Part A

1A. Optically pure (S)-3-bromo-3-methylhexane is treated with water and a substitution reaction forms an alcohol. Write the structure of the alcohol and describe the stereochemistry of the product.

1B. (S)-2-chlorobutane is allowed to react with NaI in a polar aprotic solvent, to yield a substitution product. Write the structure of the product and describe the stereochemistry of the product.

1C. Use the curved arrow formalism and equations to describe the mechanism for the reaction of ethyl bromide with potassium cyanide in acetone solution.

For each reaction above, indicate which starting material is: (1) the nucleophile, (2) the electrophilic substrate, and (3) whether the reaction condition is best described as acidic, basic, or neutral.

Part B: Complete the reactions by drawing structures of major products. Indicate important minor products. If no reaction occurs, write NR after the arrow.
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\begin{align*}
\text{CH}_3\text{-CH}_2\text{-Br} & \xrightarrow{\text{NaSCH}_3} \\
\text{OH} & \xrightarrow{\text{HBr}} \\
\text{CH}_3\text{-CH-CH}_3 & \\
\text{i-Pr-Cl} & \xrightarrow{\text{KCN}} \\
e & \xrightarrow{\text{OH / H}_2\text{O}} \text{room temp} \\
\text{i-Pr-Cl} & \xrightarrow{\text{KOH / alcohol}} \text{heat} \\
\text{Br} & \xrightarrow{\text{KCN}} \\
\text{CH}_3 & 
\end{align*}
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