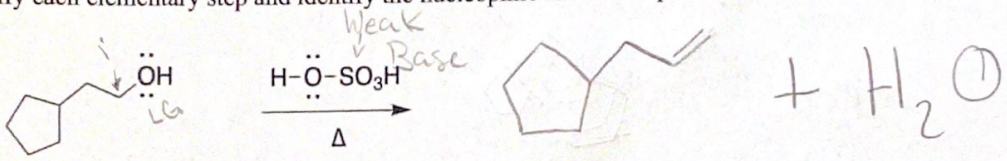
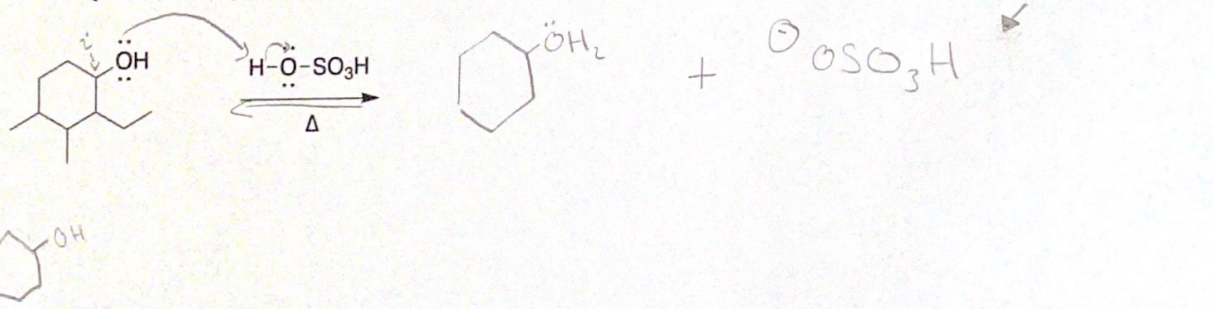
PART 1 – Substitution and Elimation!

1. **Dehydration Mechanisms!**

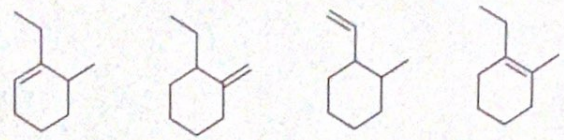
a. Please draw the reaction mechanism for the following **E2 reaction** and predict the product(s). Please identify each elementary step and identify the nucleophile and electrophile where applicable.



b. Please draw the reaction mechanism for the following **E1 reaction**, including how **all of the possible products are formed** (there are 4!). Please identify each elementary step and identify the nucleophile and electrophile where applicable and identify the major product.



2. Ranking alkene stability: Please rank the following alkenes in order from **least to most stable**. Then give an explanation as to why you picked this order:

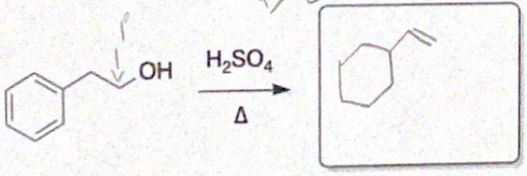


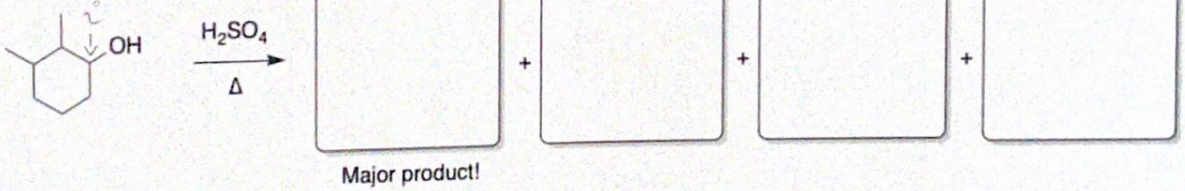
i. ii. iii. iv.

3 < 2 < 1 < 4

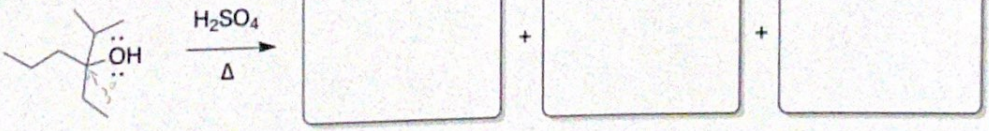
3. Reaction fill-ins! For each of these elimination / dehydration reactions, predict the products, including the major product where indicated. Also indicate if the reaction would proceed through E1 or E2.

E1 2





Major product!



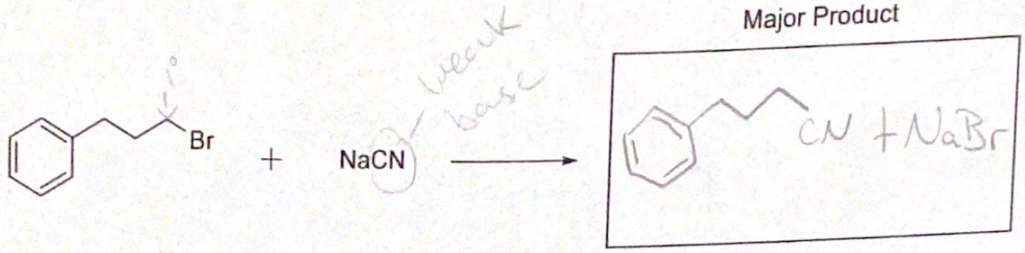
Major product!

4. **Substitution or Elimination?** Determine the mechanism (SN1, SN2, E1, or E2) and major product for the reactions below. Consider the type of LG (primary, secondary, or tertiary) AND the reactant type (strong nuc., strong base, weak/hindered base) to determine the correct mechanism/product!

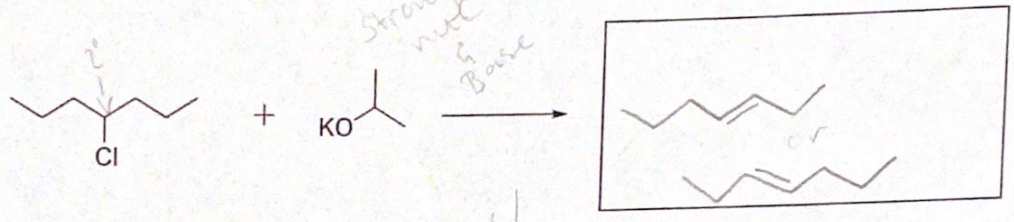
Mechanism

Major Product

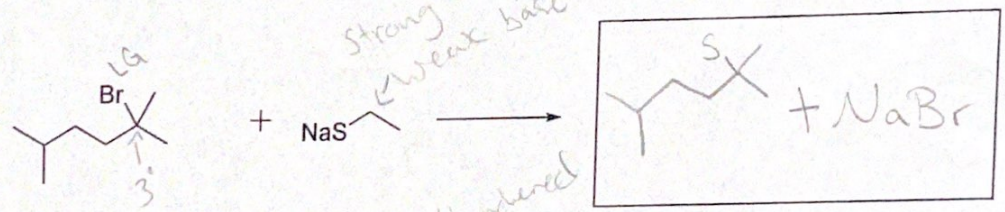
a) SN2



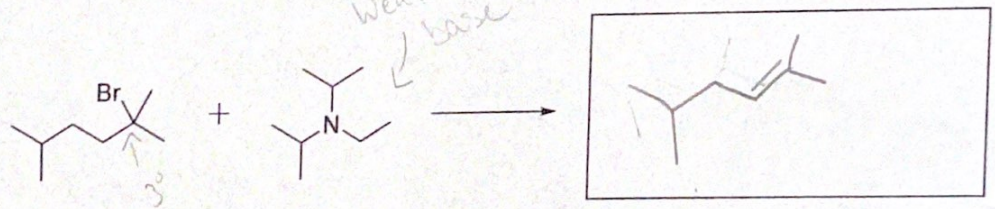
b) E2



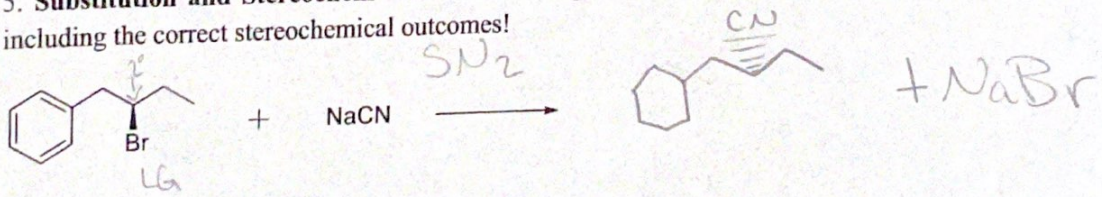
c) SN1

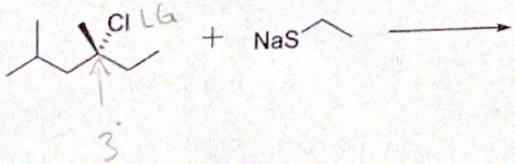


d) E1



5. **Substitution and Stereochem** – Determine the product(s) for the reactions (are they SN1 or SN2?) below including the correct stereochemical outcomes!

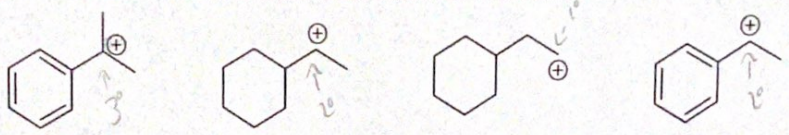




PART 2 – Resonance and Benzene! FOR ADDITIONAL PRACTICE. PLEASE READ THE BOOK AND DO PROBLEMS IN CHAPTER 7: #1, 2, 7-15, 18-20, 31, 33, 34, 37-39, 42-45, 47, 49, 50, 52, #25-27, 29, 30, 35, and 41, and Resonance Tutorial pages 255-262

1. Carbocation stability!

a. Rank the following carbocations in order from least stable to most stable:



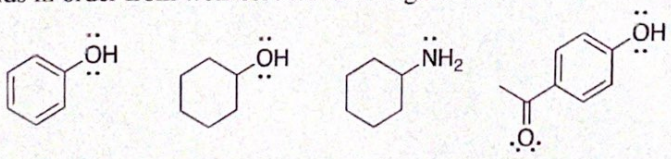
A B C D

C < B < D < A

b. Explain **thoroughly** why you ranked the carbocations above in the designated order. Your answer should include, if applicable, reasons based in hyperconjugation, resonance, etc

8. Acidity Assessment!

a. Rank the following acids in order from weakest acid to strongest acid.

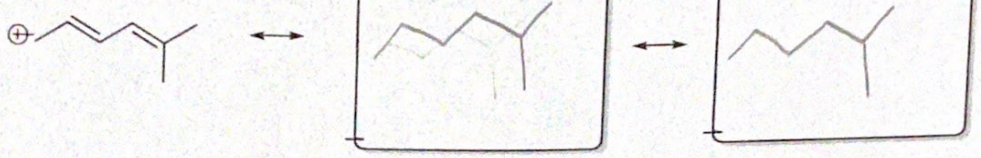


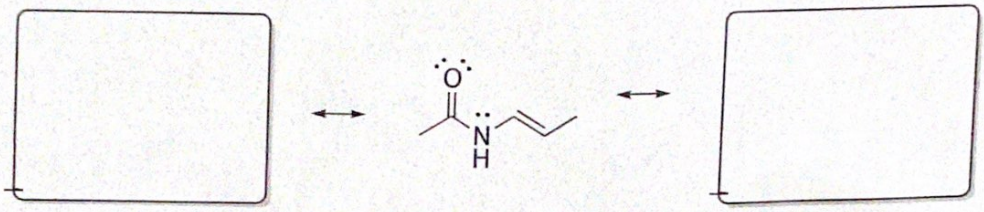
A B C D

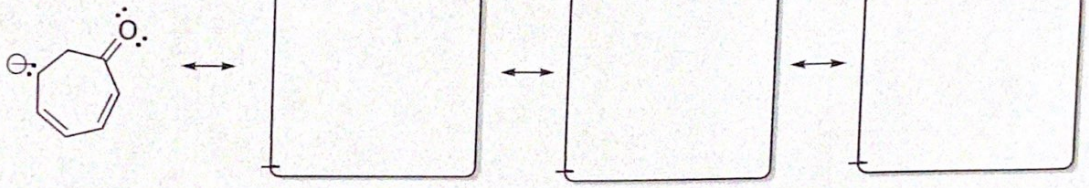
_____ < _____ < _____ < _____ < _____

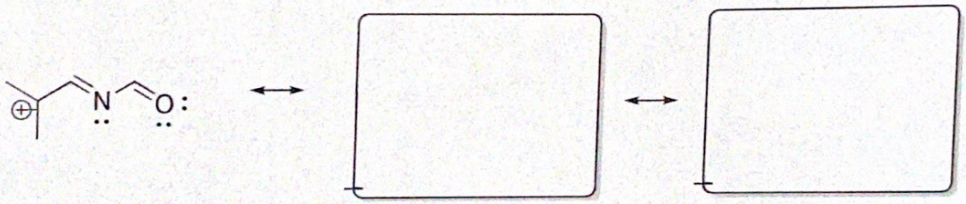
b. Explain **thoroughly** why you ranked the acids in the designated order. Your answer should include, if applicable, reasons based in hyperconjugation, inductive effects, resonance (EDG vs. EWG), etc. Just saying "their pK_a values" is not an acceptable answer.

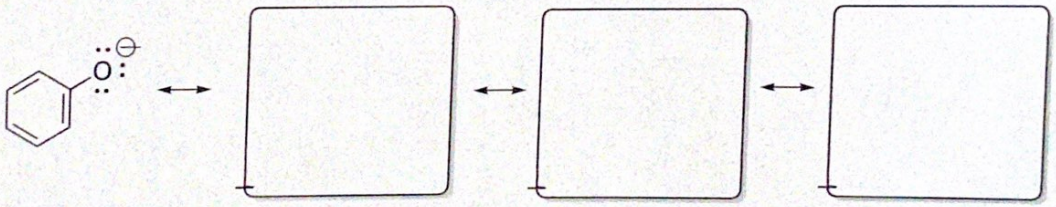
3. PRACTICE WITH A TON OF RESONANCE CONTRIBUTOR EXAMPLES! Draw the resonance contributors for the species/molecules shown in the boxes below. Then, indicate which species (if any) is the MAJOR contributor towards the resonance hybrid (most stable).

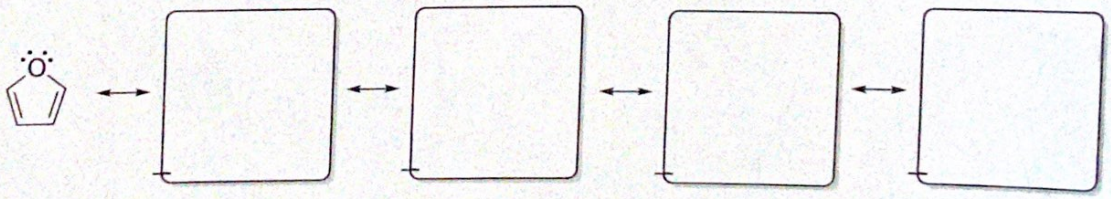
a. 

b. 

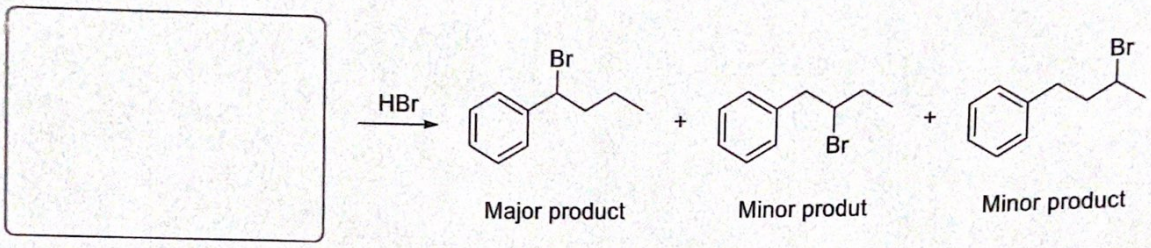
c. 

d. 

e. 

f. 

4. Predict the <u>alkene</u> reactant for following <u>addition</u> reaction. Remember, Hydride shifts are possible if/when a more stable carbocation can exist (depending on reaction mechanism)! Put your answer in the indicated box.

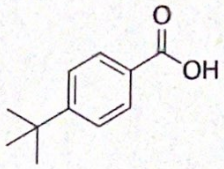


Major product Minor produt Minor product

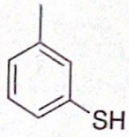
Draw the FULL electron-pushing mechanism for the reaction above, including all intermediates and paths to form each product. Explicitly label all formal charges and/or electron pairs. Label the nucleophile and electrophile in each reaction step.

5. Nomenclature with Benzene. Give the IUPAC name of the compound below; put your answer on the line ***below*** the compound. Remember that benzene compound may have common names as parent names – make sure you memorize the 6 from the lecture slides!

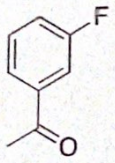
a.



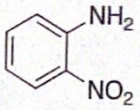
b.



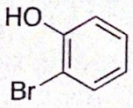
c.



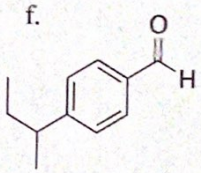
d.



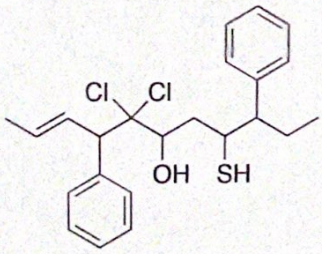
e.



f.



g.



h.