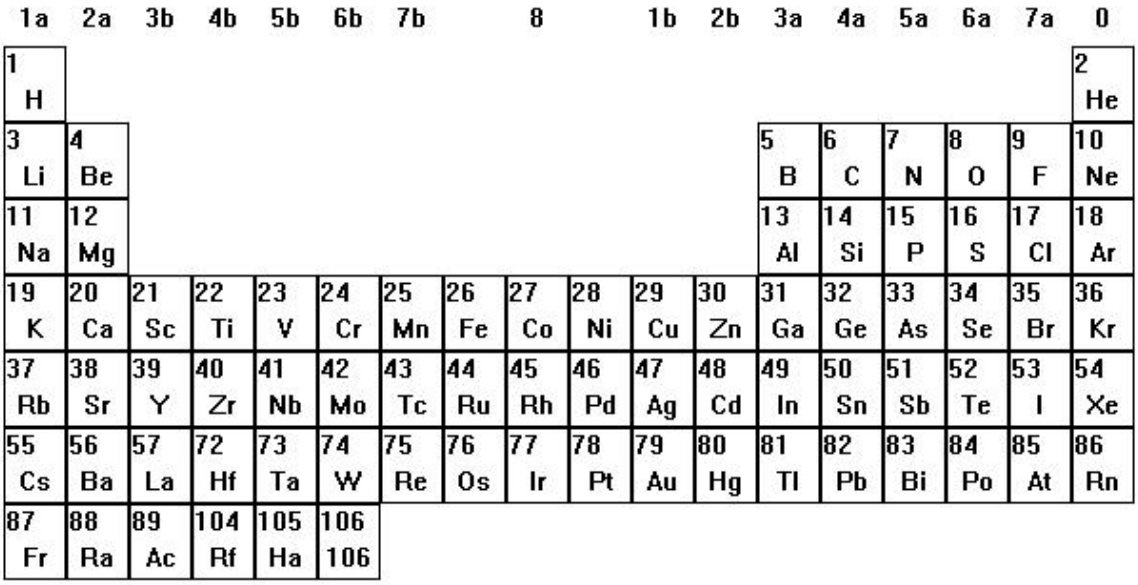
REVIEW TEST
CHM 2120 3X
Prof: Mark Dornan

Last Name: _____ **First name:**_____

Student #:_____ **Date:** May 14th 2015

Notes:

- Approximate total number of points: 51
- There are 6 pages in this exam
- Molecular models are allowed
- Re-grade requests for exams written in pencil will not be considered

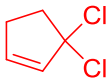


pK_a table

Acid	pK_a
HBr	-9
ROH_2^+	-2
H_3O^+	-1.75
RCO_2H	5
R_3NH^+	10-11
H_2O	15.75
ROH	16-18
$RC(O)CH_3$	20
$HC{\equiv}CH$	25
H_2	36
R_2NH	35-40
$CH_2{=}CH_2$	44
RCH_3	55

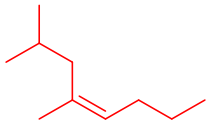
1. Draw the structure of the following compounds:
(5 points)

a. 3,3-dichlorocyclopentene



1

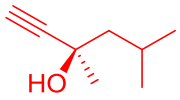
b. (Z)-2,4-dimethyloct-4-ene



1 structure

1 correct stereochem

c. (R)-3,5-dimethylhex-1-yn-3-ol

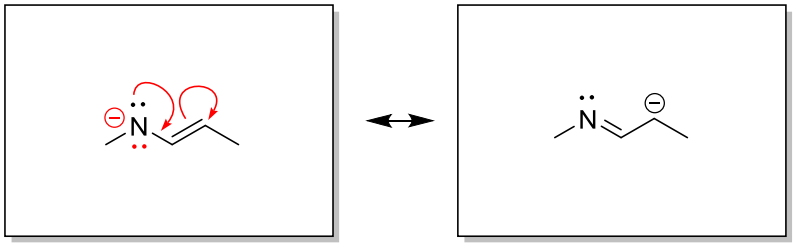


1 structure

1 correct stereochem

2.

a. Two <u>major</u> resonance structures are possible for the following compound. One resonance form is given below but it is incomplete. Complete the structure by adding a formal charge. Draw the remaining structure. Include curved arrows on structure A to show how structure B is formed.
(4 points)



A **B**

1 neg. charge (other l.p. not needed, but N always has full octet)

2 correct arrows

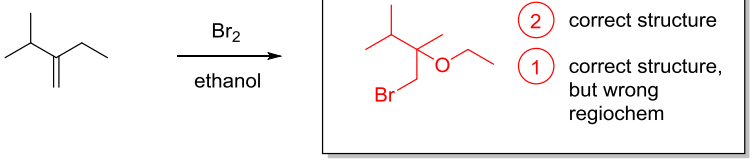
1 correct structure in B

b. Which structure (**A** or **B**) is more stable and why?
(2 points)

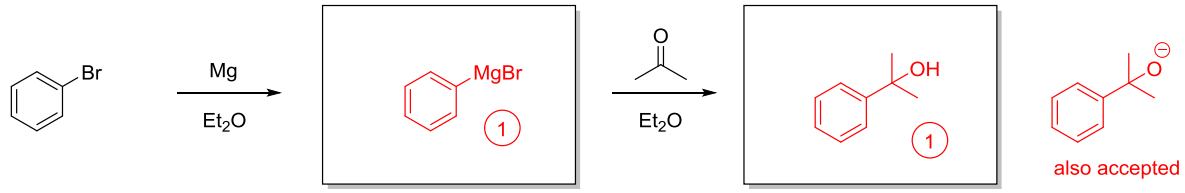
A is more stable because negative charge is on most electronegative atom. pKa explanation (R_2NH = 35-40 vs. RCH_3 = 55) is ok too.

3. Complete the following reaction schemes with starting material(s), product(s) or reagent(s). (14 points)

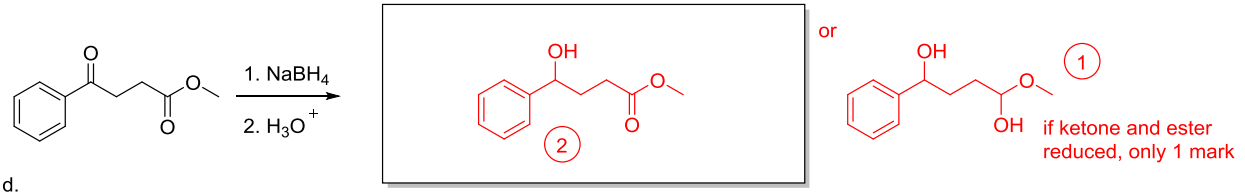
a.



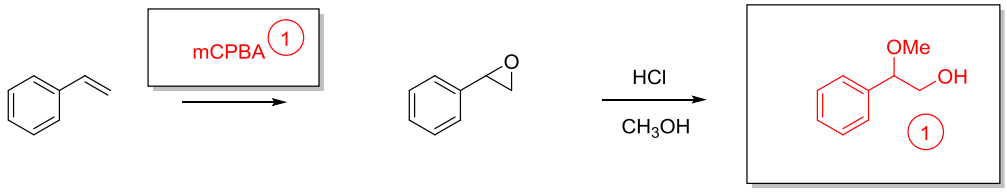
b.



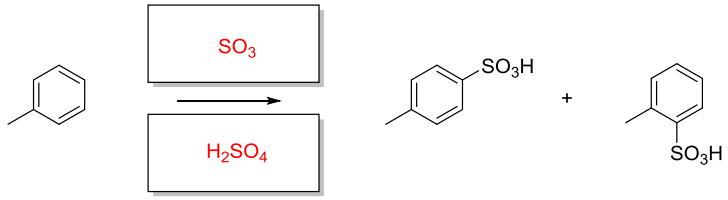
c.



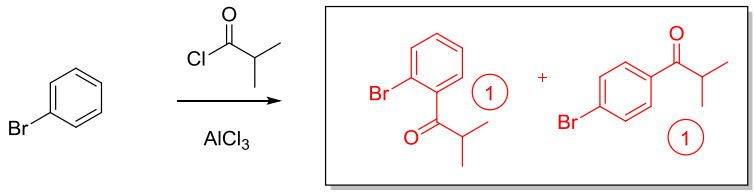
d.



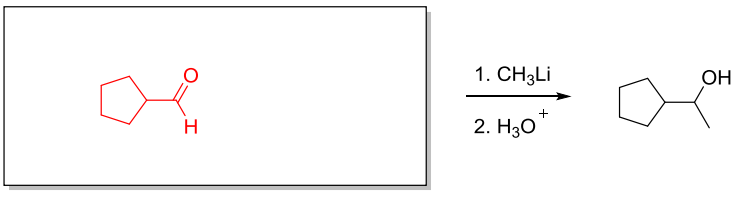
e.



f.

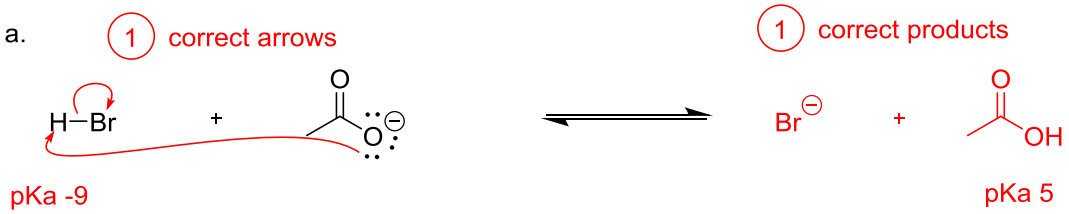


g.



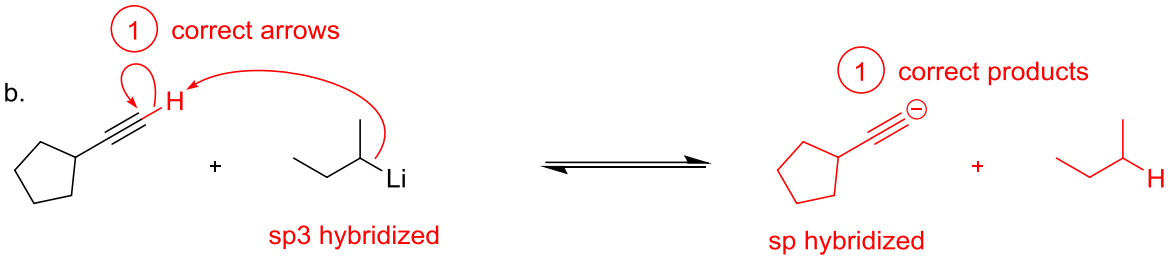
4. Write the equations for the following acid/base reactions including arrow notation. Predict whether the reaction will favour the products or the starting materials. Justify your choice.
(6 points)

a.



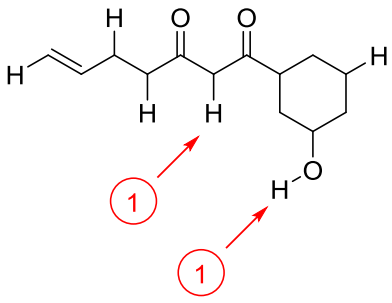
1 Products favoured

b.



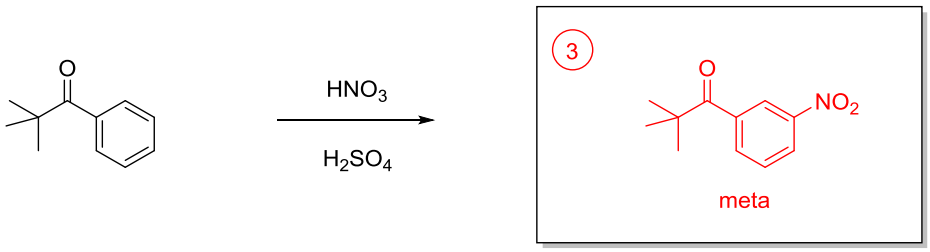
1 Products favoured

5. Two equivalents of LDA (a strong base) react with the following molecule. Indicate the two protons to be removed, labelling them **A** and **B**.
(2 points)

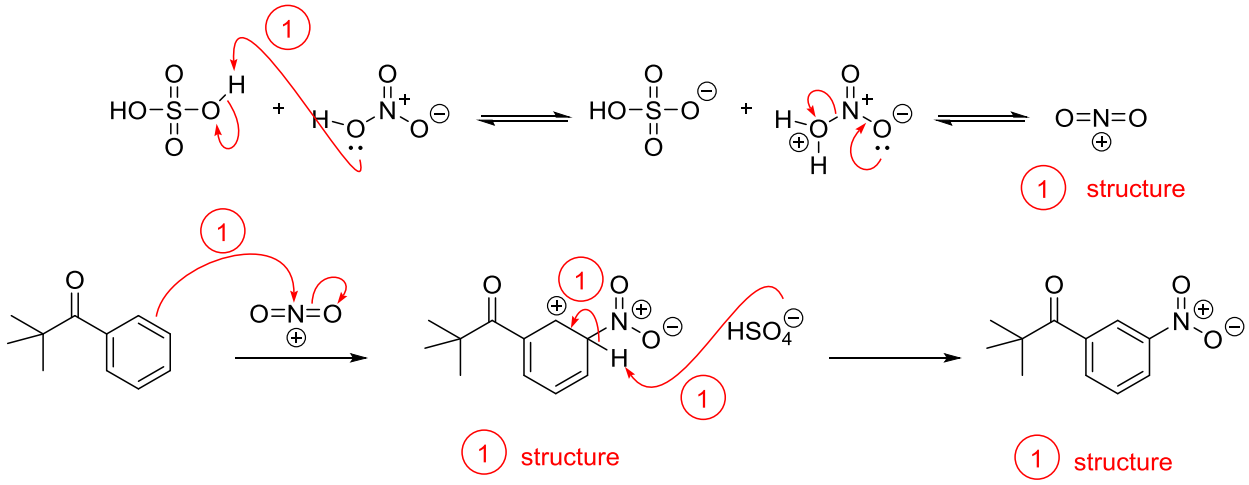


6.

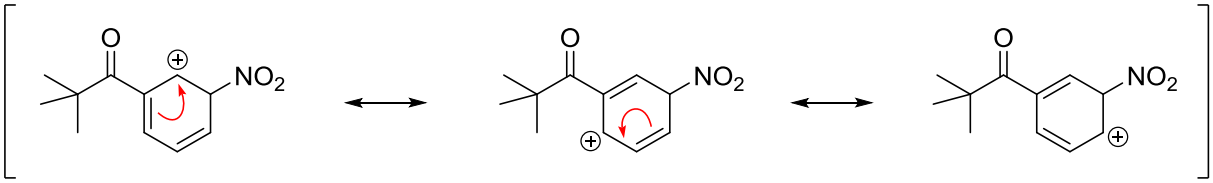
a. What is (are) the major product(s) for this reaction?
(3 points)



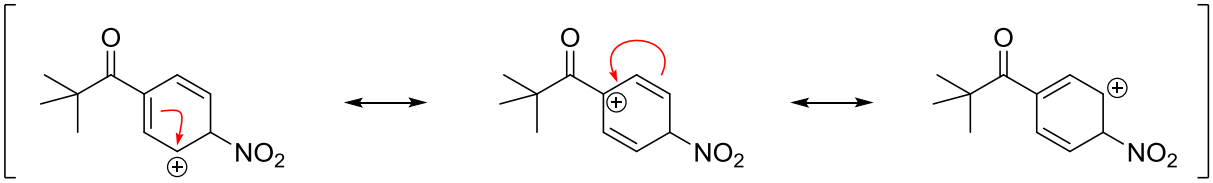
b. Show a detailed mechanism for this reaction.
(7 points)



c. Use resonance structures for the reaction intermediate of the favoured product(s) and the unfavoured product(s) to explain the regioselectivity of the reaction.
(4 points)



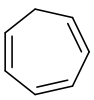
meta- substituted (2)



ortho- or para substituted (1)

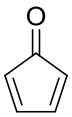
(1) The meta arenium intermediate doesnt have any resonance structure with the arenium ion directly destabilized by the electron withdrawing group. Meta is favoured.

7. Label the following structures as aromatic, anti-aromatic, or not aromatic.
(4 points)

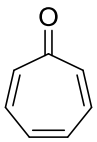


(1) not aromatic

(1) aromatic



(1) antiaromatic



(1) aromatic