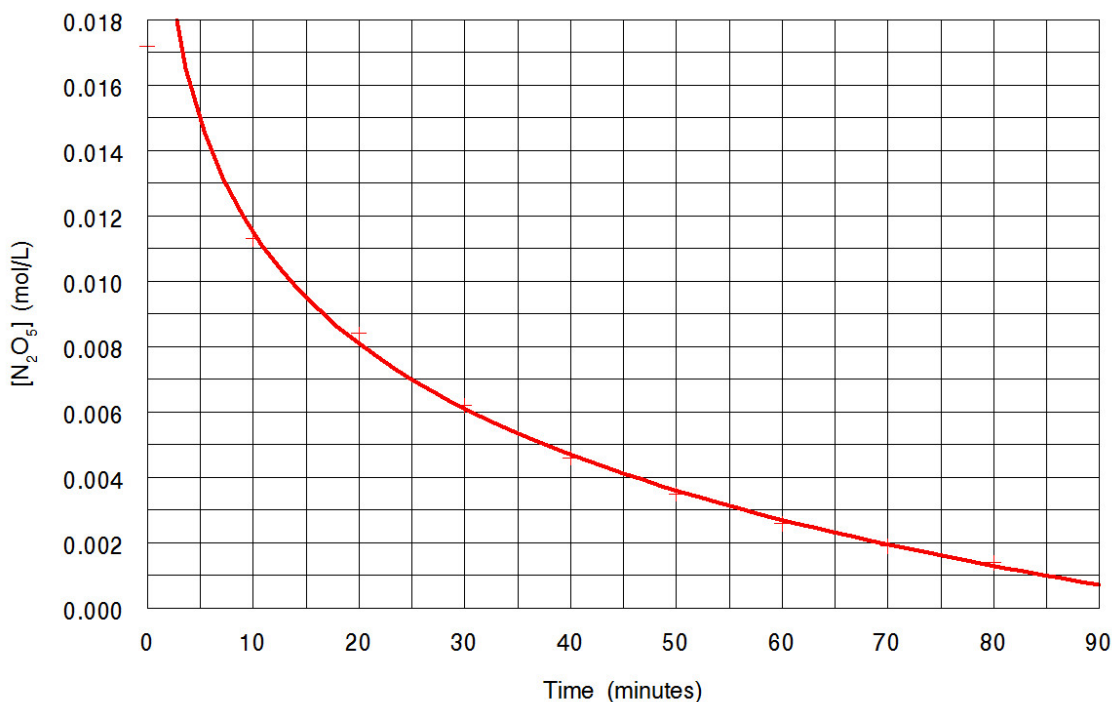


Kinetics Review

1. List 5 variables that could be used to monitor reaction rates.
2. The following data was collected for the reaction: $2 \text{N}_2\text{O}_5(\text{g}) \rightarrow 4 \text{NO}_2(\text{g}) + \text{O}_2(\text{g})$.



Determine the instantaneous rate of decomposition of N_2O_5 at $t = 30$ minutes.

3. For the reaction $4 \text{NH}_3(\text{g}) + 3 \text{O}_2(\text{g}) \rightarrow 2 \text{N}_2(\text{g}) + 6 \text{H}_2\text{O}(\text{g})$, it was found that at a certain time N_2 was being formed at a rate of 0.27 mol/Ls .
 - a) At what rate was water being formed?
 - b) At what rate was NH_3 being used up?
 - c) At what rate was O_2 being used up?
4. Use the collision theory to explain how the rate of chemical reactions is affected by surface area, concentration, and temperature.
5. Explain what is meant by activation energy.

6. Sketch and label potential energy diagrams for each of the following reactions.
- a) $A + B \rightarrow C + D$ $\Delta H = 60 \text{ kJ}$
- b) $E + F \rightarrow G + H$ $\Delta H = -40 \text{ kJ}$
7. Explain how a catalyst affects the reaction rate. Use a potential energy diagram in your explanation.
8. Explain what is meant by reaction mechanism and rate determining step.
9. The reaction between nitrogen monoxide and chlorine has the following mechanism.
- Step 1: $\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow \text{NOCl}_2(\text{g})$ (fast)
- Step 2: $\text{NO}(\text{g}) + \text{NOCl}_2(\text{g}) \rightarrow 2 \text{NOCl}(\text{g})$ (slow)
- a) Determine the net reaction.
- b) Indicate any intermediates in the reaction.
- c) Indicate the rate determining step.
10. The following initial rates were found for the reaction: $A + B \rightarrow \text{products}$

Trial	[A] (M)	[B] (M)	Rate (M/s)
1	0.20	0.10	0.00340
2	0.20	0.30	0.01020
3	0.40	0.30	0.04080