Use curved arrows (with proper orientation AND clarity) to demonstrate a reasonable mechanism where asked. Place products of the reactions shown in the boxes

1a) Draw Product A in the box (5 pts)

\[
\begin{array}{c}
\text{H} \\
\text{H} \\
\text{O} \\
(\text{CH}_3)_2\text{NH} \\
\text{cat. HCl}
\end{array}
\xrightarrow{}
\begin{array}{c}
\text{Product A}
\end{array}
\]

1b) Write out a reasonable, detailed mechanism to product A in space below. (5 pts)

1c) Write out (in space below) the mechanism of the reaction between Product A and cyclohexanone. (4 pts) Write the product in the box below. (1 pt)

\[
\begin{array}{c}
\text{O}
\end{array}
\xrightarrow{\text{Product A}}
\begin{array}{c}
\text{Product A}
\end{array}
\]

Rxn contains HCl

(1 pt)

1d) Explain briefly, using a structural diagram and words, why the reaction (above) terminates after 1 round. (5 pts)
2a) Draw Product B in the box. (5 pts)

\[ \text{O} \quad \text{Br} \quad \text{Zn}^\circ \]

Product B

2b) Write out a reasonable, detailed mechanism to product B for the _______________ reaction (1 pt, fill in the named rxn) space below. (4 pts)

\[ \text{H}_2\text{O} \]

2c) Write out (in space below) the mechanism of the reaction between Product B and acrylaldehyde \( \text{H}_2\text{C}=\text{O} \) (4 pts). Write the product in the box below (1 pt).

\[ \text{1) Product B} \quad \text{2) H}_2\text{O} \quad \text{work up} \]

(1 pt)

2d) The following reaction is done at -80 °C, explain why. In addition, explain why it is better to add dropwise the nucleophile (lithium enolate) to a solution of the electrophile (aldehyde). (5 pts)

\[ \text{Li} \quad \text{O} \]

\[ \text{H} \]

\[ \text{SHOW THE LITHIATED INTERMEDIATE} \]

\[ \text{USE DASHED AND SOLID LINES TO SHOW} \]

\[ \text{LITHIUM COORDINATION IN PRODUCT} \]