IV. A) (5 pts) Which reaction will be faster? Briefly explain why. What mechanism is occurring? If you expect no significant difference in the reaction rates, say so.

a. \[
\begin{array}{c}
\text{Cl} \\
\text{Cl}
\end{array}
\xrightarrow{\text{NaCN}}
\begin{array}{c}
\text{NC} \\
\text{Cl}
\end{array}
\]
mechanism name?
which is faster (a, b or neither)?
explain.

b. \[
\begin{array}{c}
\text{Cl} \\
\text{Cl}
\end{array}
\xrightarrow{\text{NaCN}}
\begin{array}{c}
\text{CN}
\end{array}
\]

B) (5 pts) Which reaction will be faster? Briefly explain why. What mechanism is occurring? If you expect no significant difference in the reaction rates, say so.

a. \[
\begin{array}{c}
\text{CH}_3\text{CH}_2\cdot\text{CH}\cdot\text{CH}_3 \\
\text{Br}
\end{array}
\xrightarrow{\text{CH}_3\text{OH}}
\begin{array}{c}
\text{CH}_3\text{CH}_2\cdot\text{CH}\cdot\text{CH}_3 \\
\text{OCH}_3
\end{array}
\]
mechanism name?
which is faster (a, b or neither)?
explain.

b. \[
\begin{array}{c}
\text{CH}_3\text{CH}_2\text{CH}_2\cdot\text{CH}_2 \\
\text{Br}
\end{array}
\xrightarrow{\text{CH}_3\text{OH}}
\begin{array}{c}
\text{CH}_3\text{CH}_2\text{CH}_2\cdot\text{CH}_2 \\
\text{OCH}_3
\end{array}
\]

C) (6 pts) Draw the Transition State(s) for this S_N2 reaction: \( \text{CH}_3\text{CH}_2\text{I} + \text{HO}^- \rightarrow \text{CH}_3\text{CH}_2\text{OH} + \text{I}^- \)

D) (8 pts) Refer to the given Energy vs. POR diagram to answer the following questions.

A) Place the letter A at the position of the transition state for the rate-determining step.

B) Place the letter B at the intermediate(s).

C) Indicate with the letter C the activation energy (E_a) for the 2nd step of the mechanism.

D) What is the sign of the overall \( \Delta H \) of the reaction?