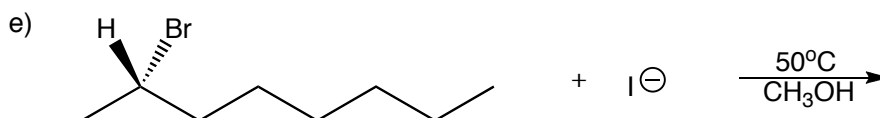
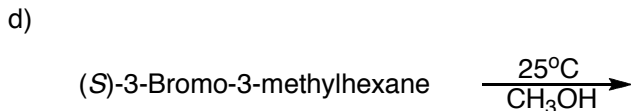
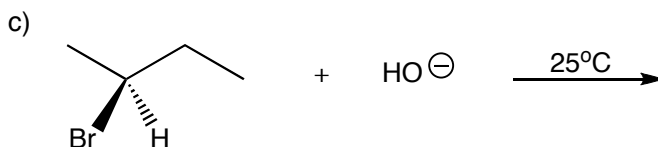
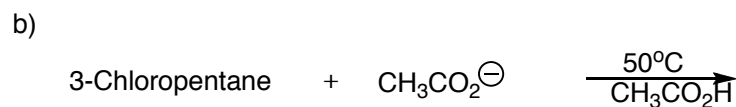
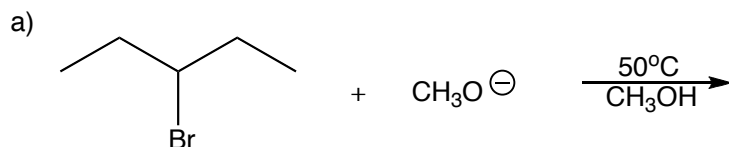
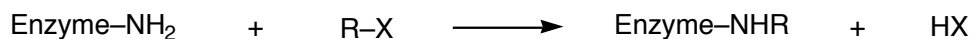


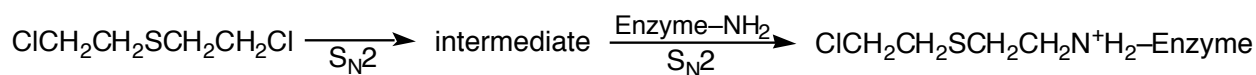
1. Predict the major product (or products) for each of the following reactions? In each part give the mechanism (S_N1 , S_N2 , E1, or E2) by which each product is formed.



2. Many biochemical processes occur by reaction pathways analogous to those carried out in the laboratory. Some toxic compounds are very good S_N2 substrates because they transfer alkyl groups to enzymes, thus deactivating them.



Mustard gas is an infamous toxic thioalkylating agent, $\text{ClCH}_2\text{CH}_2\text{SCH}_2\text{CH}_2\text{Cl}$, that was responsible for 500,000 casualties in World War I. The overall reaction for mustard gas with an enzyme is as follows, and requires **two** S_N2 reactions and proceeds through an intermediate cation.



Use curved arrows to clearly show **both** S_N2 reactions and identify the intermediate.