

7. Draw and label energy diagrams that depict the following reactions, and determine all remaining values. Place the reactants at energy level zero.
- $\Delta E_{\text{forward}} = -10 \text{ kJ/mol}$   $E_a' = 40 \text{ kJ/mol}$
  - $\Delta E_{\text{forward}} = -95 \text{ kJ/mol}$   $E_a = 20 \text{ kJ/mol}$
  - $\Delta E_{\text{reverse}} = -40 \text{ kJ/mol}$   $E_a' = 30 \text{ kJ/mol}$
- If the initial concentrations of both A and B are 0.30 M, at what initial rate is C formed?
  - What is the order of the reaction with respect to A?
  - What is the order of the reaction with respect to B?

## Reaction Rate

### SECTION 2 REVIEW

- Define the rate-determining step for a chemical reaction.
- Write the general equation for the rate law, and label the various factors.

### PRACTICE PROBLEMS

- Determine the overall balanced equation for a reaction that has the following proposed mechanism, and write an acceptable rate law. (Hint: See Sample Problem C.)  
**Step 1:**  $\text{B}_2 + \text{B}_2 \longrightarrow \text{E}_3 + \text{D}$     slow  
**Step 2:**  $\text{E}_3 + \text{A} \longrightarrow \text{B}_2 + \text{C}_2$     fast
  - Give the order of the reaction with respect to each reactant.
  - What is the overall order of the reaction?
- A reaction that involves reactants A and B is found to occur in the one-step mechanism:  $2\text{A} + \text{B} \longrightarrow \text{A}_2\text{B}$ . Write the rate law for this reaction, and predict the effect of doubling the concentration of either reactant on the overall reaction rate. (Hint: See Sample Problem C.)
- A chemical reaction is expressed by the balanced chemical equation  $\text{A} + 2\text{B} \longrightarrow \text{C}$ . Three reaction-rate experiments yield the following data.

Experiment number	Initial [A]	Initial [B]	Initial rate of formation of C
1	0.20 M	0.20 M	$2.0 \times 10^{-4} \text{ M/min}$
2	0.20 M	0.40 M	$8.0 \times 10^{-4} \text{ M/min}$
3	0.40 M	0.40 M	$1.6 \times 10^{-3} \text{ M/min}$

- Determine the rate law for the reaction.
- Calculate the value of the specific rate constant.

### MIXED REVIEW

- Draw and label energy diagrams that depict the following reactions, and determine all remaining values. Place the reactants at energy level zero.
  - $\Delta E = +30 \text{ kJ/mol}$   $E_a' = 20 \text{ kJ/mol}$
  - $\Delta E = -30 \text{ kJ/mol}$   $E_a = 20 \text{ kJ/mol}$
- A particular reaction is found to have the following rate law.  

$$R = k[\text{A}][\text{B}]^2$$
 How is the rate affected by each of the following changes?
  - The initial concentration of A is cut in half.
  - The initial concentration of B is tripled.
  - The concentration of A is doubled, but the concentration of B is cut in half.
  - A catalyst is added.
- For each of the following pairs, choose the substance or process that you would expect to react more rapidly.
  - granulated sugar or powdered sugar
  - zinc in HCl at 298.15 K or zinc in HCl at 320 K
  - 5 g of thick platinum wire or 5 g of thin platinum wire
- The following data relate to the reaction  $\text{A} + \text{B} \longrightarrow \text{C}$ . Find the order with respect to each reactant.

[A] (M)	[B] (M)	Rate (M/s)
0.08	0.06	0.012
0.08	0.03	0.006
0.04	0.06	0.003