

Name: _____

CHM 112 Exam 1 Spring

Short Answer

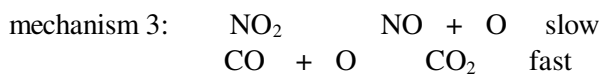
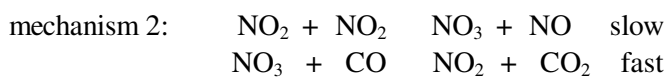
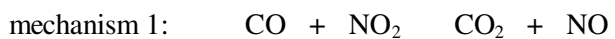
1. For a first-order reaction that has a rate constant of $6.9 \times 10^{-4} \text{ s}^{-1}$;
 - a) if the initial concentration of the only reactant is 0.25 M, what is the concentration after 8.4 min?
 - b) How long will it take for the concentration to decrease to 0.15 M?
 - c) How long will it take for the reaction to be 60% complete?

2. The rate constants for a reaction were determined at two temperatures. At 100.0 K the rate constant is $2.0 \times 10^3 \text{ s}^{-1}$, and at 500.0 K the rate constant is $4.07 \times 10^7 \text{ s}^{-1}$. Calculate the activation energy for the reaction.

3. The reaction between carbon monoxide and nitrogen dioxide has the experimentally determined rate law; rate = $k[\text{NO}_2]^2$



The following mechanisms have been proposed;



Which mechanism is most likely. Briefly explain your choice for each possibility

4. In a reversible reaction, the energy of activation for the forward reaction is 118 kJ/mol, and the energy of activation for the reverse direction is 217 kJ/mol. Sketch a reaction coordinate diagram. Label completely. What is the enthalpy, ΔH for the reaction?

5. In a kinetic study of the reaction;



the data for the initial rates;

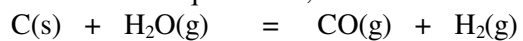
Initial concentrations (M)		Rate (M/s)
[NO]	[H ₂]	
6.4×10^{-3}	2.2×10^{-3}	2.6×10^{-5}
12.8×10^{-3}	2.2×10^{-3}	1.0×10^{-4}
6.4×10^{-3}	4.4×10^{-3}	5.1×10^{-5}

Obtain the rate law

What is the value of the rate constant?

6. The rate constant for a second-order reaction is $1.15/\text{M}$ at 25 degrees C. How long (seconds) will it take for the concentration of the single reactant to decrease from 0.55 M to 0.45 M?

7. Consider this equilibrium;



Which direction will this reaction go if;

- a) CO is added to the reaction mixture
- b) H₂O is condensed and removed from the reaction mixture
- c) C is added to the reaction mixture