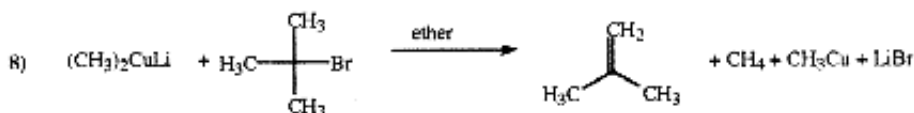
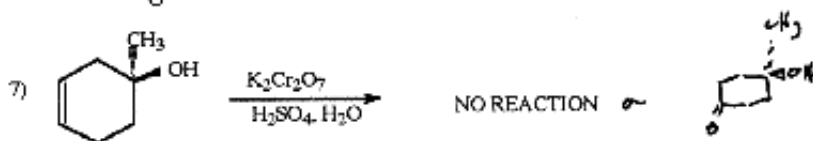
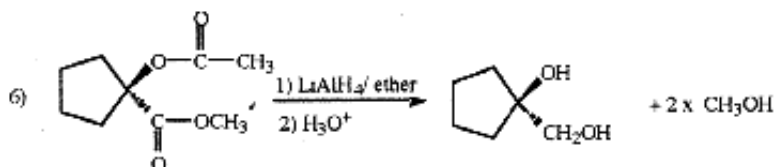
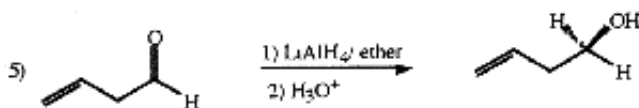
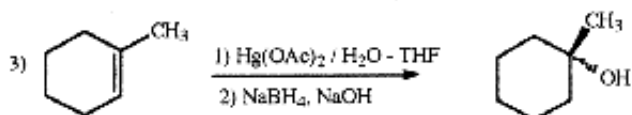
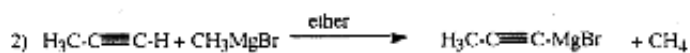
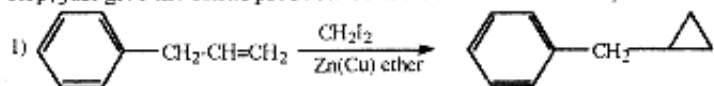
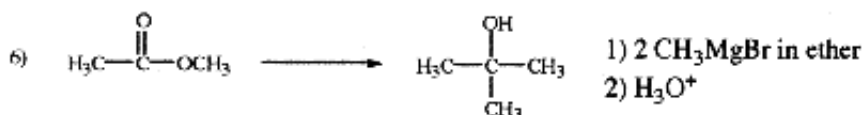
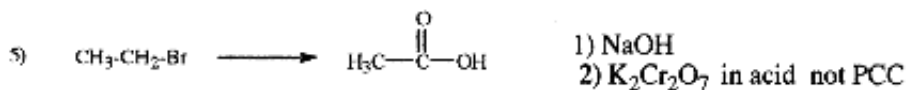
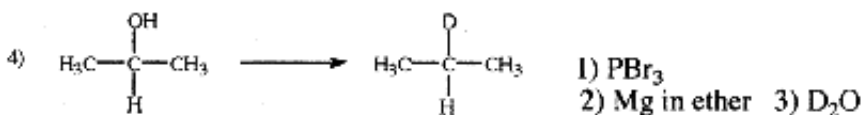
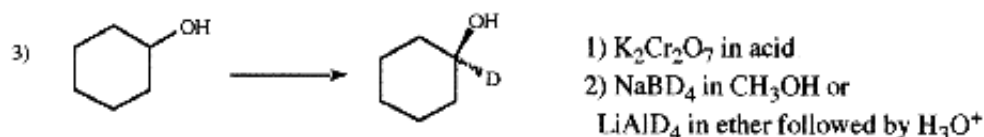
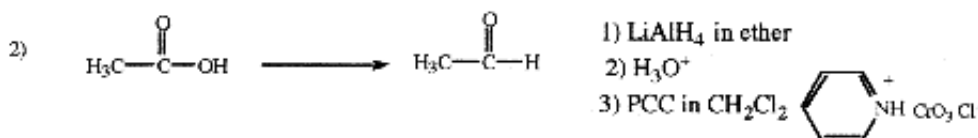
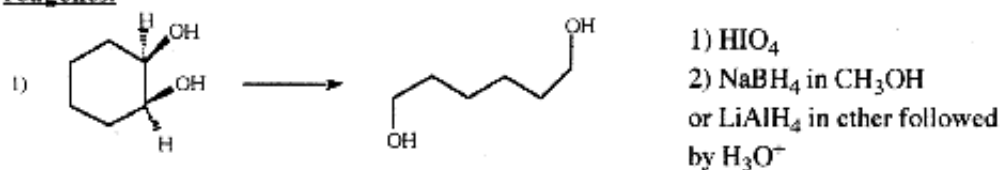


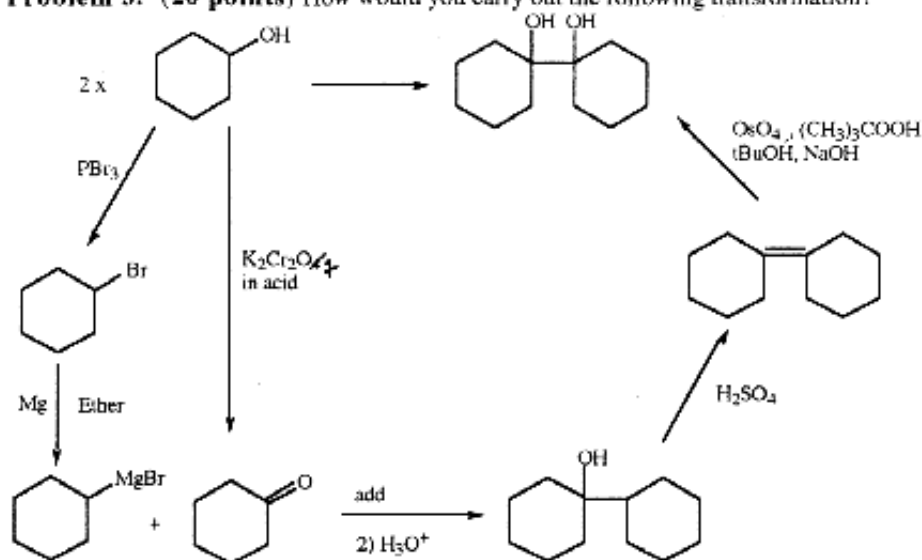
**Problem 1. (15 points)** Give the products for the following reactions. If there is more than 1 step, just give the final product. If no reactions occur, state so.



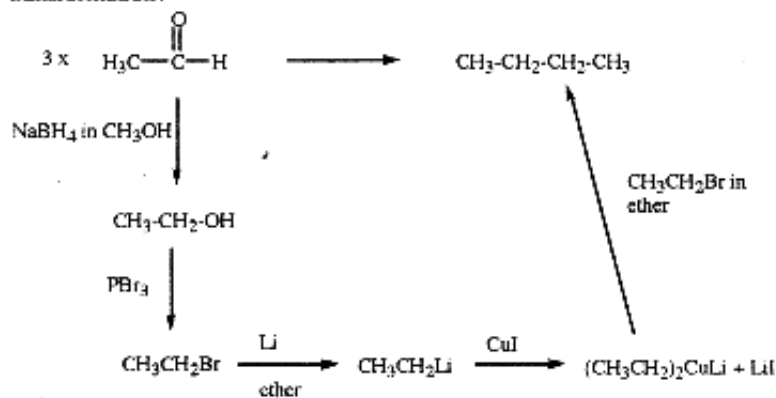
**Problem 2. (30 points)** What reagents would you use to carry out the following reactions. More than one step may be required. If more than one step is required, number each step. Circle the reagents. Do not give intermediate products. Do not give the synthesis of the reagents.



**Problem 3. (20 points)** How would you carry out the following transformation?



**Problem 4. (20 points)** Employing organocuprates, how would you carry out the following transformation?



**Problem 5. (15 points)** Determine the structure of the compound that has the molecular formula  $\text{C}_7\text{H}_{12}\text{O}_2$  whose NMR spectrum has the following resonances.

( $\delta$ 1.2, doublet, 6H)    ( $\delta$ 1.6, triplet, 3H)    ( $\delta$ 2.3, multiplet, 1H)    ( $\delta$ 4.0 quartet, 2H)

