Chemistry 2542, Fall 2016
Midterm Exam 1

Key

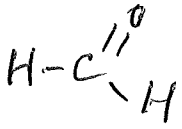
(100 points)

Important notes:

- Please use the provided Scantron form for your answers; you can keep the sheet with the questions and can use it as scratch paper
- Do not forget to write your name on the Scantron form
- You will not receive credit for unmarked answers or for more than one mark on answer line
- Your scores will be posted on eGradebook; graded Scantron forms will not be returned to students.

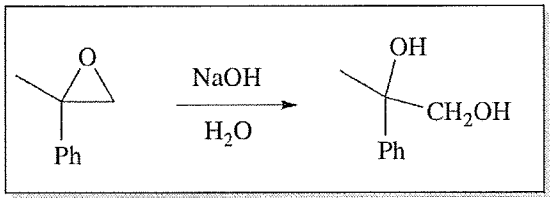
Questions 1-28 (84 pts): Please mark the appropriate box on the front of the Scantron form (3 pts each).

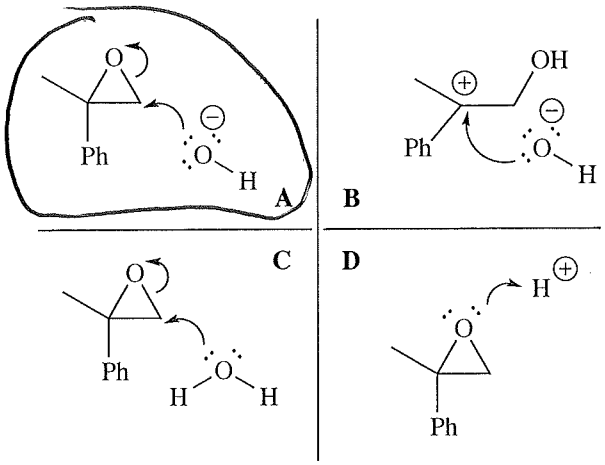
1. What is the common name of **methanal**?



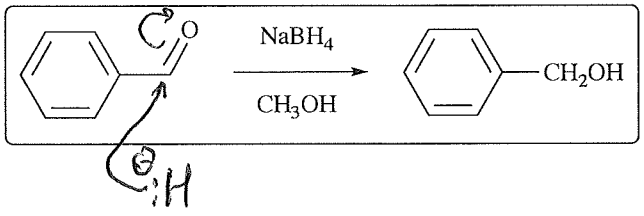
A) acetophenone (B) formaldehyde C) acetaldehyde D) acetone

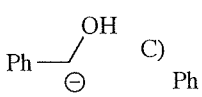
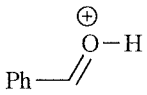
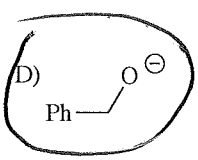
2. Which one of the following four schemes (**A-D**) represents a **step** in the **mechanism** of the reaction in the box?



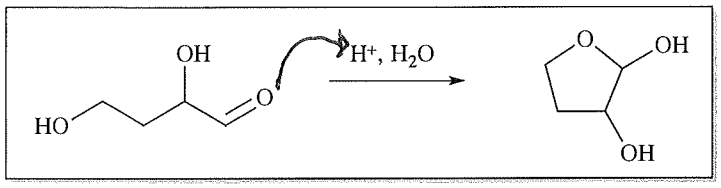


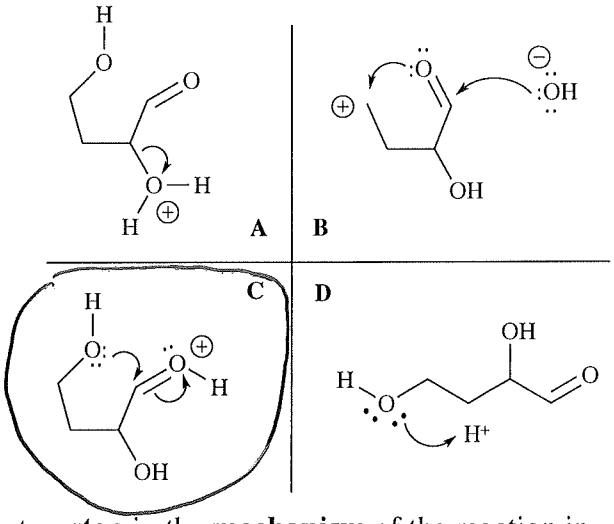
3. What is the structure of an **intermediate** in the reaction shown in the box?



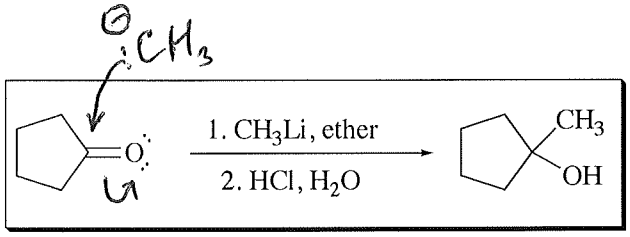
A) B)  C)  D) 

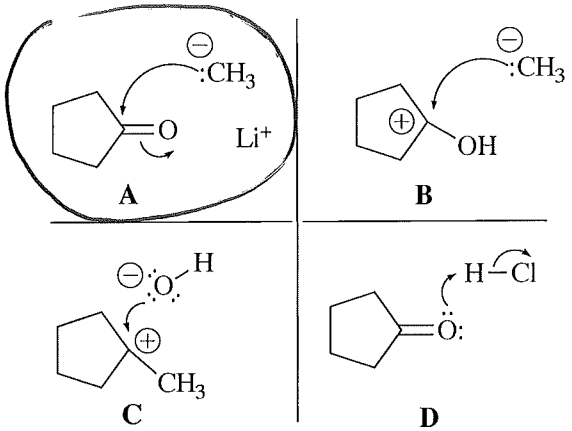
4. Which one of the following four schemes (**A-D**) represents a **step** in the **mechanism** of the reaction in the box?



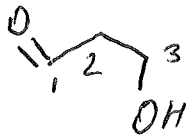


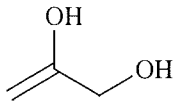
5. Which one of the following four schemes (**A-D**) represents a **step** in the **mechanism** of the reaction in the box?

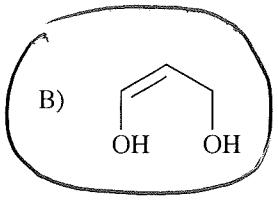


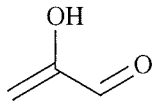


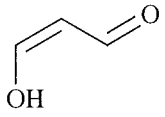
6. Which one of the following compounds is the **enol** form of **3-hydroxypropanal**?



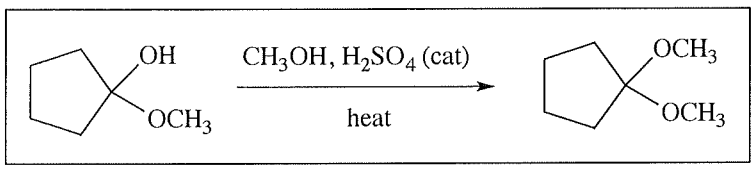
A) 

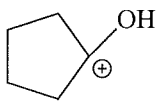
B) 

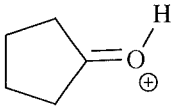
C) 

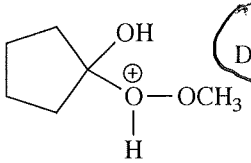
D) 

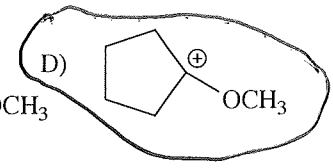
7. What is the structure of an **intermediate** in the acetal formation reaction shown in the box?



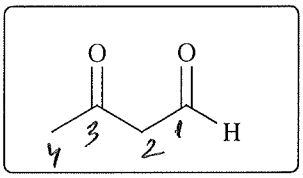
A) 

B) 

C) 

D) 

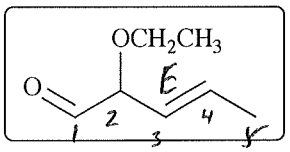
8. What is the **IUPAC name** for the compound in the box?



A) 4-butanal-2-one B) 3-butanone-1-al

C) 3-oxobutanal D) 4-oxo-2-butanone

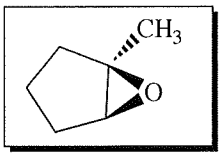
9. What is the **IUPAC name** for the compound shown in the box?



A) *(Z)*-2-ethoxy-3-pentenal B) *(E)*-2-ethoxy-3-pentenal

C) *(Z)*-2-ethoxy-1-oxo-3-pentenal D) *(E)*-2-ethoxy-1-oxo-3-pentenal

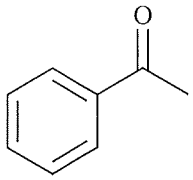
10. What is the **IUPAC name** for the compound shown in the box?

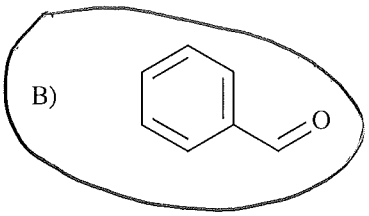


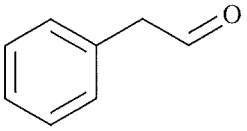
A) *cis*-1-methylcyclopentane epoxide B) *trans*-1-methylcyclopentane epoxide

C) *cis*-1-methyl-1,2-oxycyclopentane D) 1-methyl-1,2-epoxycyclopentane

11. Which one of the following structures is **benzaldehyde**?

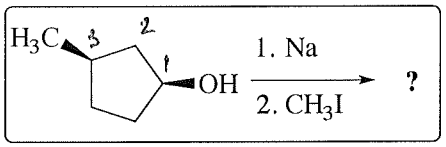
A) 

B) 

C) 

D) CH_3CHO

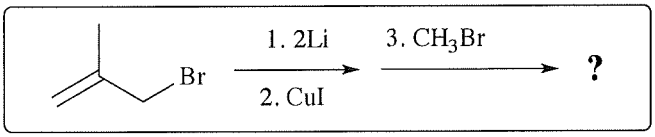
12. What is the IUPAC name of the major **product** for the reaction shown in the box?



A) *trans*-1-methoxy-3-methylcyclopentane B) *cis*-3-methoxycyclopentanol

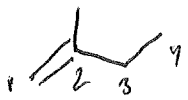
C) *cis*-1-methoxy-3-methylcyclopentane D) 3-methylcyclopentene

13. What is the IUPAC name of the major **product** for the reaction shown in the box?

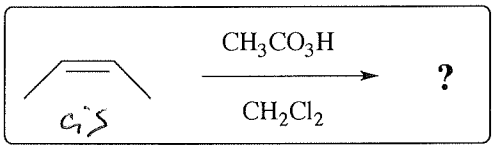


A) 2-methyl-1-butene B) 2-methyl-1,3-butadiene

C) 2-methyl-1-pentene D) 2-methyl-1,4-pentadiene



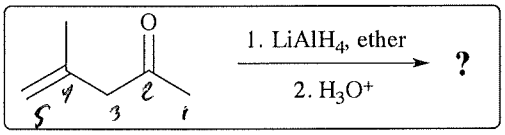
14. What is the IUPAC name of the major **product** for the reaction shown in the box?



A) *cis*-3,4-dimethylepoxide B) *trans*-2,3-dimethyloxirane

C) *trans*-2,3-dimethylepoxide D) *cis*-2,3-dimethyloxirane

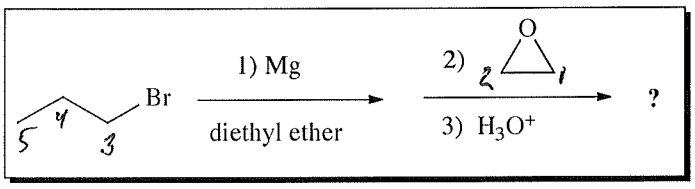
15. What is the IUPAC name of the major **product** for the reaction shown in the box?

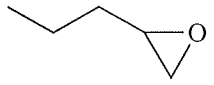


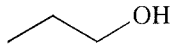
A) 4-methyl-2-pentanol B) 4-methyl-4-penten-2-one

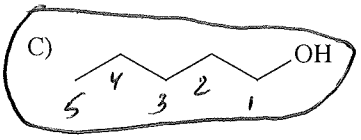
C) 4-methyl-4-penten-2-ol D) 4-methyl-4-hydroxy-2-pentanone

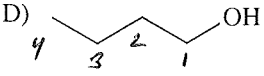
16. What is the main **product** of the reaction sequence shown in the box?



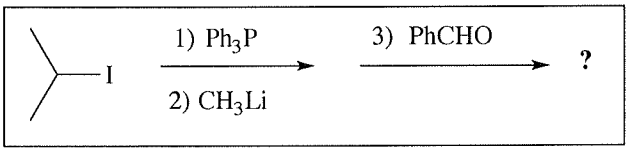
A) 

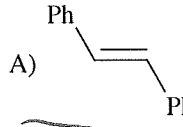
B) 

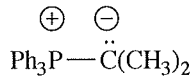
C) 

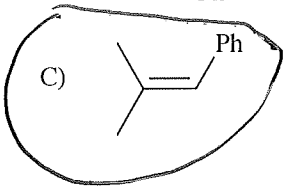
D) 

17. What is the main **product** of the reaction sequence shown in the box?



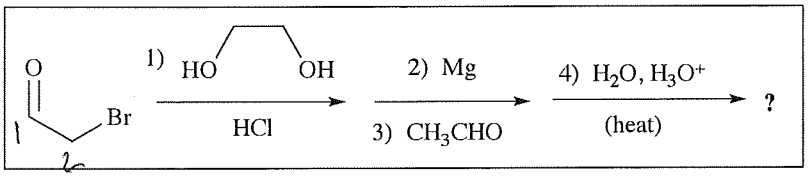
A) 

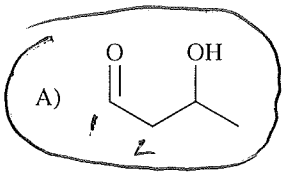
B) 

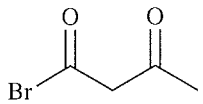
C) 

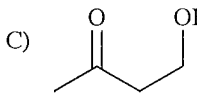
D) $(CH_3)_2CHCH_2Ph$

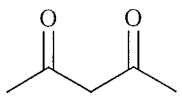
18. What is the main **product** of the reaction sequence shown in the box?



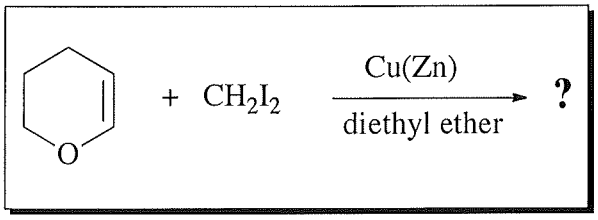
A) 

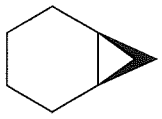
B) 

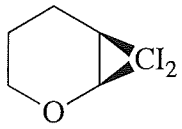
C) 

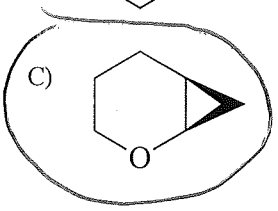
D) 

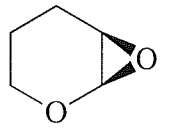
19. What is the main **product** of the reaction shown in the box?



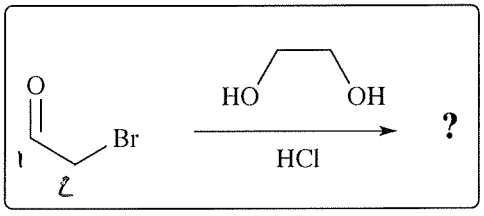
A) 

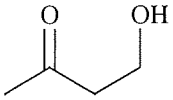
B) 

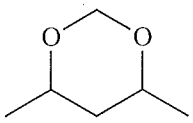
C) 

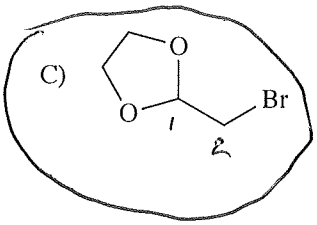
D) 

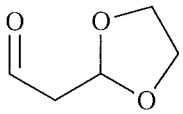
20. What is the main **product** of the reaction shown in the box?



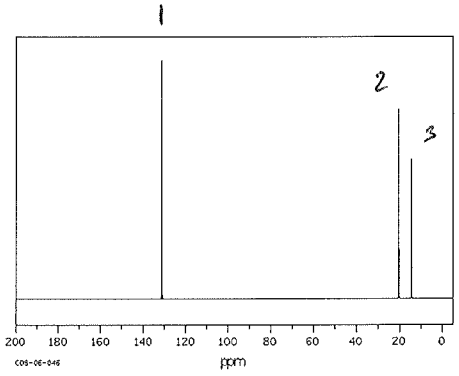
A) 

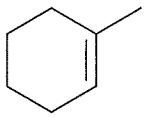
B) 

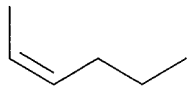
C) 

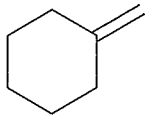
D) 

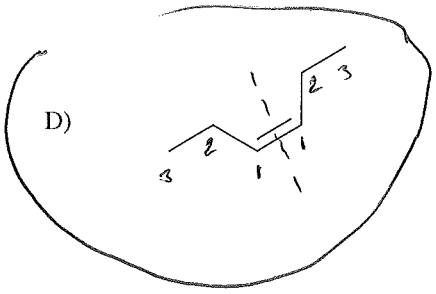
21. Identify the compound that gives the ^{13}C NMR spectrum shown below.



A) 

B) 

C) 

D) 

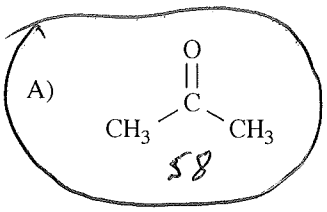
22. Which of the following compounds will have the most **shielded** carbon atoms?

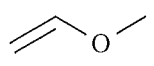
A) CH_4 B) $H_2C{=}O$ C) $(CH_3)_4Si$ D) CH_3Cl

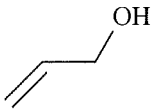
23. How many signals would you expect to observe in the ^{1}H NMR spectra of the molecule of **acetone**?

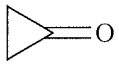
A) 4 B) 3 C) 2 D) 1

24. Which of the following compounds will have the *characteristic* **IR** peak at about 1720 cm^{-1} and the molecular peak $M^+ = 58$ in the mass spectrum (atomic weight of C is 12, O 16, H 1)?

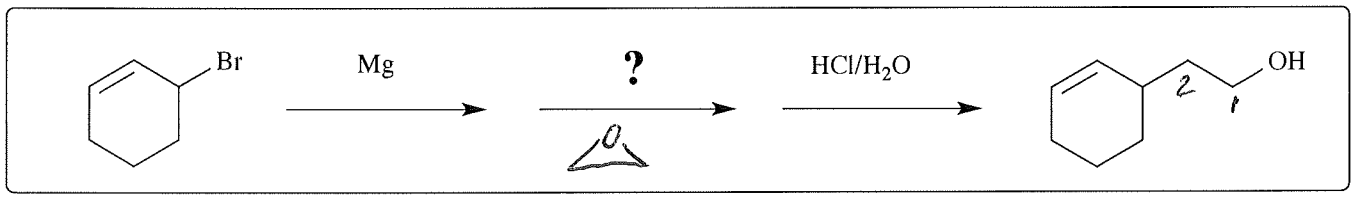
A) 

B) 

C) 

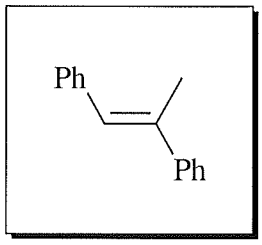
D) 

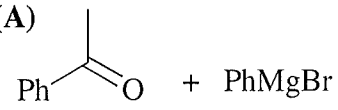
25. What is the name of the missing **reactant**?

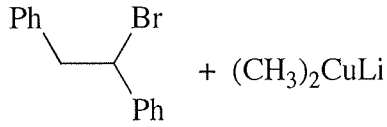


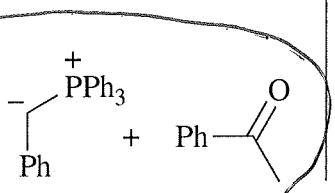
A) formaldehyde B) acetaldehyde C) cyclohexanone D) ethylene oxide

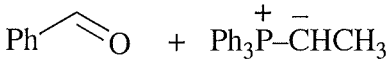
26. Which pair of **reactants** is required to synthesize the compound in the box?



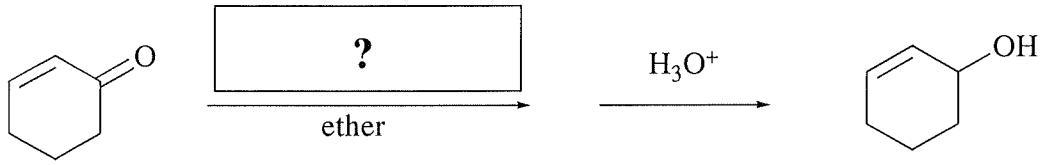
(A) 

(B) 

(C) 

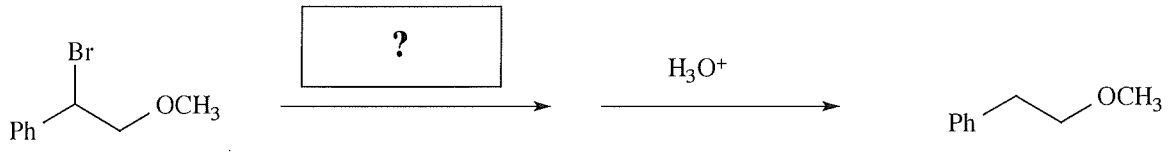
(D) 

27. Which **reagent** can be used for the reaction shown in the box?



A) $LiAlH_4$ B) CH_3MgBr C) CH_3Li D) Ag_2O

28. Which **reagent** can be used for the reaction shown in the box?



A) $LiAlH_4$ B) CH_3MgBr C) Mg D) NH_2NH_2

Question 29 (16 pts): Please write your answers into the appropriate space on the back of the Scantron form.

29. Provide the **reagents** that give indicated products in high yield (4 pts each):