1. A new drug called *Ochemisfun* is being tested for its enantiomeric purity in the labs. The enantiopure specific rotation of (-)*-Ochemisfun* at 25° C is known to be -15° ([α]$_{D}^{25}$).

   a. What is the observed rotation for a solution of *Ochemisfun* containing 0.84 g (+)-*Ochemisfun* and 0.02 g (-)*-Ochemisfun* in 100 mL of solvent. Assume a 1 dm cell.

   b. If a solution has a specific rotation of -7.2°, what is the stereochemical composition (% (-)*-Ochemisfun* and (+)-*Ochemisfun*) of this mixture.

2. Suppose *Ochemisfun* is known to work best only when it is the pure chiral compound. As a member of the lab that is testing the effects of *Ochemisfun* you are asked to find the specific rotation of the enantiopure drug, but you only have at hand a solution that is 95% of the (+)-enantiomer and 5% of the (-)-enantiomer. You measure the specific rotation of this solution to be -30.1°. What is the specific rotation of a solution of pure (-)*-Ochemisfun*?
3. Identify the type of organic reactions below (addition, elimination, or substitution)

a.

\[ \begin{align*}
\text{H} & \text{H} & \text{Br} & \text{H} \\
\text{H} & \text{H} & \text{H} & \text{H} \\
\end{align*} \]

\[ \begin{align*}
\text{O} & \text{C} & \text{H}_3 \\
\end{align*} \]

\[ \begin{align*}
\text{H} & \text{C} & \text{C} & \text{H} \\
\text{H} & \text{C} & \text{C} & \text{H} \\
\text{O} & \text{H} & \text{C} & \text{H}_3 \\
\end{align*} \]

\[ \begin{align*}
\text{Br}^{-} \\
\end{align*} \]

b.

\[ \begin{align*}
\text{C} & \text{H} & \text{H} \\
\text{C} & \text{H} & \text{H} \\
\text{Cl} & \text{H} & \text{H} \\
\end{align*} \]

\[ \begin{align*}
\text{O} & \text{C} & \text{H}_3 \\
\end{align*} \]

\[ \begin{align*}
\text{C} & \text{C} & \text{H} \\
\text{C} & \text{C} & \text{H} \\
\end{align*} \]

\[ \text{HCl} \]

c.

\[ \begin{align*}
\text{Cl} & \text{H}_3 \\
\end{align*} \]

\[ \begin{align*}
\text{F}^{-} \\
\end{align*} \]

\[ \begin{align*}
\text{F} & \text{H}_3 \\
\end{align*} \]

d.

\[ \begin{align*}
\text{H} & \text{C} & \text{C} & \text{H} \\
\end{align*} \]

\[ \begin{align*}
\text{H} & \text{C} & \text{C} & \text{H} \\
\end{align*} \]

\[ \begin{align*}
\text{H} & \\
\end{align*} \]
4. Complete the organic reaction below. Be sure to use the correct arrow type (fish hook vs double headed).

\[
\begin{array}{c}
\text{H} \\
\text{C} \\
\text{H}
\end{array} + \text{H} - \text{Cl} \rightarrow \text{Product}
\]

5. Given the reaction below, label the following 2 step energy diagram with:
   a. reactants
   b. products
   c. transition state(s)
   d. intermediate(s)
   e. Total change in enthalpy of the reaction
   f. Activation energies
   g. Determine which step is the rate limiting step

\[
\text{Cl-C(CH}_3\text{)}_3 + \text{OH}^- \rightarrow \text{C(CH}_3\text{)}_3 + \text{OH}^- + \text{Cl}^- \rightarrow \text{HO-C(CH}_3\text{)}_3
\]