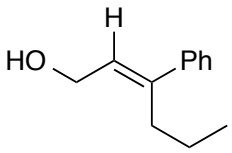
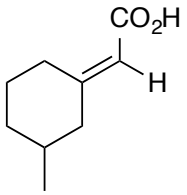
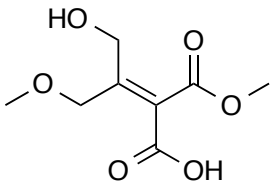
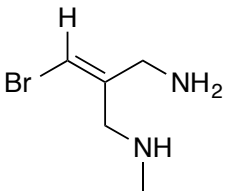
Designate each alkene below as *E* or *Z*.



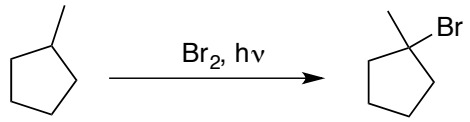


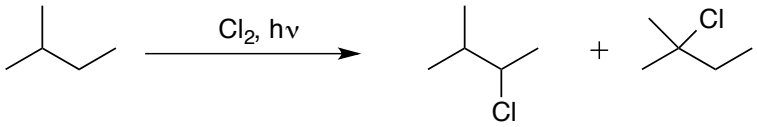


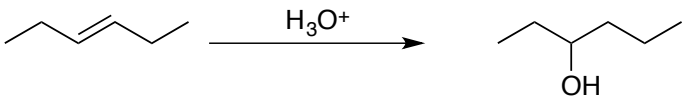


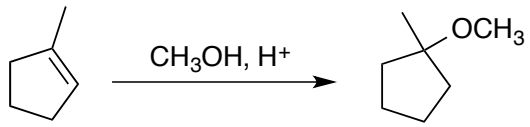
Clearly provide the mechanisms for the following reactions. Your mechanism *must show:*

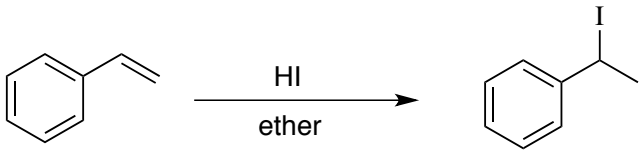
- Proper arrows to show all electron motion
- The structure of all intermediates including stereochemistry where appropriate



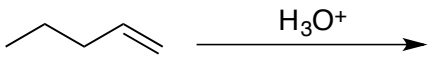




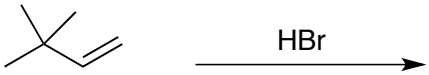




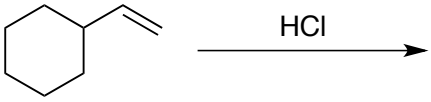
Show the **major product(s)** for each of the following reactions. Clearly indicate the *stereochemistry* in your structures where appropriate. Where more than one stereoisomer is formed you only need to draw one of the stereoisomeric products. Other stereoisomers should be indicated by writing, *"+ enantiomer"* or "+ *diastereomer",* as appropriate. **Check the boxes** on the right to indicate whether the reaction product solution would be optically active or not optically active.



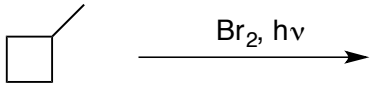
$[\alpha]_D = 0$ ☐ $[\alpha]_D \neq 0$ ☐



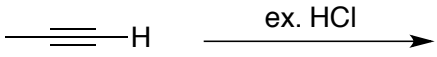
$[\alpha]_D = 0$ ☐ $[\alpha]_D \neq 0$ ☐



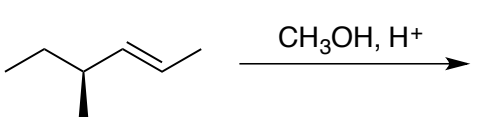
$[\alpha]_D = 0$ ☐ $[\alpha]_D \neq 0$ ☐



$[\alpha]_D = 0$ ☐ $[\alpha]_D \neq 0$ ☐



$[\alpha]_D = 0$ ☐ $[\alpha]_D \neq 0$ ☐



$[\alpha]_D = 0$ ☐ $[\alpha]_D \neq 0$ ☐