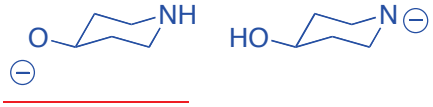
CHM 1321A
Mid Term 2 Version A Answers

1. Compare the two hydrogens shown in this compound and circle the one that is more acidic. (**1 point**)

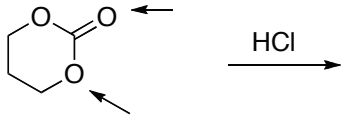
   a. Draw the two possible conjugate bases (**2 points**).



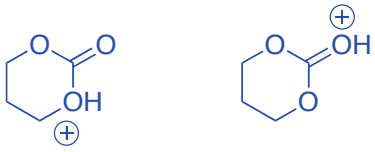
   b. Underline the conjugate base in part a that is more stable (**1 Point**)
   c. Briefly justify your answer in part b. (**3 points**)

- Oxygen is right of nitrogen in periodic table
- Oxygen is more electronegative than nitrogen
- Negative charge is more stable on oxygen than on nitrogen

2. Consider the two sites indicated on the following molecule during a reaction with HCl.

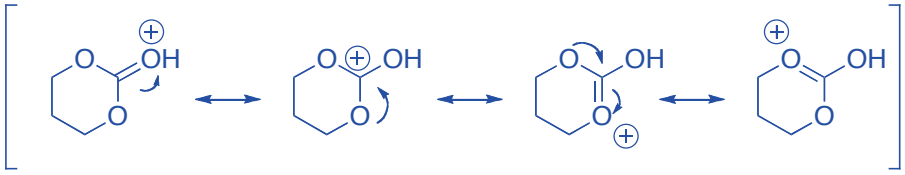


   a. Draw the two possible conjugate acids that can be formed from this reaction. (**2 points**).



   b. Underline the strongest acid in part b. (**1 Point**)
   c. Justify your answer to part b. It may be helpful to draw additional structures as part of your answer. (**5 Points**)

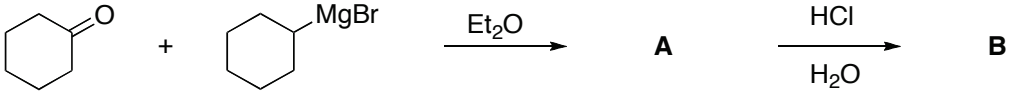
- resonance is possible for the structure on the right
- this distributes the charge over 4 atoms making this ion more stable and the weaker acid



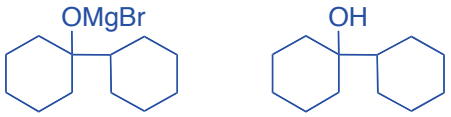
   d. Using the data from part b, predict the site of protonation on the original molecule and briefly explain your choice. (**2 Points**)

- molecule with react to give the weakest acid

3. Consider the following reaction.

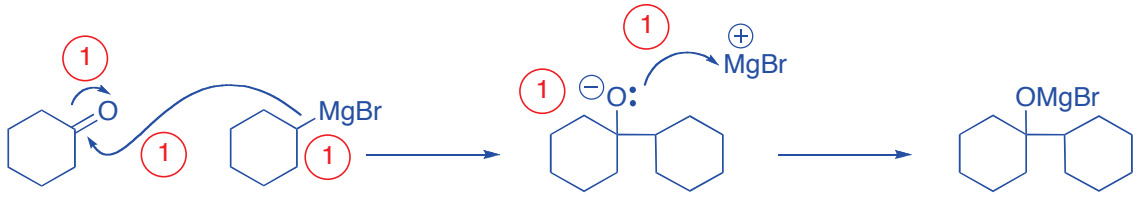


a) What is the structure of product **A** and product **B**? (**2 points**).

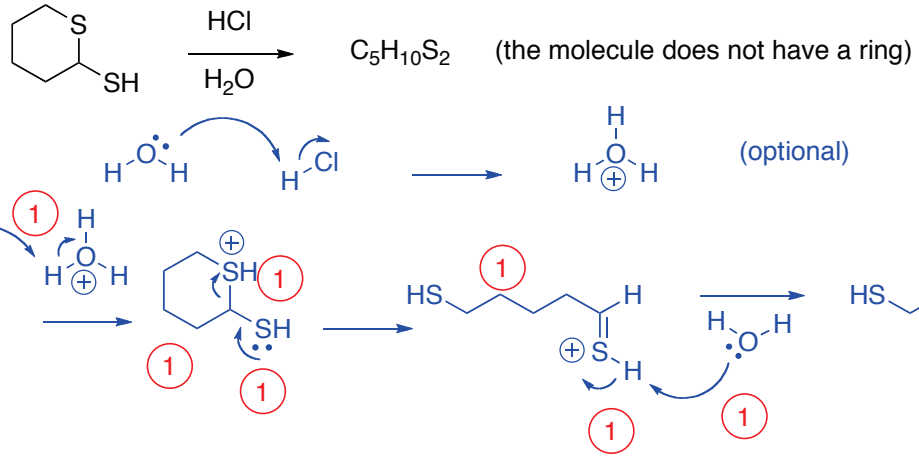


A **B**

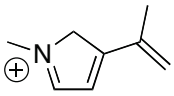
b) Provide a detailed mechanism showing the formation of **product A**. (**5 points**).



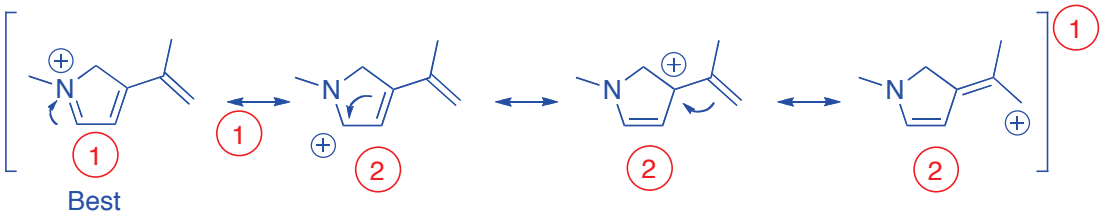
4. Write a <u>detailed</u> mechanism for this transformation (**9 points**).



5. Consider the following structure



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

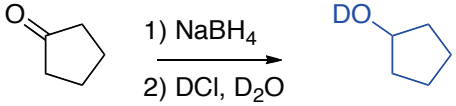


b) Label the **best** resonance form in part a. Provide a brief justification for your choice. (**3 points**).

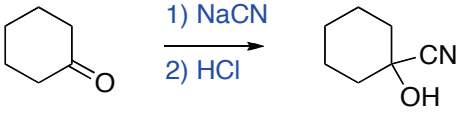
- all atoms have octets
- in all the other structures there is a carbon lacking an octet

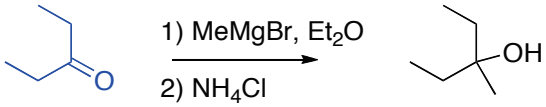
6. Supply the missing products, reagents or starting materials as necessary. (**12 points**)

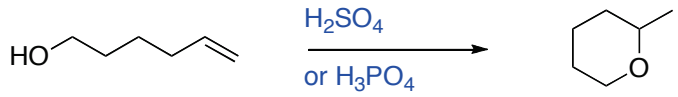
a.



b.



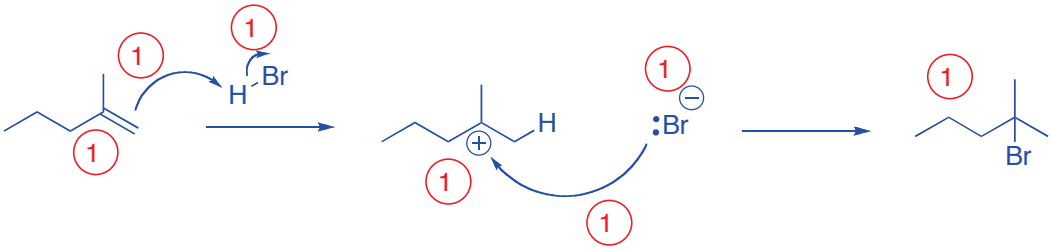
c. 

d. 

7. A student wishes to selectively prepare a certain pentylbromide from 2-methylpentene using HBr.
   a. Draw the structure of both possible products and identify the Markovnikov product (**3 Points**).

Markovnikov

   b. Give a mechanism to explain the preferential formation of the Markovnikov product from 2-methylpentene. (**7 Points**)



   c. What controls the selectivity in this reaction? (**3 Points**)

- the most stable carbocation is formed the fastest
- this is the tertiary carbocation that is stabilized by the most electron donating alkyl groups

Bonus: Write the mechanism for the *reverse* of the following: (**3 points**)