1. Match each compound with its IR spectrum.

For A, steric hinderance prevents H-bonding. Thus, the OH stretch is sharp.

The syntheses in problems 2-4 all give racemic products

2) \[
\text{O} \quad \text{LiAlH}_4 \quad \text{LiAlH}_4 \text{ is a strong reducing agent, and reduces both esters and ketones}
\]

3) \[
\text{O} \quad \text{NaBH}_4 \quad \text{NaBH}_4 \text{ only reduces the ketone}
\]

4) epoxidation is selective for the more substituted alkene

reduction at the more sterically accessible center
5) Propose a multistep synthesis

Retrosynthesis: this is your scratch work! We find that there is more than one possibility

(This type of arrow \( \Longrightarrow \) refers to a "backwards" transformation)

Points about the above retrosynthesis

• Path \( a \) is better than \( b \) because it is shorter, and because it uses an allylic bromide rather than a secondary bromide (we expect a better yield with the more reactive allylic bromide in an \( S_N2 \) reaction).

• We worked our way back to a 5 carbon intermediate epoxide, because we knew that this could be constructed from our starting alkene.

The forward synthesis: (this is your formal answer!)

\[ \text{(MCPBA)} \]

1) NaH
2) \( \stackrel{\text{Br}}{\text{CH}} \)

\[ \text{note: NaH is being used as a base to deprotonate the alcohol} \]

\[ \text{OH} \xrightarrow{\text{NaH}} \text{O}^{-} \text{Na}^{+} \]