1. A catalyst lowers an $E_{a,f}$ from 358 kJ mol$^{-1}$ to 350. kJ mol$^{-1}$ for a particular reaction. Determine the change (if any) in the:
   (a) $\Delta E$ for the reaction and
   (b) $E_{a,r}$ for the reaction.

   (a) **A catalyst does not affect the $\Delta E$ for the reaction. The $\Delta E$ is a State Function (i.e. independent of path).**
   (b) **The $E_{a,r}$ is also lower by 8 kJ.**

2. (a) Draw a reaction coordinate diagram with “potential energy (P.E.)” on the Y-axis and “Reaction Coordinate ->” on the X-axis for an endothermic reaction.
   (b) Show as a solid line, the activation energy barrier for the uncatalyzed reaction, and show as a dashed line, the activation energy barrier for the catalyzed reaction.
   (c) Label the diagram with “products”, “reactants,” and “$\Delta E$.”

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**Additional Book Problems:**

Atkins and Jones, Chemical Principles, fifth edition:

Chapter 14.16, problem 14.95