1. Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Denote all intermediates, lone pairs, nonzero formal charges, countercharges, and reversibility or nonreversibility. Describe clearly why only a catalytic amount of the weak acid, HZ, is required. Finally, state what would occur if an excess of a strong acid was used instead of a weak acid.

\[
\begin{align*}
H_3C\text{-}CH\text{-}CH\text{-}CH\text{-}CH\text{-}CH_3^\ddagger + H_2O \quad &\xrightarrow{\text{cat. HZ}}\quad H_3C\text{-}CH\text{-}CH\text{-}CH\text{-}CH\text{-}CH_3\text{NH}_2^\ddagger + H_2O^\ddagger \\
\end{align*}
\]

2. Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Denote all intermediates, lone pairs, nonzero formal charges, countercharges, and reversibility or nonreversibility. State why a cyclic structure is formed, instead of an acyclic acetal, formed by the reaction of two moles of methanol per mole of the δ-hydroxyaldehyde starting material. Also, describe clearly why only a catalytic amount of phosphoric acid is required.

\[
\begin{align*}
\text{HO-CH-CH-CH-CH-CH}_3^\ddagger + H_3C\text{OH} \quad &\xrightarrow{\text{cat. HOPOH}}\quad \text{HOPOH} + H_2O^\ddagger \\
\end{align*}
\]