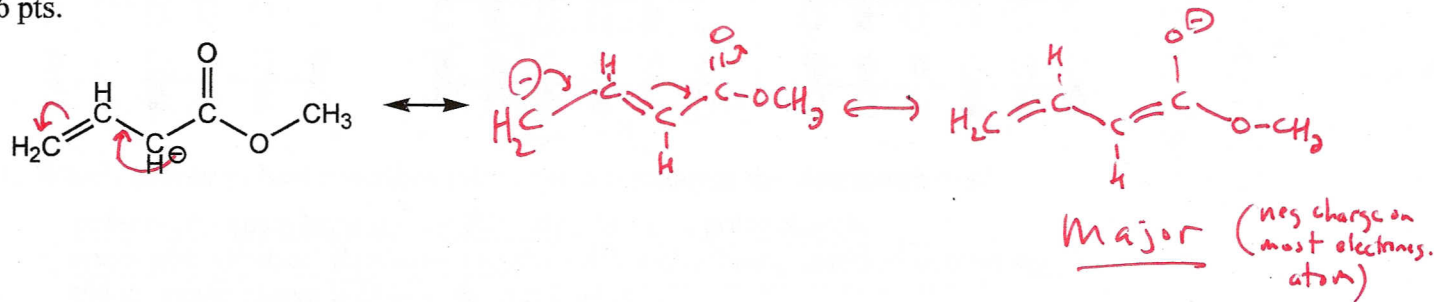
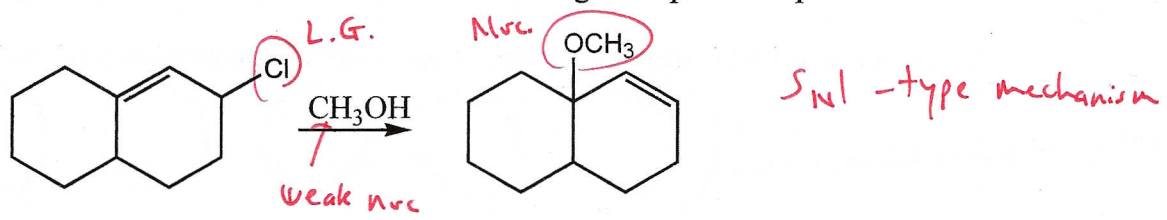


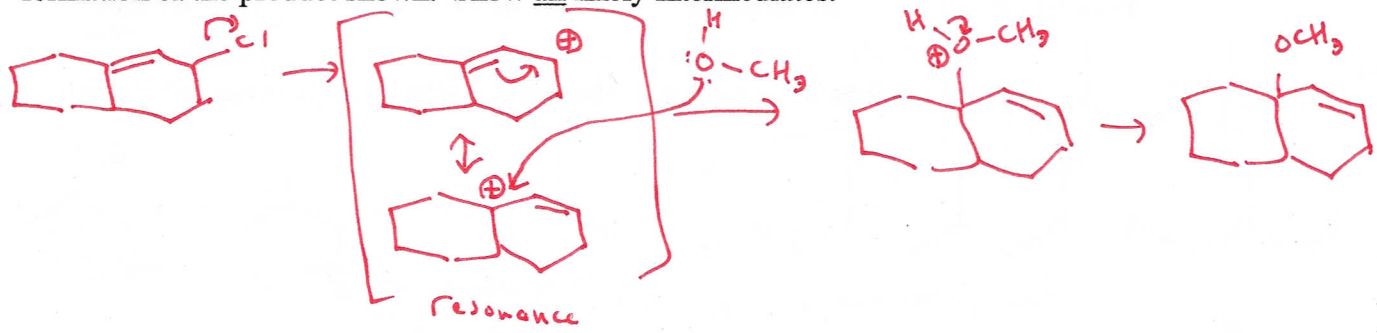
I. Draw all significant resonance structures of the compound shown. Clearly label the major contributor. 6 pts.



II. Consider the reaction shown and answer the following three parts. 16 pts total



1. Use curved arrow formalism to show a plausible, step-by-step mechanism that accounts for the formation of the product shown. Show all likely intermediates.



2. Draw the structure of one other likely product that also formed.

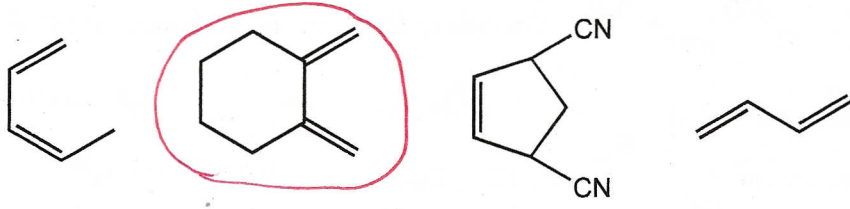


3. Consider the following changes. Circle the one(s) that will likely increase the observed reaction rate.


- a bromine was used in place of the chlorine ← better leaving group
- a catalytic amount of sulfuric acid was added acid can not assist
- the concentration of methanol was increased rate independent of nucleophile concentration
- the concentration of the alkyl chloride was increased rate = k [alkyl halide]
- the temperature was increased ↑ temp means ↑ rate

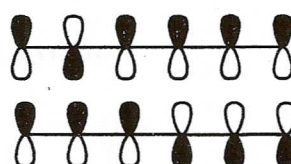
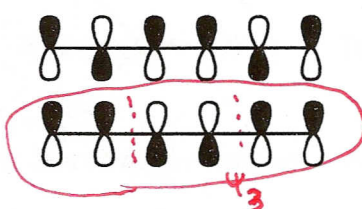
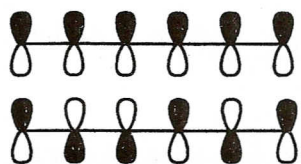
III. Answer each of the following by circling the best choice. Best 12 count 4 pts each, 48 pts total, try all for bonus.

1. Which compound reacts fastest as a diene in a normal Diels-Alder reaction?



maximum ratio of s-cis : s-trans conformations vs other dienes given

2. Which is the HOMO for 1,3,5-hexatriene pi system () in the ground state?

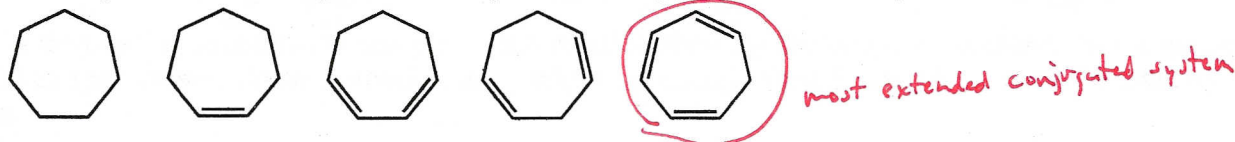


ψ_6 —
 ψ_5 —
 ψ_4 —
 ψ_3 — ← HOMO 2 nodes
 ψ_2 —
 ψ_1 —

3. Which statement best describes thin layer chromatography characteristics?

- polar compounds have lowest R_f's with the most polar eluents
- spots with identical R_f's have a high likelihood of being identical compounds
- the strongest eluent will give the most spots
- all of the above

4. Which compound absorbs light of the longest wavelength in the UV-vis spectrum?

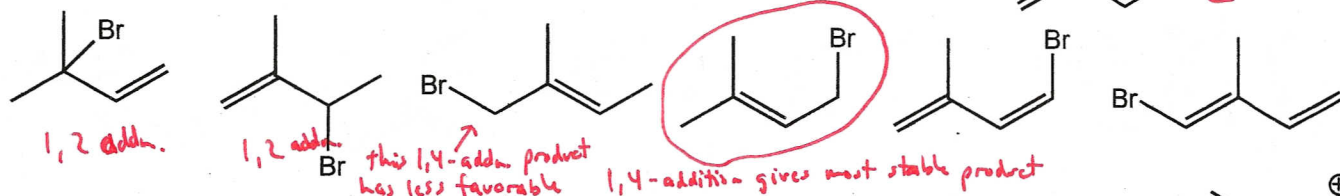


5. Which is the strongest nucleophile?

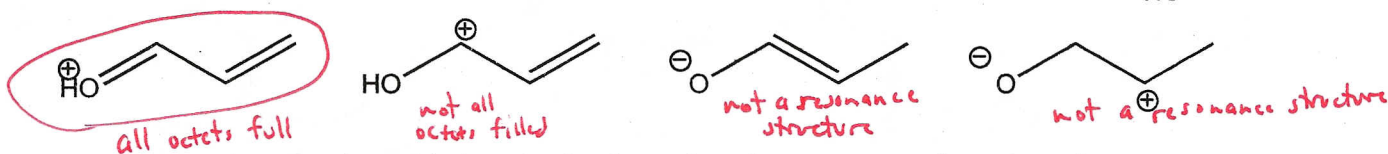


neg charge; S atom more polarizable & larger than O atom

6. Which is the thermodynamically favored addition product of adding HBr to

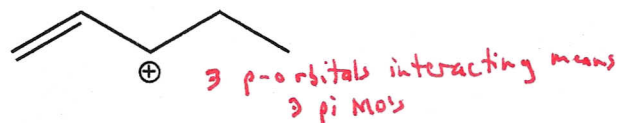


7. Which is the major resonance contributor below of the compound shown at right?

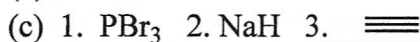
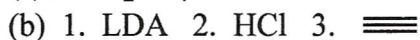
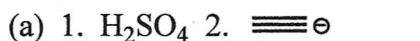


8. How many pi molecular orbitals exist for the cation shown?

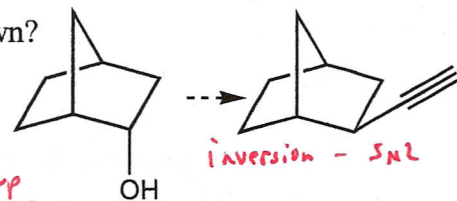
0 1 2 3 4 5 6 7 more than 7



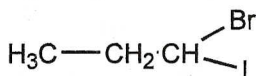
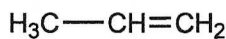
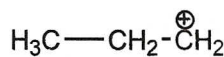
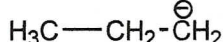
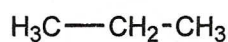
9. Which is the best sequence of reactions for the transformation shown?



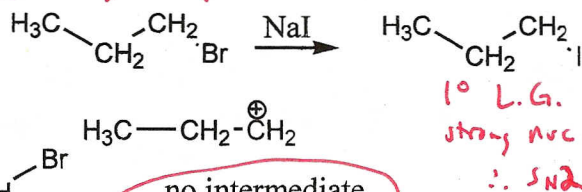
*step #1 makes leaving group
step #2 adds strong nucleophile*



10. What is the intermediate in the reaction shown?

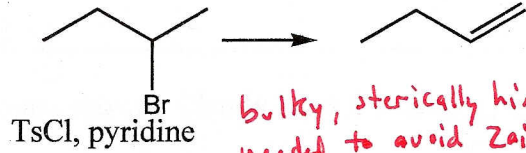
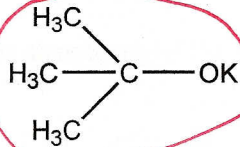


no intermediate



11. What is the best reagent for the reaction shown?

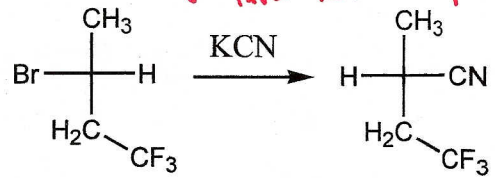
NaOH H₂SO₄ HBr



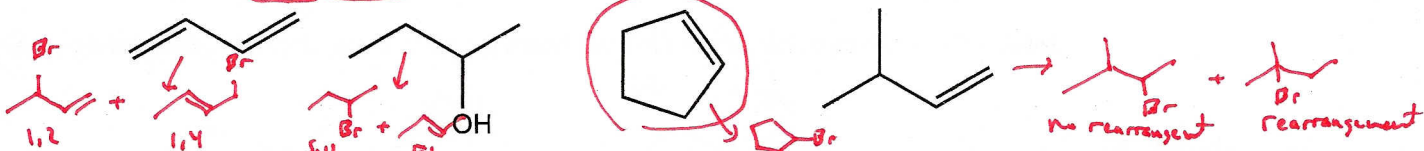
bulky, sterically hindered base needed to avoid Zaitsev product & favor Hofmann product

12. What mechanism name best describes the reaction shown?

S_N2 S_N1 E2 E1



13. Which gives a single product upon reaction with HBr?



IV. Fill in the missing structures to complete each reaction showing the necessary reactants or the major product(s) as appropriate. Show stereochemistry where necessary. Best 5 count 6 pts each, 30 total, try all for bonus.

