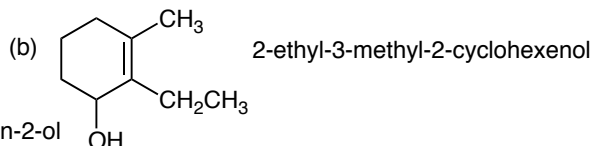
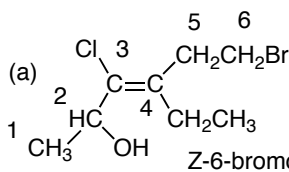
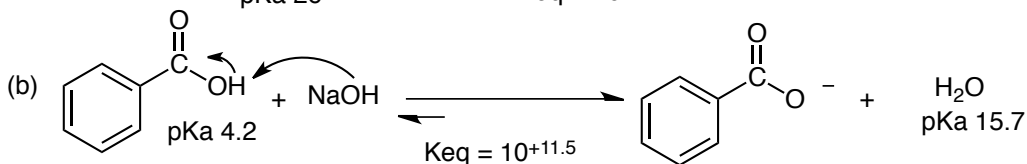
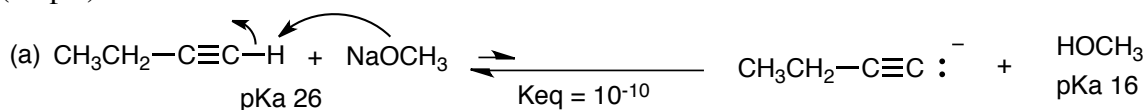


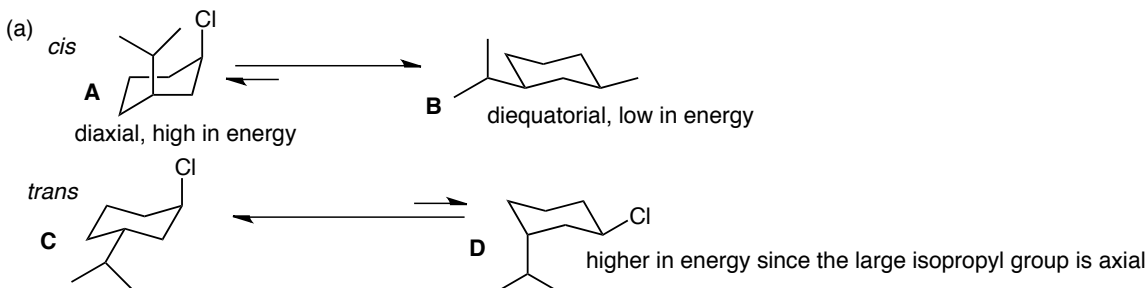
1. Name the following compounds. (20 pts)



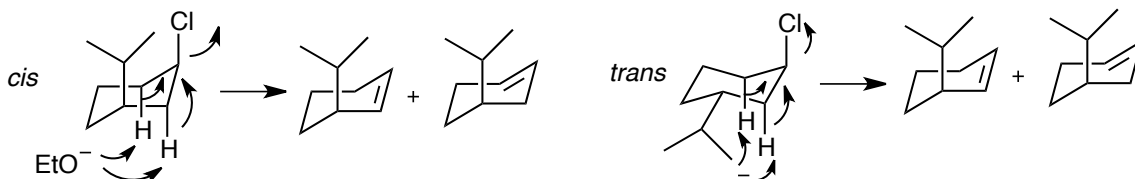
2. Give the product of the following acid-base reactions and indicate in each case whether or not the reaction is favorable as drawn by calculating the equilibrium constant. (20 pts)



3. (a) Draw both chair conformations of *cis*- and *trans*-1-chloro-3-isopropylcyclohexane and indicate which is lower in energy. Briefly explain why. (b) Which molecule would react faster with sodium ethoxide in ethanol ($\text{NaOCH}_2\text{CH}_3/\text{HOCH}_2\text{CH}_3$)? Explain by showing the complete reaction that occurs for each molecule, giving the reaction mechanism and the products that are formed. (30 pts).

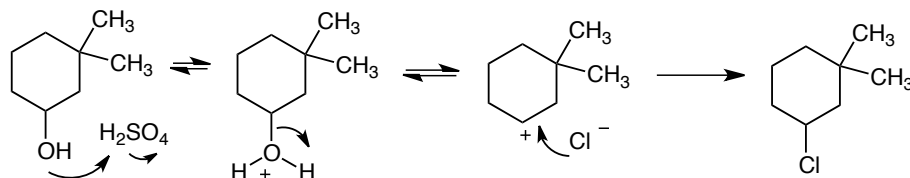
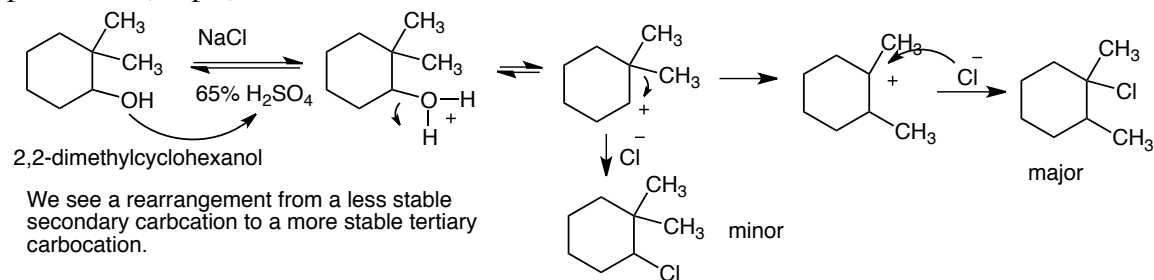


(b) For the *cis* isomer, only conformation A can undergo the elimination reaction, since the chlorine is in the necessary axial conformation. But this is the high energy conformation. Therefore the concentration of this species will be very low and the overall reaction will be slower than with the *trans* isomer.



4. Two products are formed when 2,2-dimethylcyclohexanol is treated with sodium chloride in the presence of aqueous sulfuric acid but only one product is formed when 3,3-dimethylcyclohexanol is treated under the same conditions. Explain by showing both

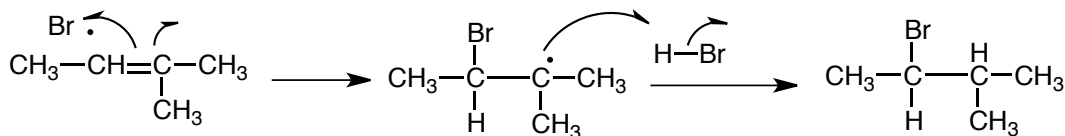
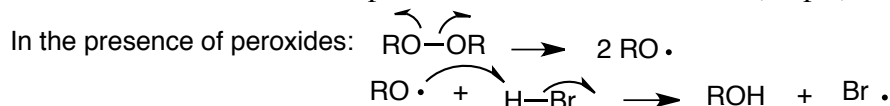
reactions, giving the complete reaction mechanism in each case and showing all three products. (30 pts)



3,3-dimethylcyclohexanol

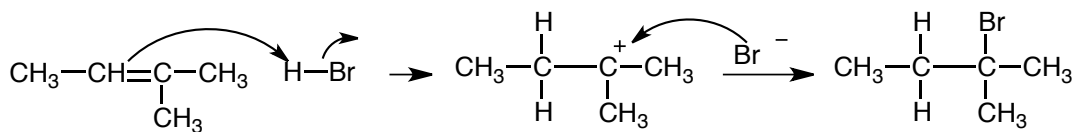
We get a secondary carbocation which is attacked by the chlorine nucleophile but there is no rearrangement since the two methyl groups are too far away.

5. When 2-methyl-2-butene reacts with HBr in the presence of peroxides (ROOR) and ultraviolet light one major product is formed but when the same reaction is carried out in the absence of peroxides a different product is formed. Explain by showing the complete reaction mechanism and the product formed in each case. (30 pts)



2-methyl-2-butene

In the absence of peroxides:



6. Give the product of the following reaction, showing the complete reaction mechanism and paying particular attention to regiochemistry and stereochemistry. (20 pts)

