Chemistry 2542

Fall Semester 2012; Midterm 1 Exam

October 10, Wednesday, 11:00 to 11:50 am

This exam has 6 problems (100 pts) on 8 pages. Make sure your copy is complete and correct.

Printed Name (Last, First) _____

Your graded exams will be available Friday, October 12, before class.

Good Luck!

Chemistry 2542
Fall 2012; Midterm 1 Exam

This exam has 6 problems on 8 pages. Make sure your copy is complete and correct.

Printed Name (Last, First) _____

Scores:

Problem 1:_____

Problem 2:_____

Problem 3:_____

Problem 4:_____

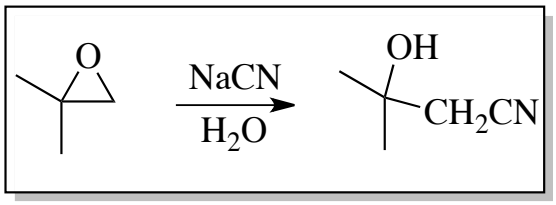
Problem 5:_____

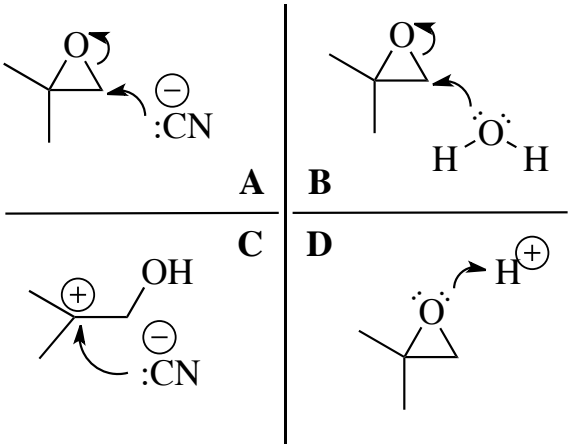
Problem 6:_____

Total: _____

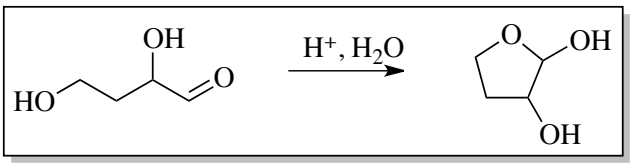
1. (15 pts) Answer the questions on mechanisms of the following reactions.

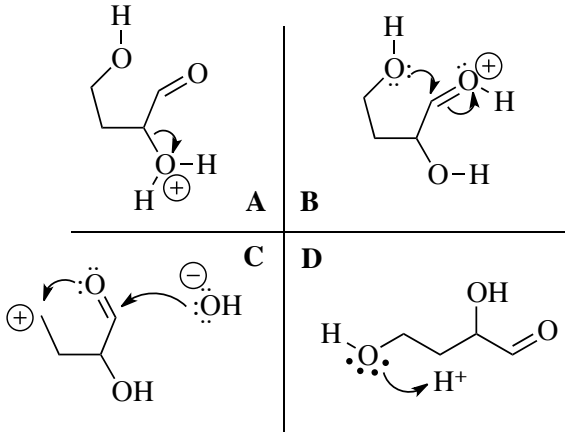
(a) (5 pts) Which one of the following four schemes (**A-D**) gives the best representation of a step in the mechanism of the reaction in the box (circle the correct answer):



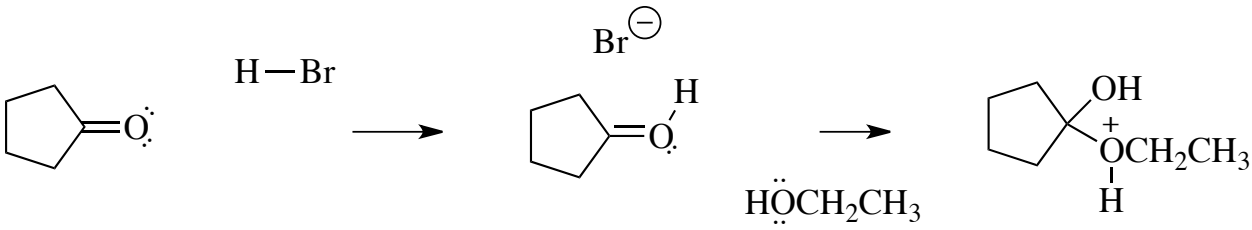


(b) (5 pts) Which one of the following four schemes (**A-D**) gives the best representation of a step in the mechanism of the reaction in the box (circle the correct answer):



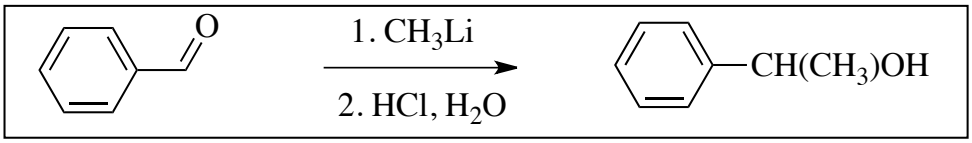


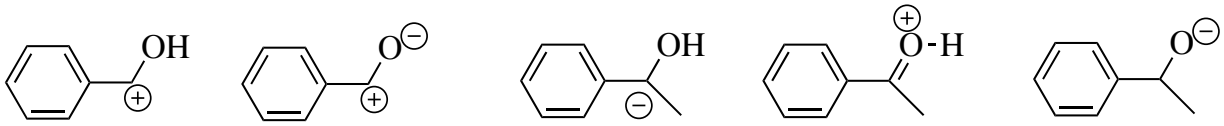
(c) (5 pts) Draw **4** curved **arrows** and show **1 charge** missing in the following mechanism (1 pt each arrow or charge):



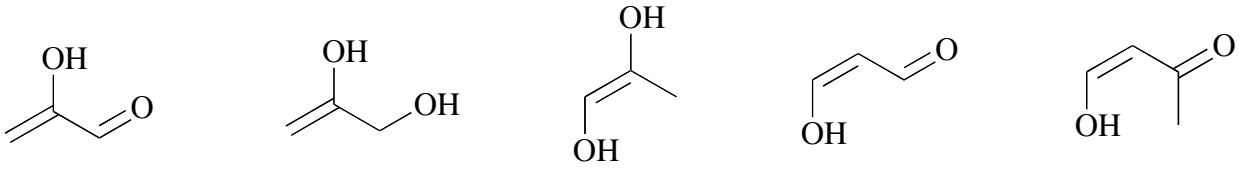
2. (16 pts) Answer the following questions.

(a) (4 pts) Circle the structure of the **intermediate** for the reaction in the box:

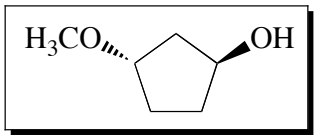




(b) (4 pts) Which one of the following compounds is the **enol** form of **3-oxopropanal**?

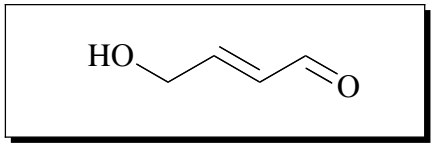


(c) (8 pts) Circle the correct **IUPAC name** of the compounds in the boxes (2 pts each):



cis-3-methoxycyclopentanol *cis*-1-hydroxy-3-methoxycyclopentane

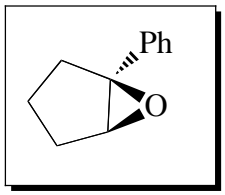
trans-3-methoxycyclopentanol *trans*-1-hydroxy-3-methoxycyclopentane



(E)-4-hydroxy-2-butenal *(Z)*-4-hydroxy-2-butenal

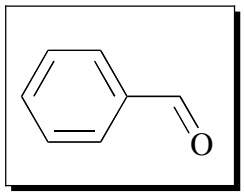
(E)-1-hydroxy-2-buten-4-al *(Z)*-1-hydroxy-2-buten-4-al

(E)-4-oxo-2-butenol *(Z)*-4-oxo-2-butenol



1-phenylcyclopentane epoxide 2-phenylcyclopenteneoxirane

1-phenyl-1,2-epoxycyclopentane 1-phenylcyclopentaneoxide

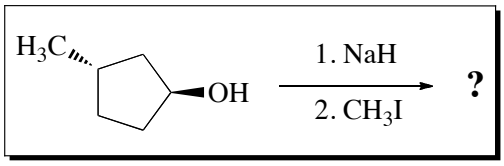


phenylcarbaldehyde cyclohexenecarbaldehyde

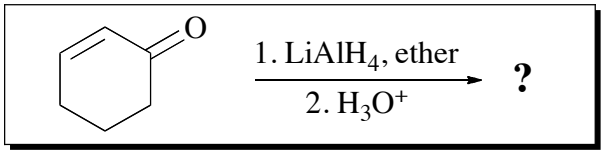
benzaldehyde benzophenone benzenal

3. **(26 pts)** Answer the following questions:

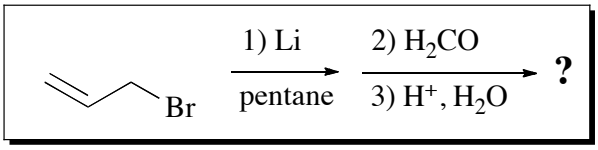
(a) Circle the name of a **major product** in each of the following reactions **(5 pts each)**:



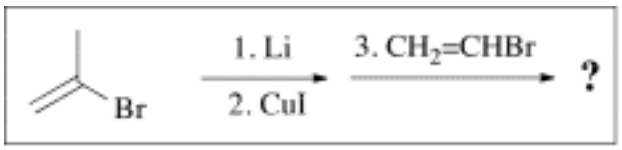
trans-1-methoxy-3-methylcyclopentane 3-methoxycyclopentene
trans-3-methoxycyclopentanol *cis*-3-methoxycyclopentanol
3-methylcyclopentene *cis*-1-methoxy-3-methylcyclopentane



1-cyclohexenol cyclohexanol cyclohexanone
cyclohexene 2-cyclohexenol cyclohexane

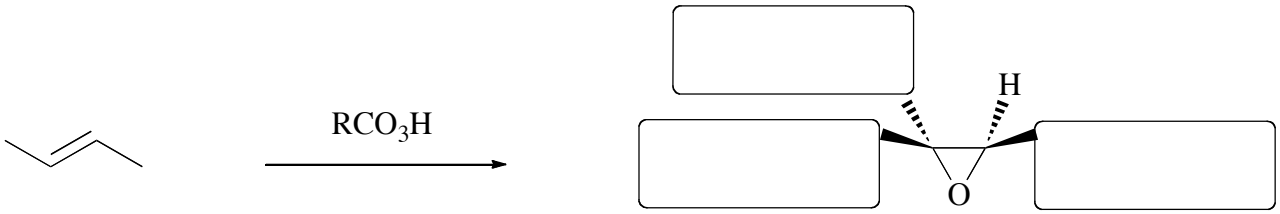


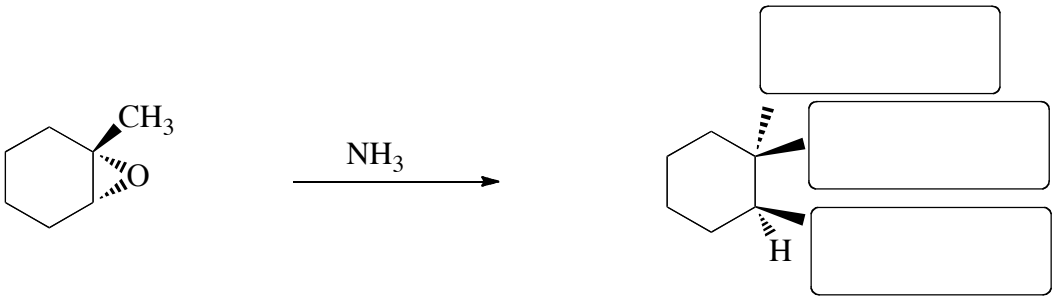
(*Z*)-2-buten-1-ol (*E*)-2-buten-1-ol 3-buten-1-ol
2-propen-1-ol (*Z*)-3-penten-1-ol (*E*)-3-penten-1-ol



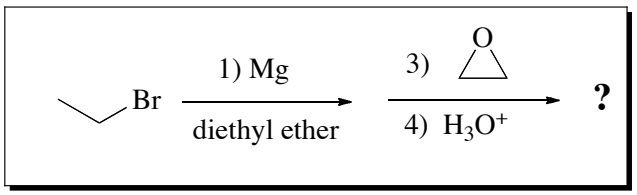
2-methyl-1,4-pentadiene 2-methyl-1,3-butadiene
2-methyl-1,5-hexadiene 2-methyl-1,4-hexadiene

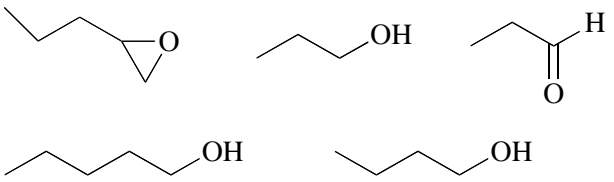
(b) (6 pts) Finish drawing the main product for each the following reactions by placing appropriate substituents in the boxes; 1 pt each.

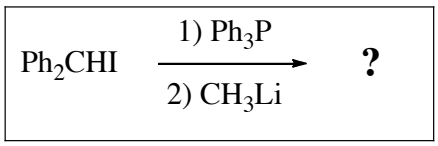


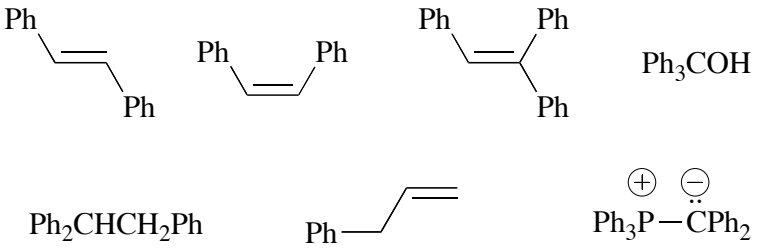


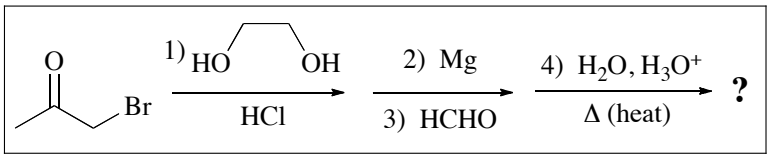
4. (**21 pts**) **(a)** Circle the structure of a **major product** in each of the following reactions (4 pts each):

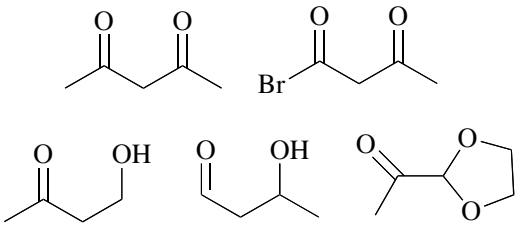


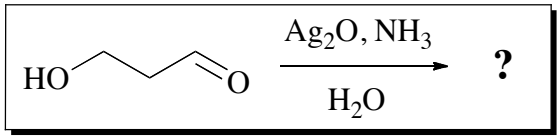


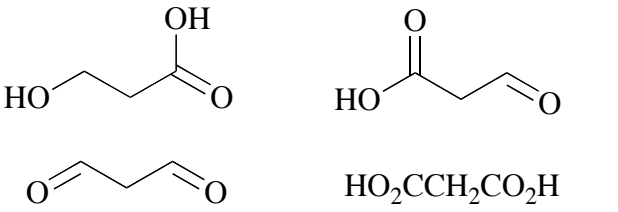




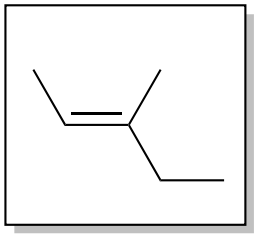


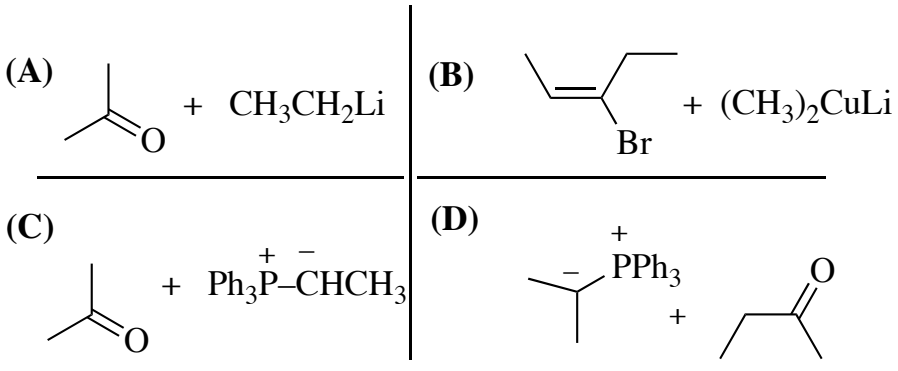






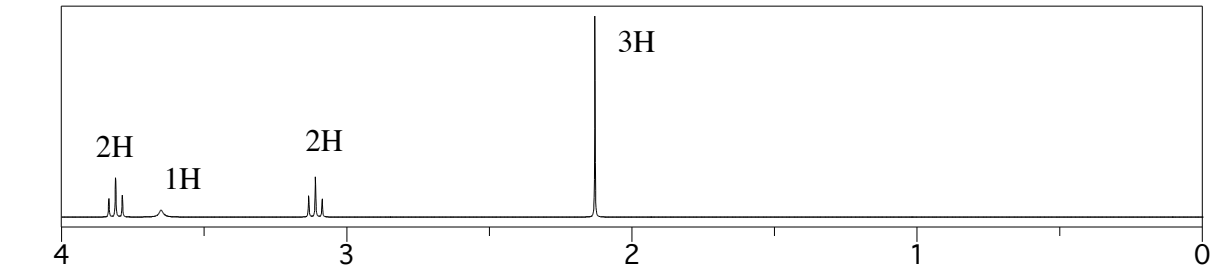
(b) (5 pts) Which pair of reactants is required to synthesize the compound in the box (circle the answer):

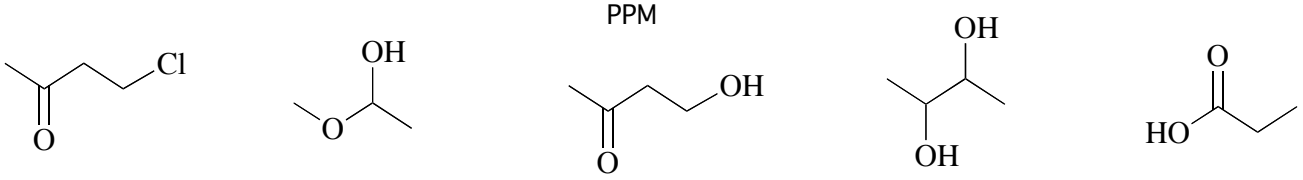




5. (10 pts) Answer the following spectroscopy questions:

(a) (4 pts) Circle the structure of the compound which has a broad, strong IR absorption at 3200-3500 cm^{-1} and the following ^{1}H NMR spectrum:

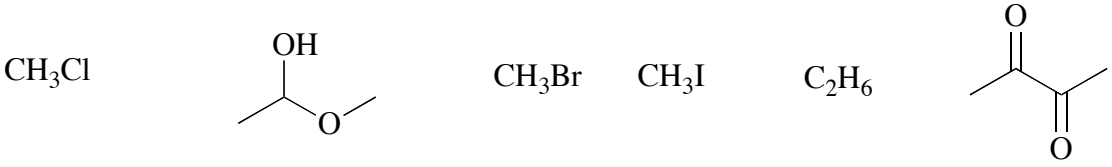




(b) (2 pts) How many signals would you expect to observe in the ^{13}C NMR spectra of the molecule of **1,3-cyclohexanedione** (put the number in the box):

(c) (2 pts) Which of the following compounds will have the *characteristic* **IR** peak at about 2150 cm^{-1} and the molecular peak $M^{+} = 44$ in the mass spectrum (atomic weight of C is 12, N 14, F 19, H 1)?

(d) (2 pts) Which of the following compounds will have the most de**shielded** carbon atom? (Circle one structure)



6. (12 pts) Place in each box the molecule of a reagent that is required to perform each of the following reactions (2 pts each box):