1. The forward activation energy for a reaction is 60 kJ/mol. If ΔE for the reaction is 45 kJ/mol, what is the activation energy for the reverse reaction?

2. What factors affect the rate constant for a reaction?

3. The rate constants for a certain second order reaction are $3.20 \times 10^{-2}$ 1/M s at 24 °C and $9.45 \times 10^{-1}$ 1/M s at 150 °C.
   a. Calculate the activation energy for the reaction.
   
b. What is the rate constant at 100 °C?
4. The activation energy for the reaction \( \text{H}_2 (g) + \text{I}_2 (g) \rightarrow 2 \text{HI} (g) \) is changed from 184 kJ/mol to 59.0 kJ/mol both at 600. K by the introduction of a Pt catalyst. Calculate the ratio of the catalyzed rate to the un-catalyzed rate. Assume \( A \) is constant.

5. Given the following mechanism:
   \[
   \begin{align*}
   \text{H}_2\text{O}_2 & \rightarrow \text{H}_2\text{O} + \text{O} \\
   \text{O} + \text{CF}_2\text{Cl}_2 & \rightarrow \text{ClO} + \text{CF}_2\text{Cl} \\
   \text{ClO} + \text{O}_3 & \rightarrow \text{Cl} + 2 \text{O}_2 \\
   \text{Cl} + \text{CF}_2\text{Cl} & \rightarrow \text{CF}_2\text{Cl}_2
   \end{align*}
   \]
   a. Write the overall equation for the reaction?
   b. Identify the reaction intermediate(s).
   c. Identify the catalyst.

6. Derive a rate law given the following reaction mechanism:
   \[
   \begin{align*}
   \text{Cl}_2 & \rightleftharpoons 2 \text{Cl} \quad \text{(fast equilibrium)} \\
   \text{Cl} + \text{CO} & \rightleftharpoons \text{COCl} \quad \text{(fast equilibrium)} \\
   \text{COCl} + \text{Cl}_2 & \rightarrow \text{COCl}_2 + \text{Cl} \quad \text{(Slow)} \\
   2\text{Cl} & \rightarrow \text{Cl}_2 \quad \text{(Fast)}
   \end{align*}
   \]