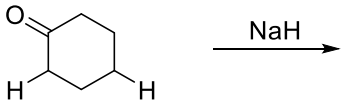
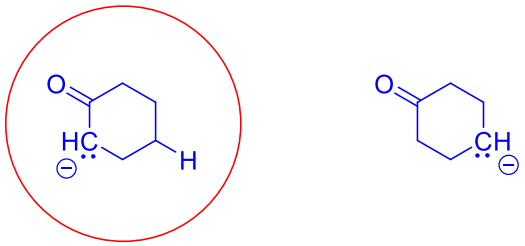
CHM 1321A
Mid Term 2 Version A Answers

1. Consider the two hydrogens shown in the following reaction.

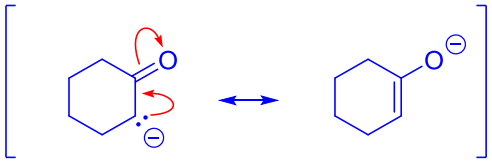


   a. Draw the two possible conjugate bases (**2 points**).



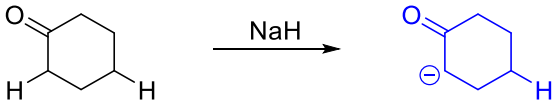
   b. Circle the conjugate base in part a that is weaker (**1 Point**)
   c. Briefly justify your answer in part b. Structures may be helpful in your explanation. (**4 points**)

- Charge is delocalized in this base
- Spreading the charge over more than one atom will lower the energy of the base and make it more stable

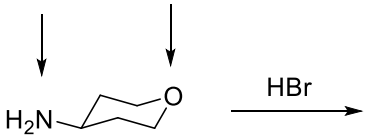


   d. Using the data from part b, predict the outcome of the reaction and briefly explain your choice. (**2 Points**)

Reaction produces the weakest base



2. Consider the two reacting sites on the following molecule, and how they can react with HBr.



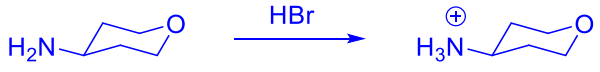
   a. Draw the two possible conjugate acids that can be formed from this reaction. (**2 points**).

   b. Underline the weakest acid in part a. (**1 Point**)
   c. Justify your answer in part b. Structures may be helpful in your explanation. (**2 Points**).

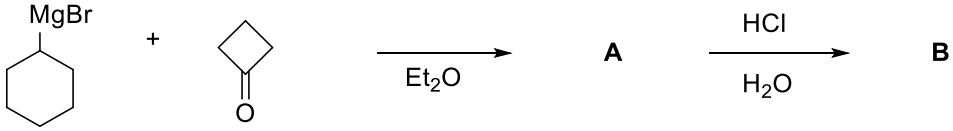
- nitrogen is left of oxygen in the periodic table
- nitrogen is less electronegative than oxygen
- positive charge will be more stable on the less electronegative atom (nitrogen), this is the weakest acid

d. Using the data from part b, predict the outcome of the reaction and briefly explain your choice. (**2 Points**)

Reaction produces the weakest acid

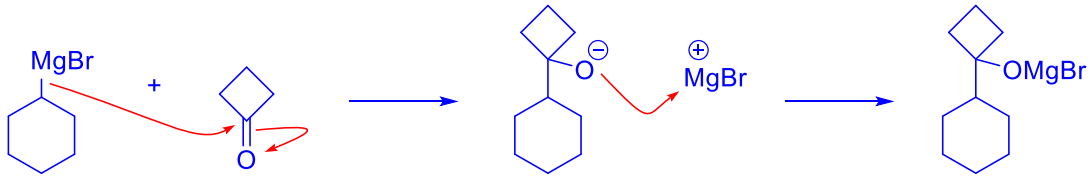


3. Consider the following reaction.

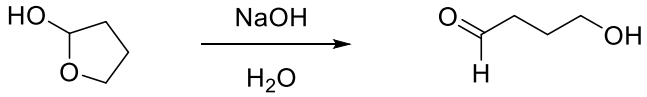


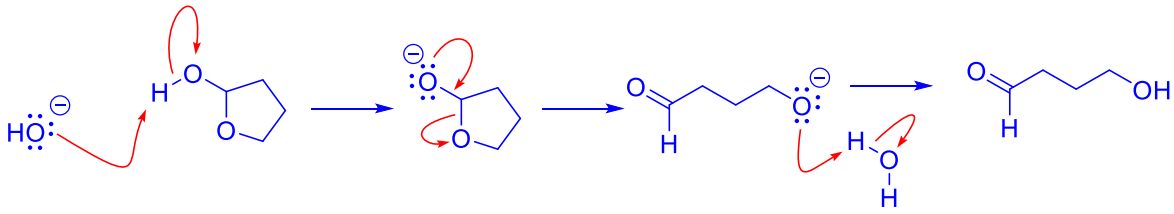
a) What is the structure of product **A** and product **B**? (**2 points**).

b) Provide a detailed mechanism showing the formation of **product A**. (**5 points**).

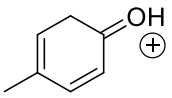


4. Write a detailed mechanism for this transformation (**8 points**).

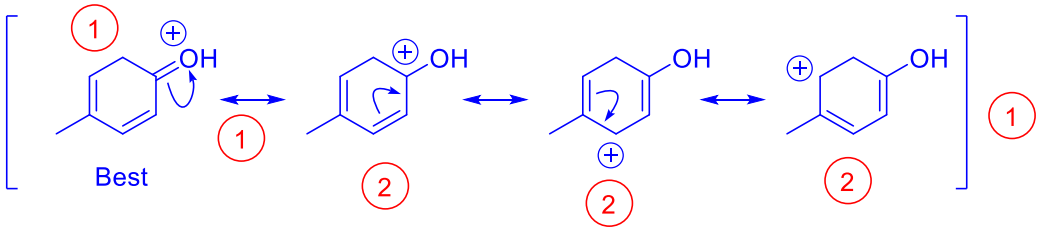




5. Consider the following structure



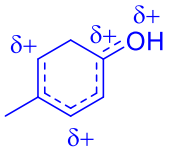
a) Construct the significant resonance forms for this molecule. (**9 points**).



b) Label the **best** resonance form(s) in part a. Provide a brief justification for your choice. (**2 points**).

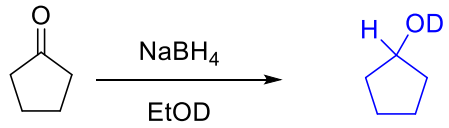
All the atoms in the indicated form have full octets. Each of the other structures has at least one atom with an incomplete octet

c) Draw the resonance hybrid structure for this molecule. (**2 points**).

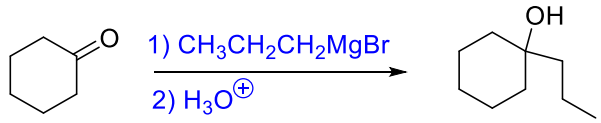


6. Supply the missing products, reagents or starting materials as necessary. (**12 points**)

a.

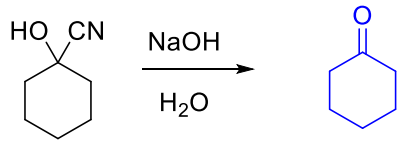


b.

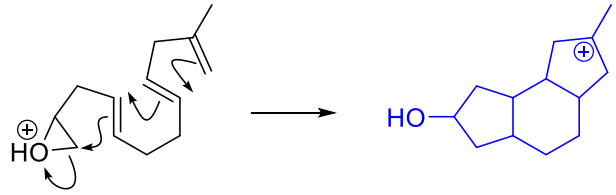


Note: $H_3O^{\oplus}$ or NH_4Cl/H_2O or HCl/H_2O

c.

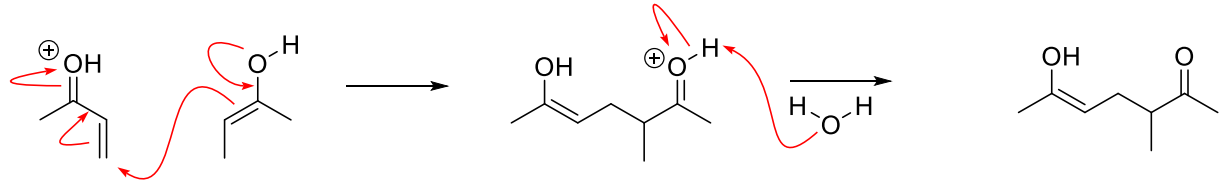


d.

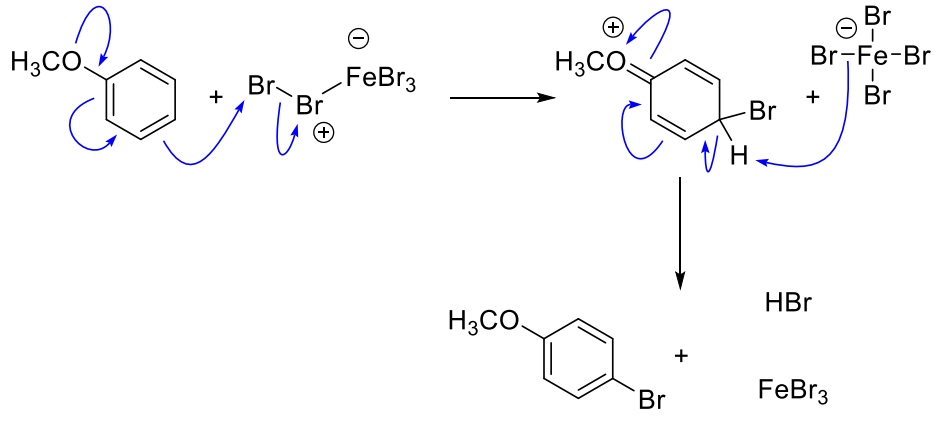


7. Add mechanistic arrows to the following to show how the reactant is converted into products. (**6 Points**).

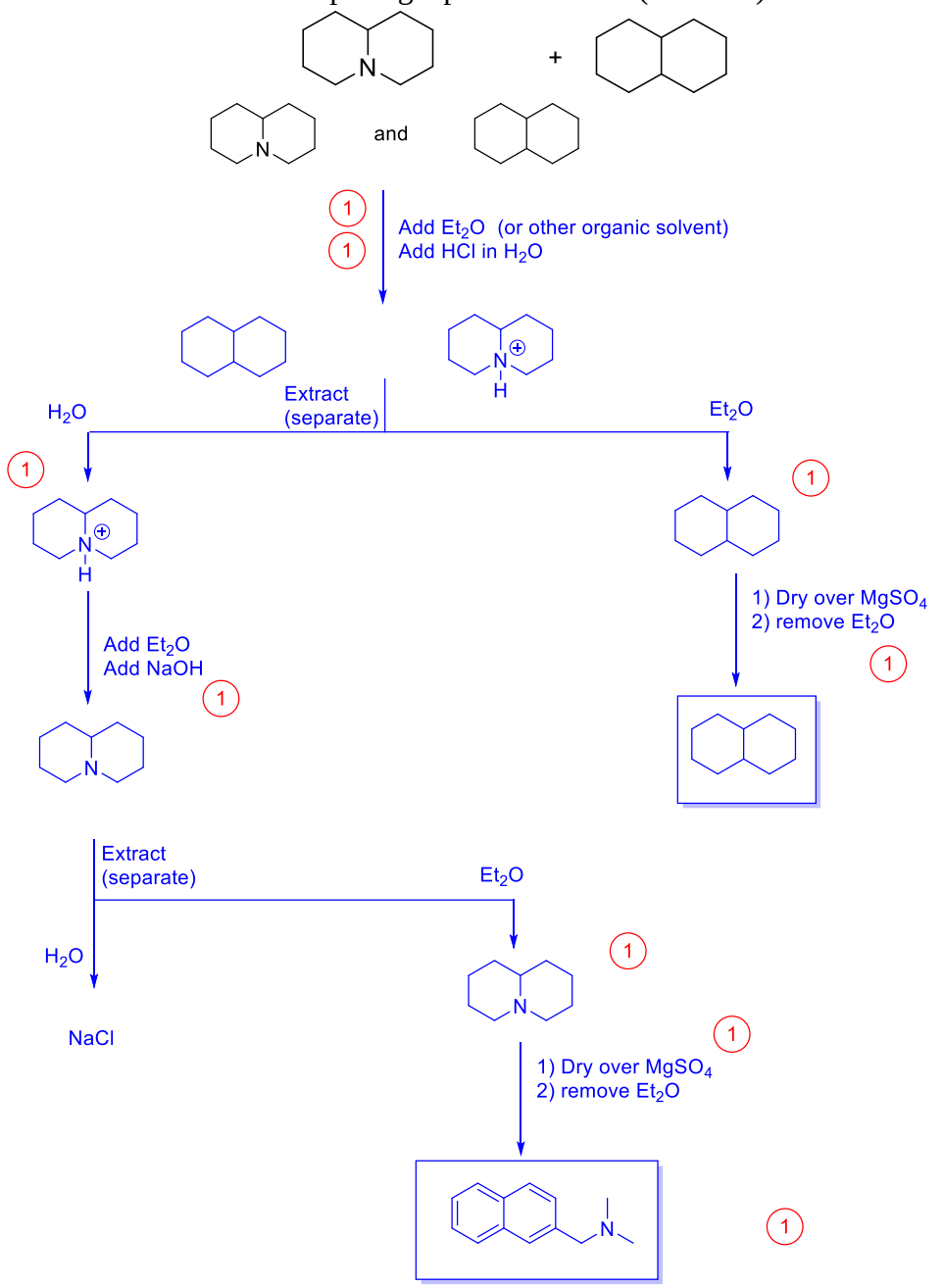
a.



b.



8. Use a flow chart to show how you could separate a mixture of the following compounds using an extraction. Be sure to include all steps to get pure materials. (**9 Points**)



Bonus: Give a mechanism that is the *reverse* of the following reaction: (**3 points**)