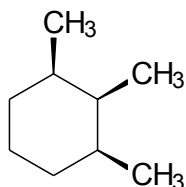
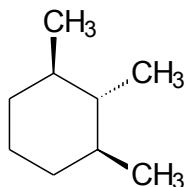


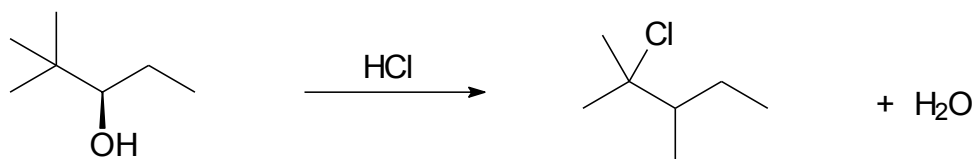
1. (10 pts) Draw a complete set of 6 Newman Projections for 3,4-diethylhexane, considering rotation about the C<sub>3</sub>-C<sub>4</sub> bond. Indicate which structure(s) are MOST stable and LEAST stable.

2. (10 pts) Draw both chair forms of each of the following. Indicate which of the four chair forms is the MOST STABLE.

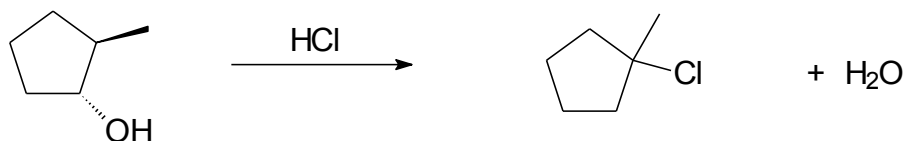




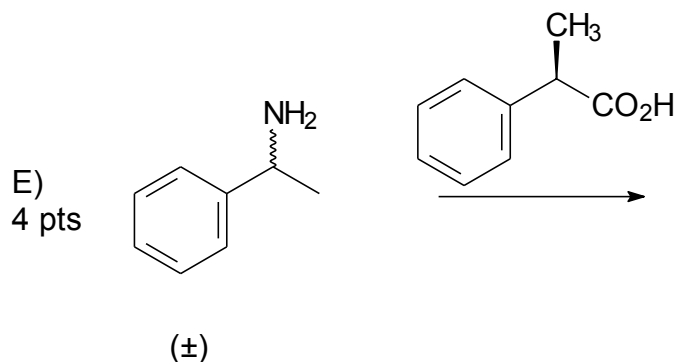
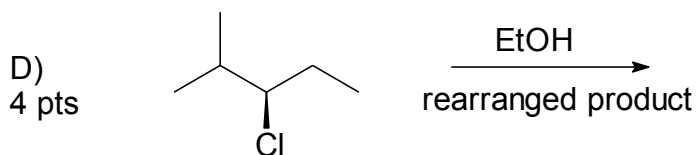
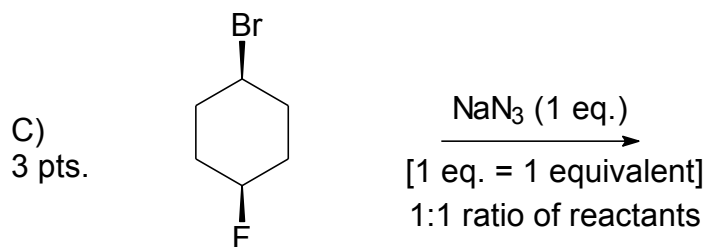
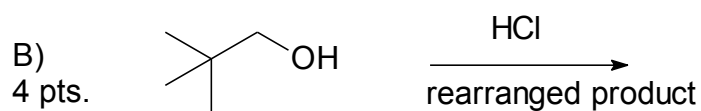
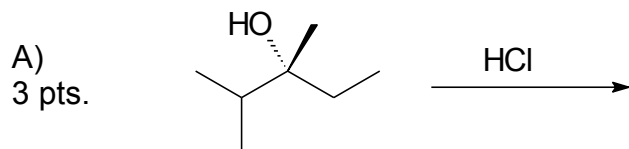
4. (10 pts). Provide a complete, step by step mechanism for the following transformation. Draw the structures of all intermediates formed in the mechanism. Use arrows to show "pushing" of electrons.



5. (10 pts). Provide a complete, step by step mechanism for the following transformation. Draw the structures of all intermediates formed in the mechanism. Use arrows to show "pushing" of electrons.



6. (18 pts) Draw the structure(s) of the **MAJOR** organic product(s) formed after each step in the following reactions. *Draw the correct product stereochemistry where applicable.* You may indicate racemic mixtures by using the ( $\pm$ ) symbol.

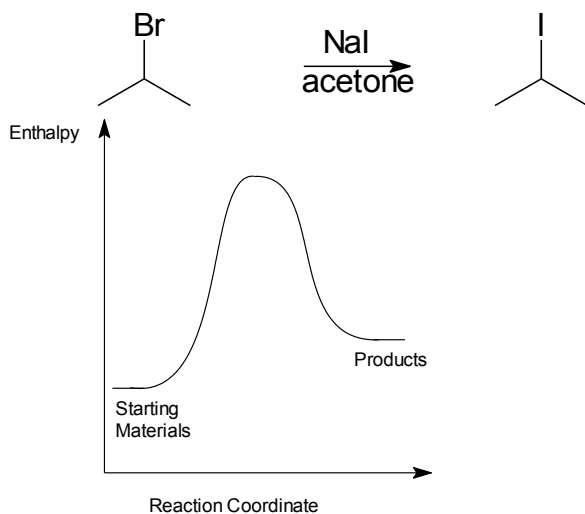


7. Given the reaction and energy diagram below:

A) (2 pts) Calculate the Heat of Reaction ( $\Delta H^\circ$ ) for the formation of 2-iodopropane from reaction of 2-bromopropane with sodium iodide in acetone. Bond energies:  $(\text{H}_3\text{C})_2\text{CH-Br}$  (68 kcal/mole),  $(\text{H}_3\text{C})_2\text{CH-I}$  (53 kcal/mole).

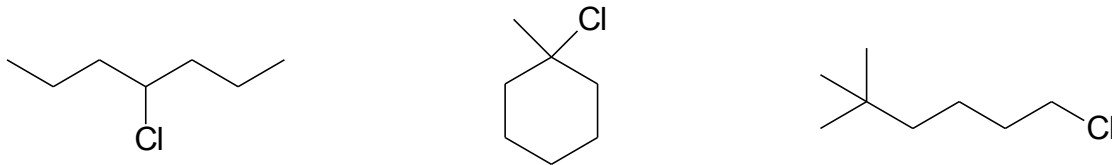
B) (3 pts) Draw a step by step mechanism for the formation of 2-iodopropane from reaction of 2-bromopropane with sodium iodide in acetone. Use arrows to show "pushing" of electrons.

C) (4 pts.) Draw the structure of the Transition State (the high energy intermediate) that would occur during the reaction of 2-bromopropane with sodium iodide in acetone.

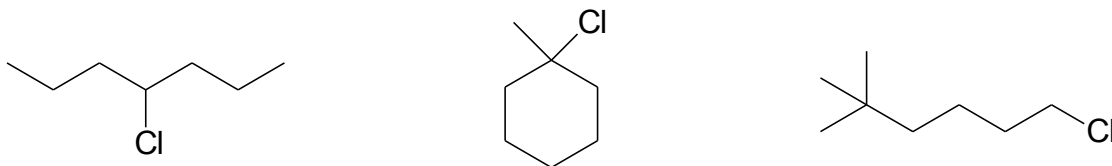


D) (3 pts.) How would the rate of the reaction be affected if the concentration of both 2-bromopropane and sodium iodide were reduced by 50%?

8. (4 pts.) Rank the following alkyl chlorides in order of reactivity (fastest to slowest) in the  $S_N1$  reaction pathway.



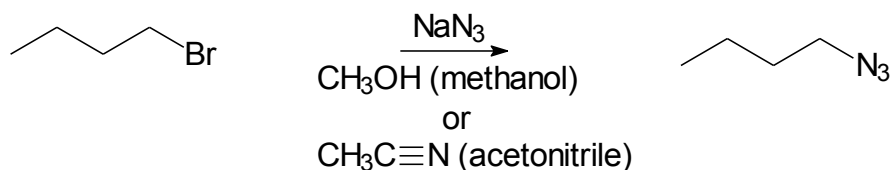
9. (4 pts.) Rank the following alkyl chlorides in order of reactivity (fastest to slowest) in the  $S_N2$  reaction pathway.



10. (4 pts.) The tertiary carbocation shown below can rearrange to a more stable, resonance stabilized carbocation. Draw both resonance forms of the rearranged carbocation.



11. The reaction of 1-bromobutane with sodium azide produces 1-azidobutane (below):



11A (2 pts) In which solvent will the reaction proceed at a **faster** rate, acetonitrile or methanol?

11B (6 pts) Using words and diagrams, explain your answer to problem 11A.