

Kinetics and Reaction Rate

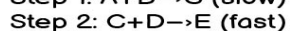
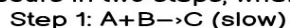
Name: _____

Date: _____

Answer each question in the blank space!

1. Reaction Mechanisms and Rate-Determining Steps

- a) A reaction occurs in two steps, where Step 1 is slow and Step 2 is fast:



Write the overall reaction equation and determine which step is the rate-determining step. Explain why this step limits the rate of the reaction.

- b) Based on the reaction mechanism above, propose a rate law for the reaction. Explain your reasoning, and describe any assumptions you make about the concentration of intermediate species.

2. Effect of Temperature on Reaction Rate

- a) Explain how the temperature of a system influences the rate of a chemical reaction, referencing the concept of collision theory.

- b) A reaction has an activation energy of 80 kJ/mol and follows first-order kinetics. If the rate constant doubles when the temperature is increased by 10°C, calculate the new temperature. Assume that the initial temperature is 298 K.

3. Complex Rate Laws and Integrated Rate Laws

- a) Derive the integrated rate law for a first-order reaction and show how it can be used to determine the concentration of a reactant over time.

- b) A reaction follows zero-order kinetics with an initial concentration of 0.8 M and a rate constant of 0.02 M/s. Calculate the time required for the concentration to drop to 0.2 M.