CH 335

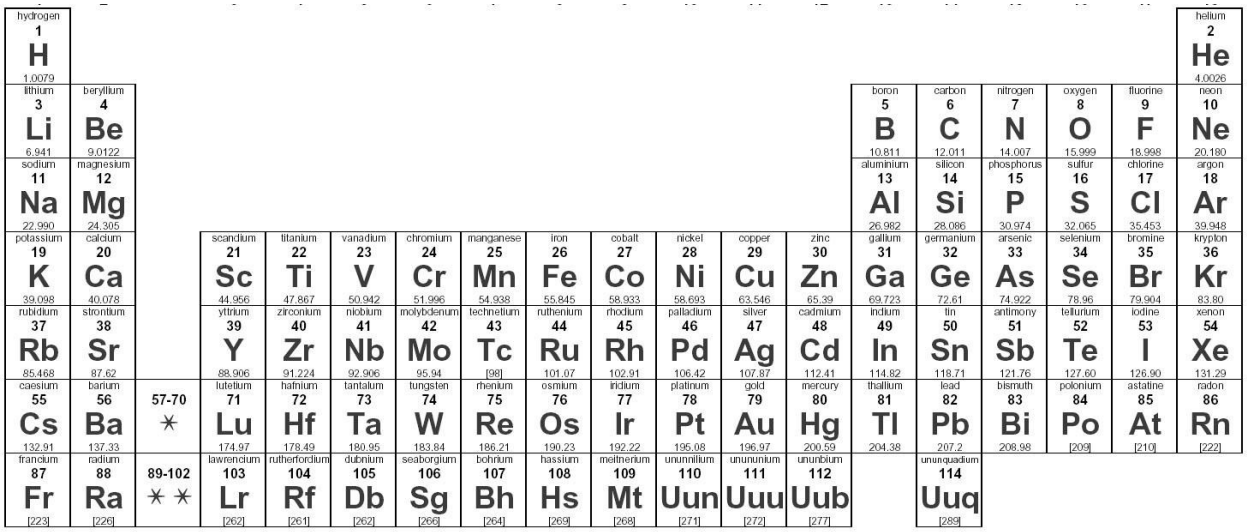
Second Midterm Exam Monday, February 21, 2022

Form B

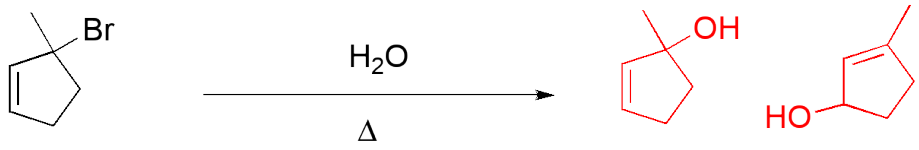
Name_____

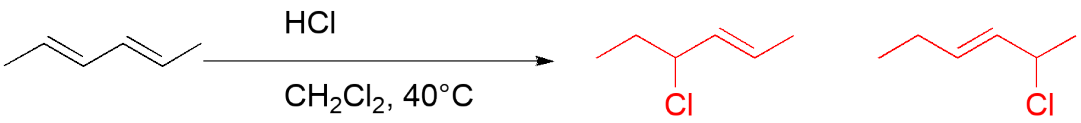
You may use model kits but no other material with chemical information without instructor approval.

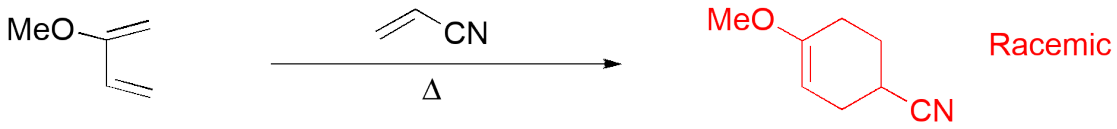
Please do not use ipods or other music players.

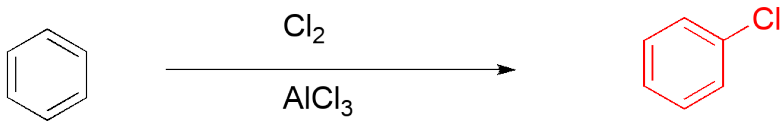


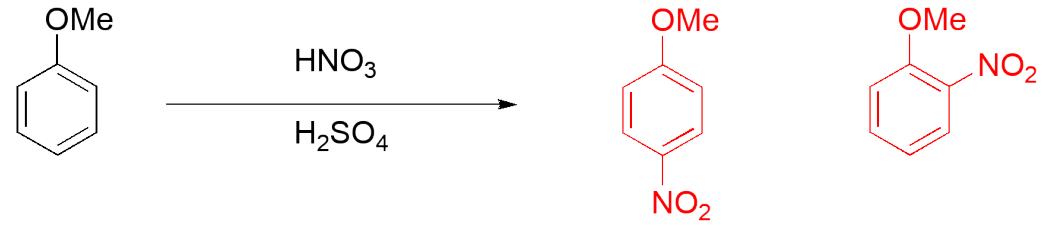
1. (30 points) Write the expected product(s) for each of the following reactions. Specify stereochemistry where appropriate, and include all expected organic products.

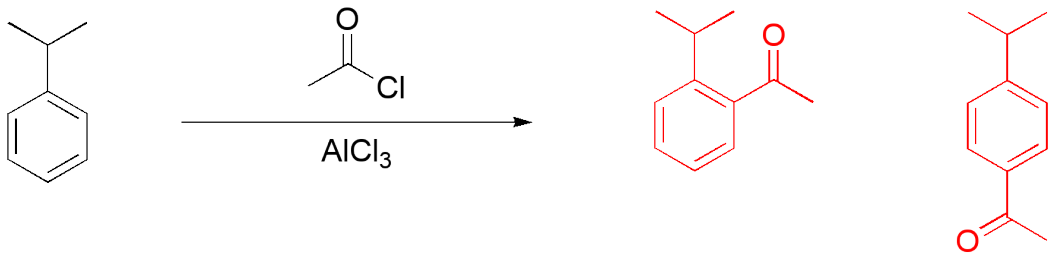
A. 

B. 

C. 

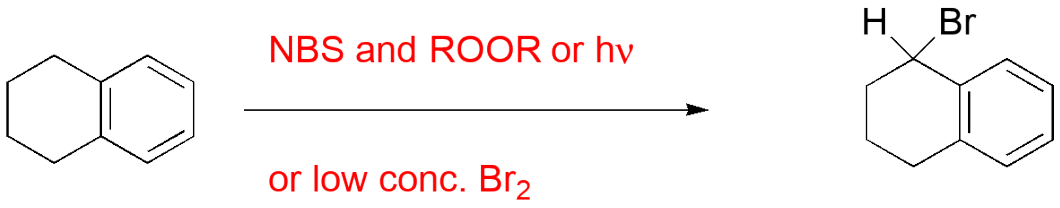
D. 

E. 

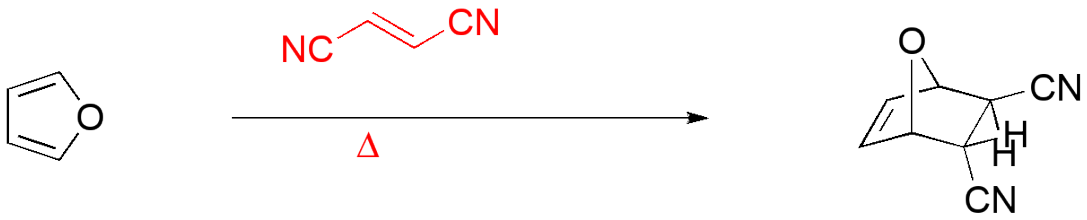
F. 

2. (25 points) Write (over the arrow) the reagents and/or conditions needed to accomplish the following transformations.

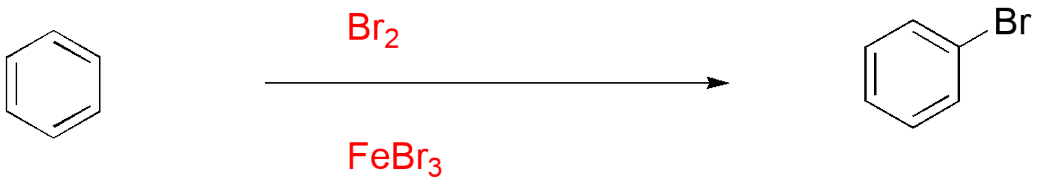
A.



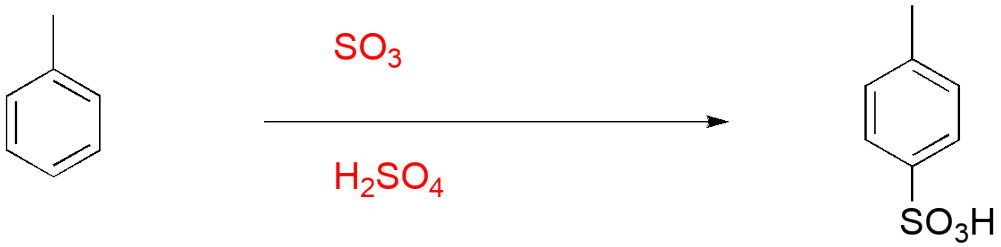
B.



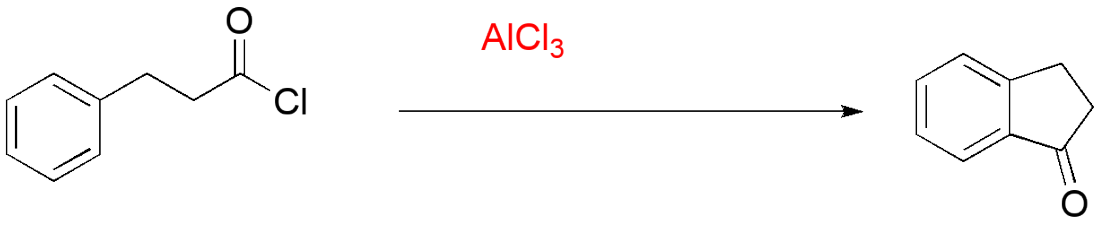
C.



D.

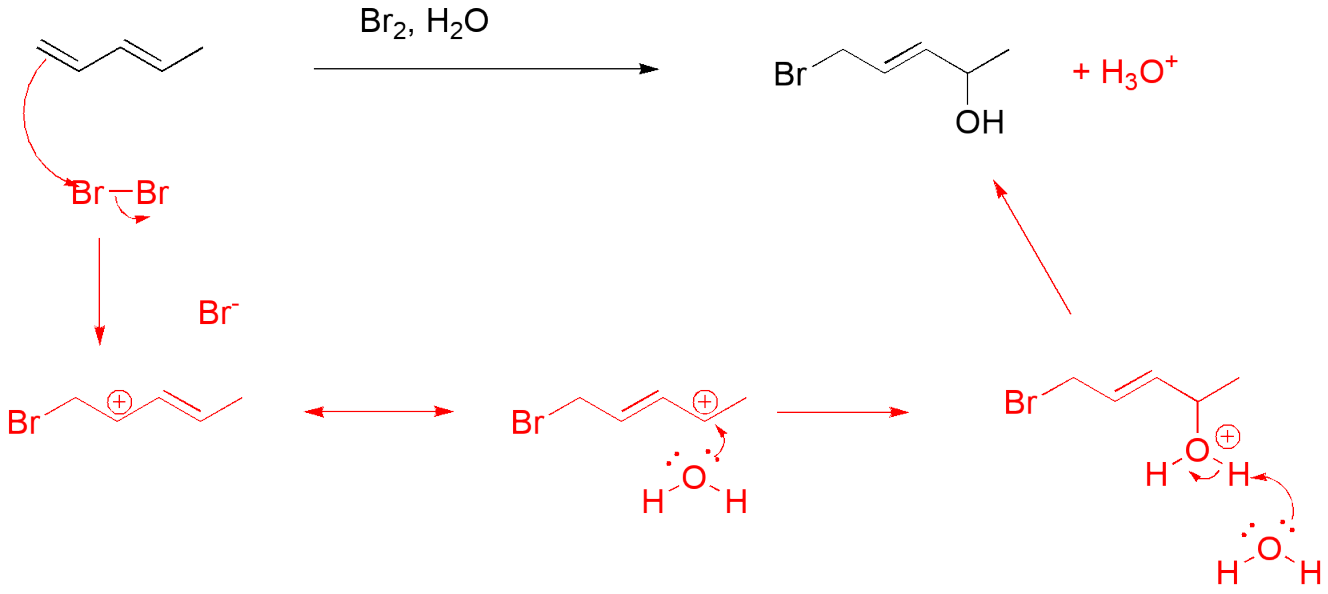


E.

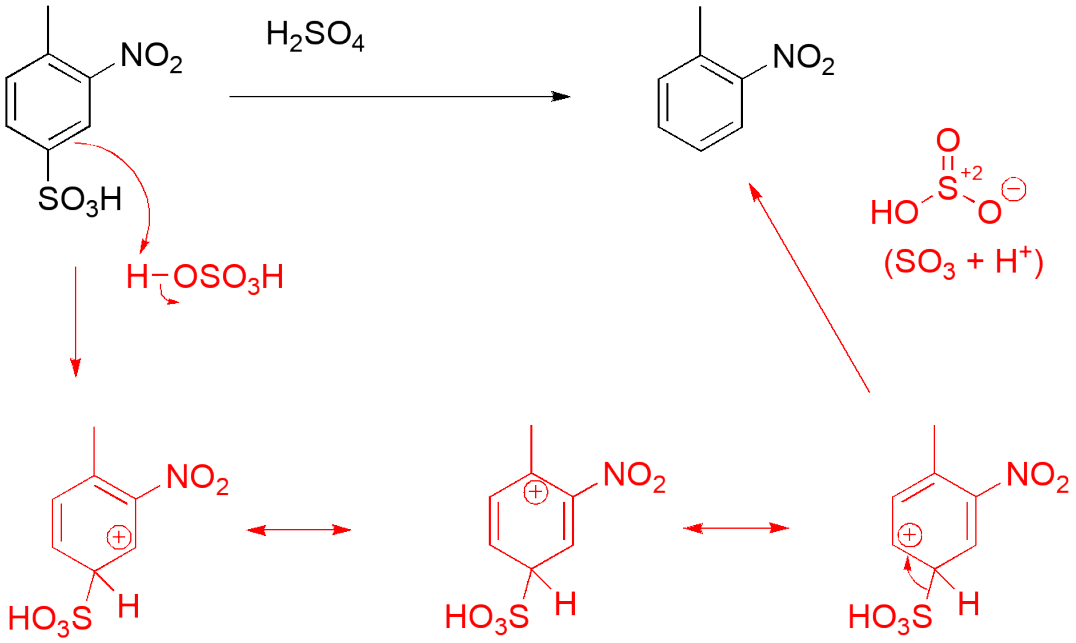


3. (20 points) Write multistep mechanisms (using the correct electron-pushing formalism, and as many steps as needed) for each of the following transformations. Be sure to draw resonance structures for any intermediate so stabilized.

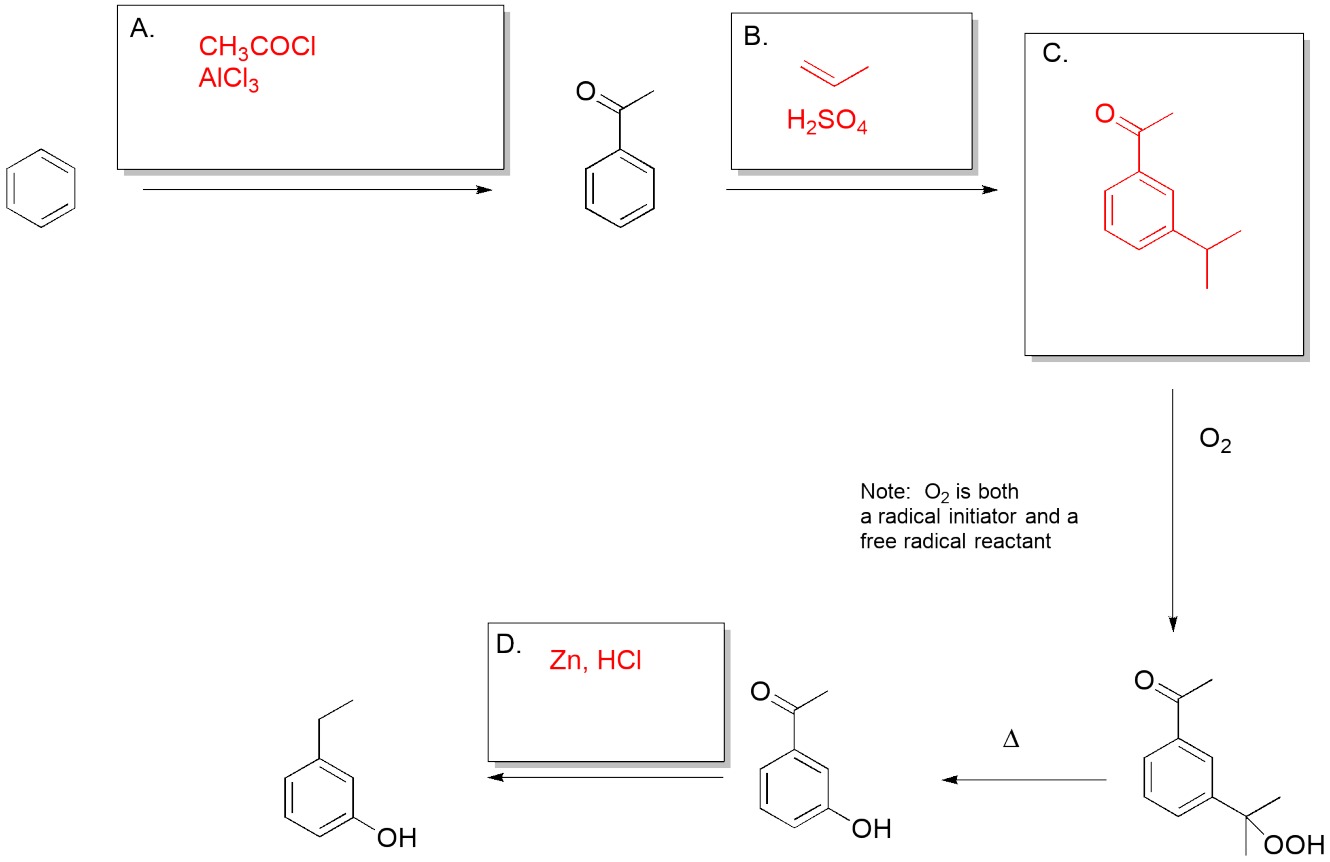
A.



B.

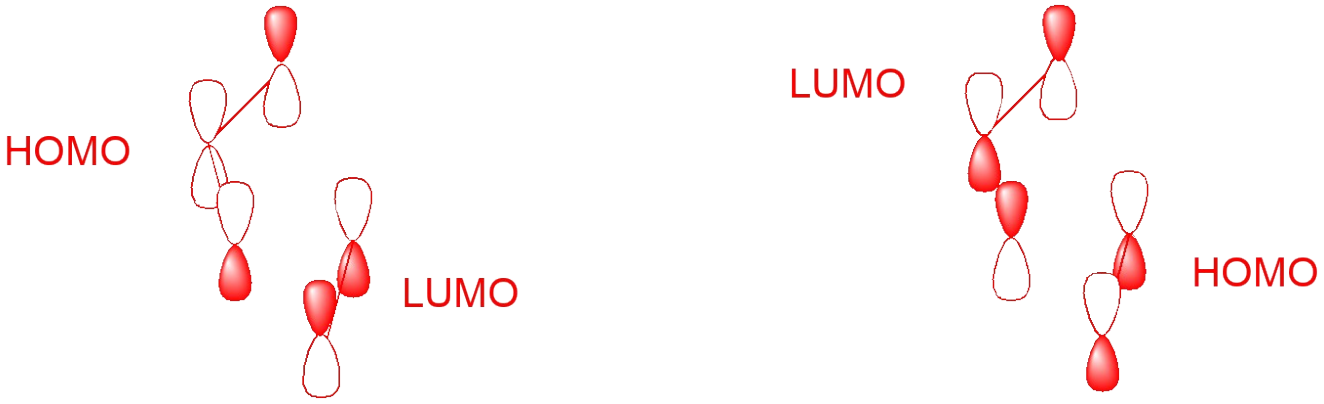


4. (16 points) Using multistep synthesis, show how to make 3-ethylphenol, a compound with two o/p-directors arranges meta to each other.



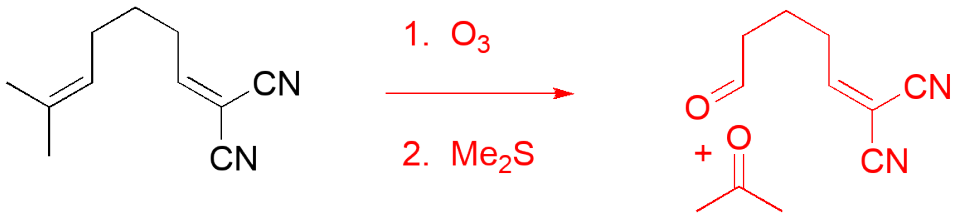
5. (9 points) The reaction of ozone with an alkene is thought to be a concerted pericyclic reaction like the Diels-Alder reaction.

A. Sketch the two HOMO-LUMO interactions between ozone and an alkene. Fill in the correct wavefunction phases by shading the appropriate parts of the p orbitals. (If the particular p orbital is on a node, leave it completely blank.)



Note that the ozone HOMO actually has a node that lies on the central O atom.

B. Given that thermodynamically, ozone is an oxidant and thus electron poor, explain which alkene in the following molecule would react faster (or if they are expected to react at the same rate) in an ozonolysis and why.



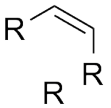
The methyl groups raise the alkene HOMO, making it more reactive, while the nitriles lower the alkene HOMO, making it less reactive. The left side will thus be expected to react faster.

Bond strengths (kcal/mol):

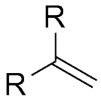
F-F	38
Cl-Cl	58
Br-Br	46
I-I	36
H-F	136
H-Cl	103
H-Br	87
H-I	71
CH_3-H	105
CH_3CH_2-H	101
$(CH_3)_2CH$-H	98.5
$(CH_3)_3C$-H	96.5
CH_3-F	110
CH_3-Cl	85
CH_3-Br	70
CH_3-I	57
CH_3CH_2-F	111
CH_3CH_2-Cl	84
CH_3CH_2-Br	70
CH_3CH_2-I	56
$(CH_3)_2CH$-F	111
$(CH_3)_2CH$-Cl	84
$(CH_3)_2CH$-Br	71
$(CH_3)_2CH$-I	56
$(CH_3)_3C$-F	110
$(CH_3)_3C$-Cl	85
$(CH_3)_3C$-Br	71
$(CH_3)_3C$-I	55

Typical Heats of Hydrogenation

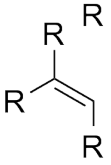
-30 kcal/mol



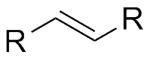
-28.2 kcal/mol



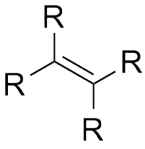
-27.9 kcal/mol



-26.5 kcal/mol



-27.4 kcal/mol



-26.3 kcal/mol