CHEMISTRY 112A FALL 2016

EXAM 2

OCTOBER 20, 2016

NAME- WRITE BIG _____

STUDENT ID: _____

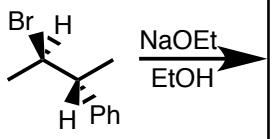
SECTION AND/OR GSI IF YOU ARE IN THE LABORATORY COURSE: _____

- **You will have 75 minutes in which to work.**
- **BE NEAT! Non-legible structure drawings will not be graded.**
- **Only answers in the answer boxes will be graded – you can write in other places, but we only grade the answers in the boxes.**
- **All pages of the exam must be turned in.**
- **No calculators**
- **No stencils**
- **Molecular models may be used**

Problem	Points (Maximum)
1	20
2	20
3	16
4	18
5	10
6	17
7	19
Total	***120***

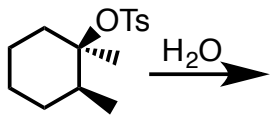
1. (20 points) For each reaction draw the major organic products, **including all stereoisomers**. Write NR if you think there will be no reaction.

a.



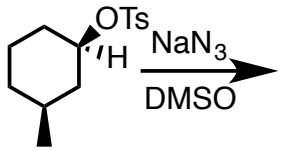
NaOEt
EtOH

b.



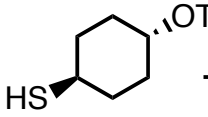
H_2O

c.



NaN_3
DMSO

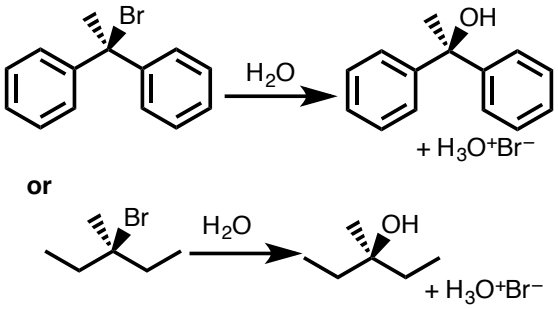
d.



$NaOCH_3$

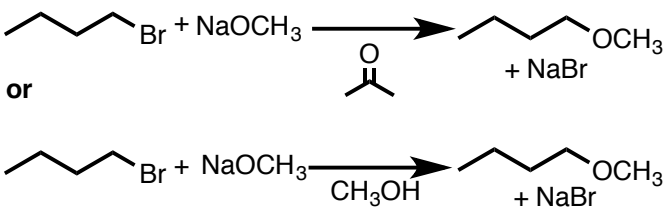
2. (20 points) **Circle** the reaction in the following pairs of reactions that you would expect to go faster. It is possible that both reactions have the same rate. It is possible that one of the reactions shown in each pair does not occur at a measurable rate. You may disregard any other products besides the ones pictured that may form under the reaction conditions. Give explanations in the boxes provided.

a.



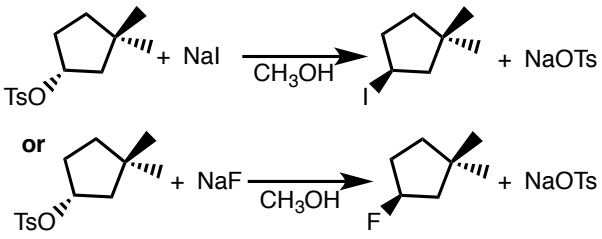
Type of mechanism:_____
Explanation

b.



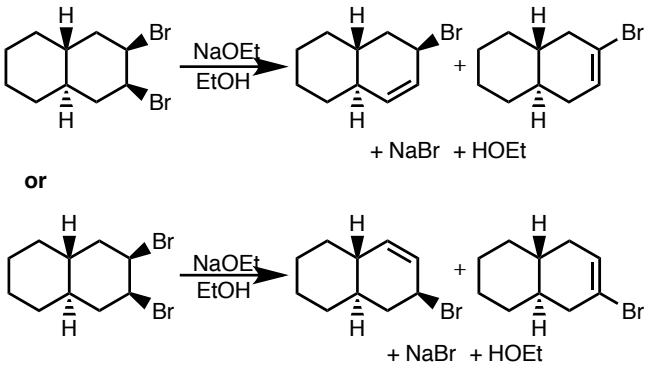
Type of mechanism:_____
Explanation

c.



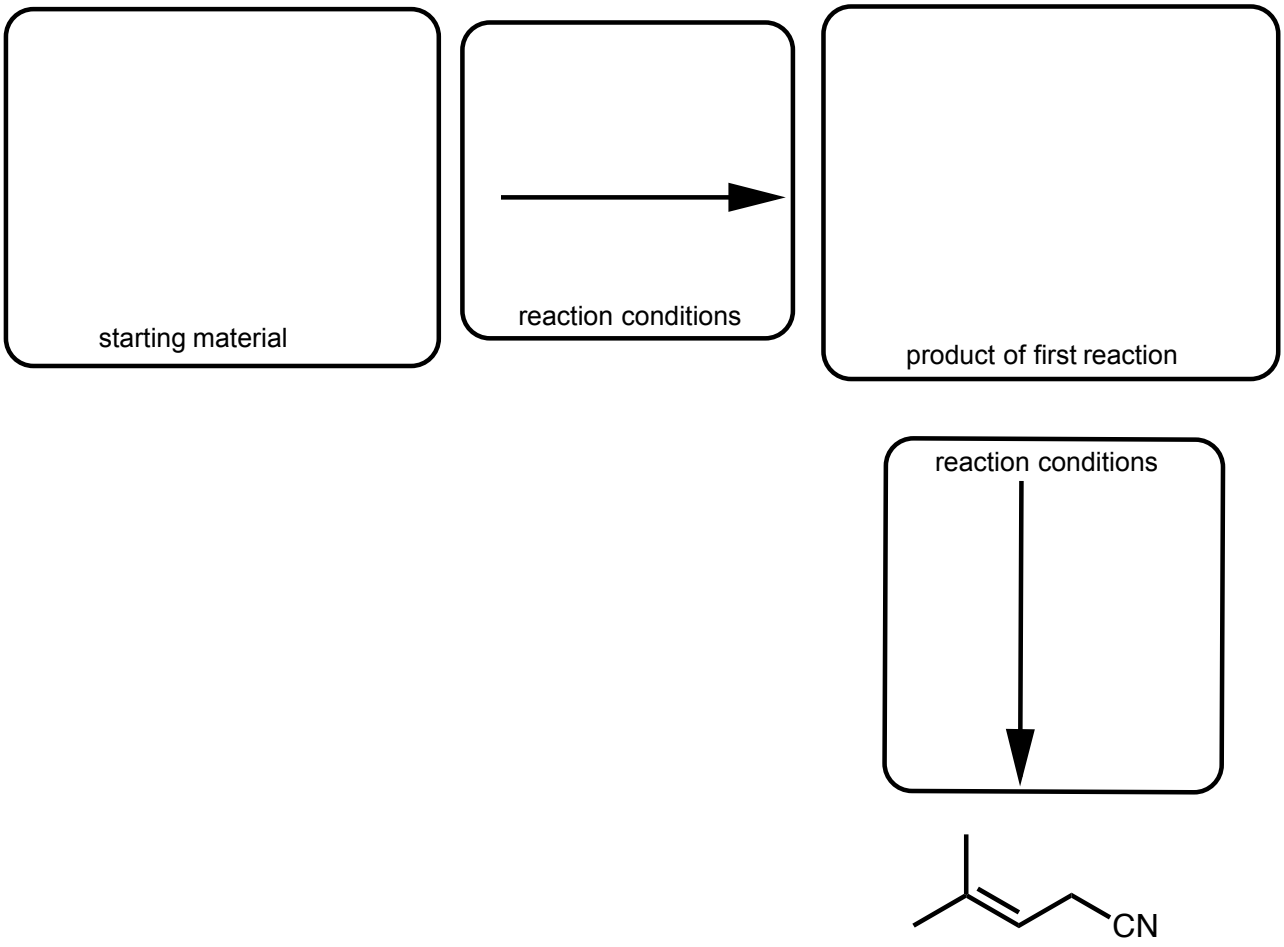
Type of mechanism:_____
Explanation

d.



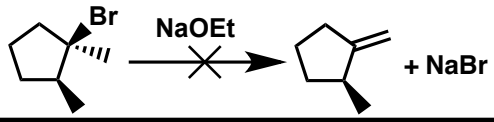
Type of mechanism:_____
Explanation

3. (16 points) Propose a two-step synthesis of the following molecule from any 5-carbon dihalide starting material.



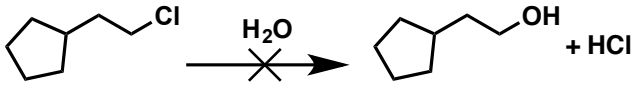
4. (18 points) The following reactions would not occur as written. i. What product would actually be made? ii. Why was the desired product not formed? iii. How could you change either the substrate **or** reaction conditions to give the desired product?

a.



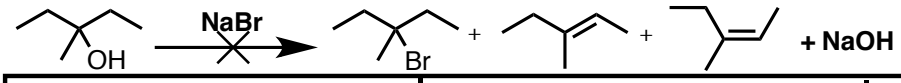
What product is actually made? (Draw structure or NR for no reaction)	Why was desired product not formed? (Explain in 1 sentence)	How could substrate **or** reaction be changed to give desired product?

b.



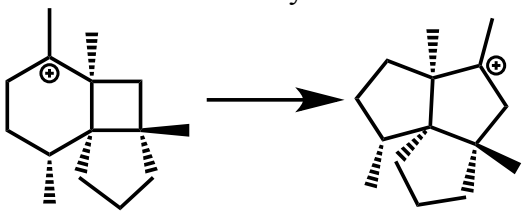
What product is actually made? (Draw structure or NR for no reaction)	Why was desired product not formed? (Explain in 1 sentence)	How could substrate **or** reaction be changed to give desired product?

c.

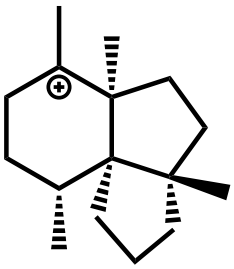


What product is actually made? (Draw structure or NR for no reaction)	Why was desired product not formed? (Explain in 1 sentence)	How could substrate **or** reaction be changed to give desired product?

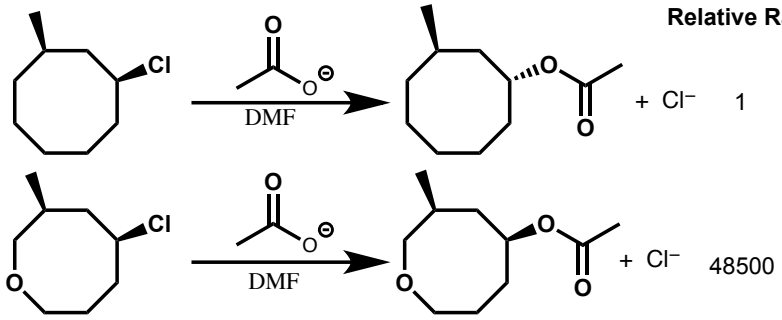
5. (10 points) a. Draw the mechanism of the following reaction using arrows to indicate the flow of electrons. Make sure to clearly indicate stereochemistry.



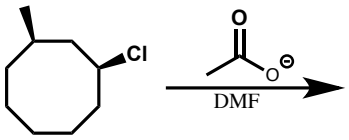
b. Explain why the molecule shown below does not undergo a similar rearrangement.



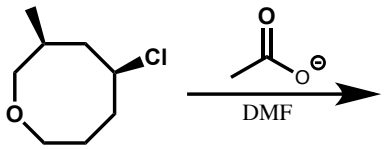
6. (17 points) The two reactions shown below have considerably different rates. The reaction shown on the bottom is faster than the one shown on the top.



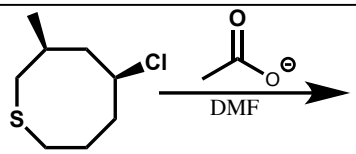
a. Draw the mechanism of the first reaction using arrows to show the flow of electrons.



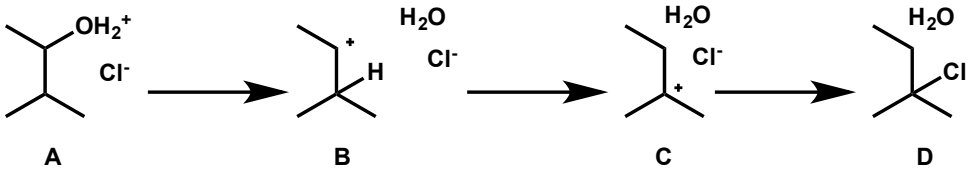
b. Draw the mechanism of the second reaction using arrows to show the flow of electrons.



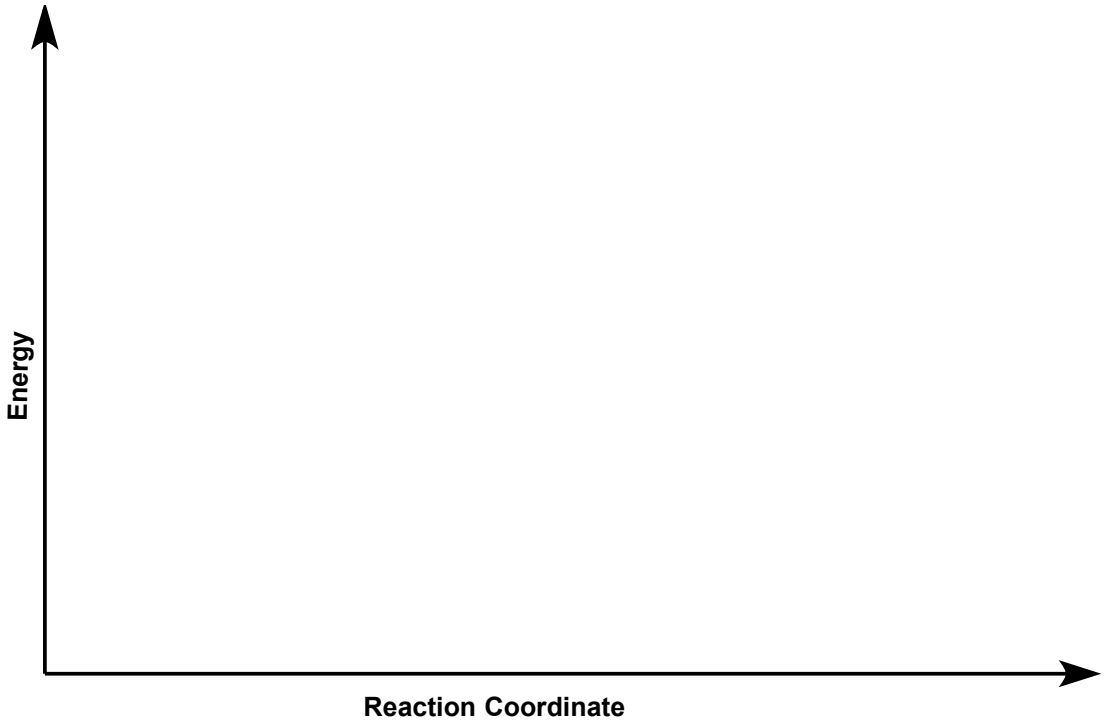
c. Draw the product of the reaction shown below. Would you expect this reaction to be faster or slower than the two reactions at the beginning of the problem? Explain your answer.



7. (19 points) Consider the reaction shown below.



a. Draw a reaction coordinate energy diagram including the relative energies of the compounds in the reaction above **using the letters shown below each compound.** Assume the reaction is performed in a polar protic solvent.



b. Label the rate-determining step of the reaction in the diagram you drew in part a.

c. Draw a dotted line on your energy diagram showing how the energies will change if the reaction is run in a polar aprotic solvent

d. If the reaction is run in a polar aprotic solvent, is the reaction rate expected to increase, decrease, or not change? Explain your answer.