

# Chemistry 2542, Fall 2016

## Midterm Exam 1

(100 points)

### Important notes:

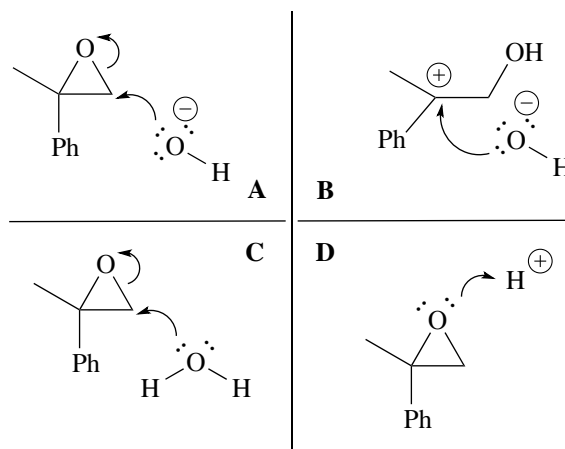
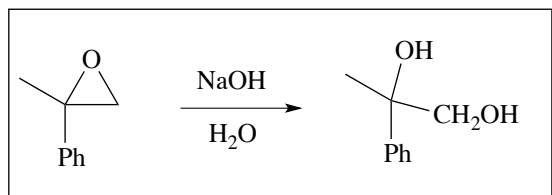
- Please use the provided Scantron form for your answers; you can keep the sheet with the questions and can use it as scratch paper
- Do not forget to write your name on the Scantron form
- You will not receive credit for unmarked answers or for more than one mark on answer line
- Your scores will be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

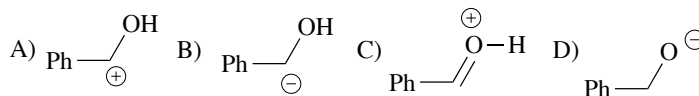
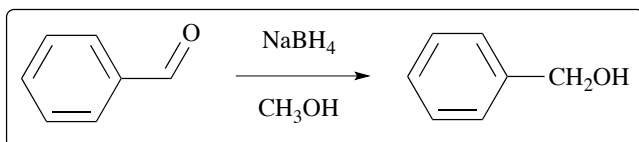
1. What is the common name of **methanal**?

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

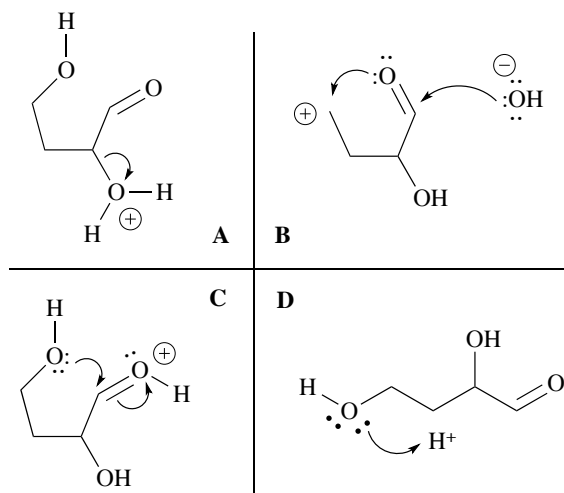
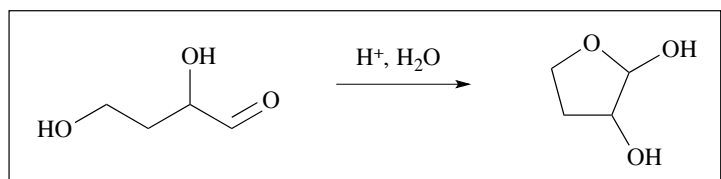
2. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



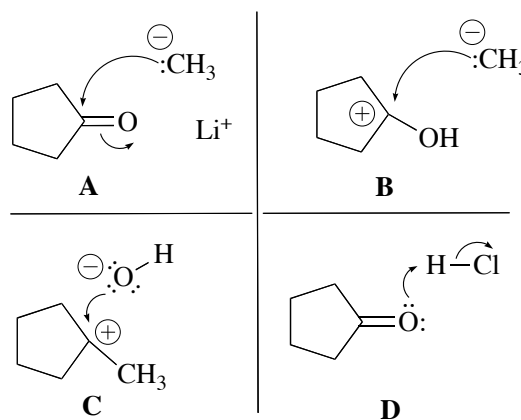
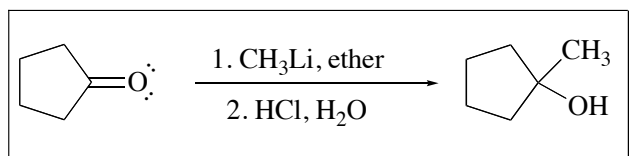
3. What is the structure of an **intermediate** in the reaction shown in the box?



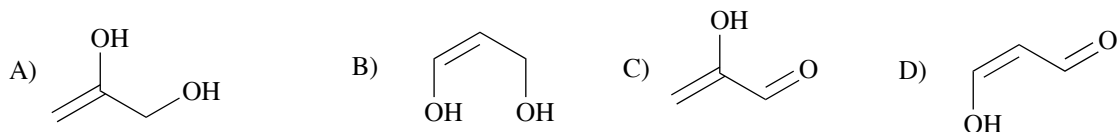
4. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



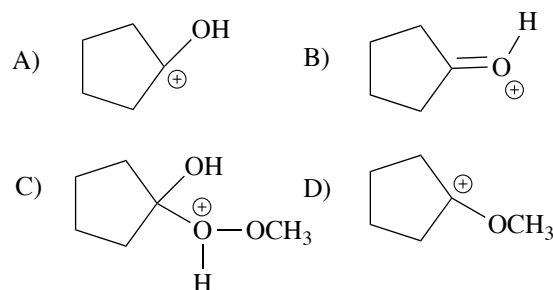
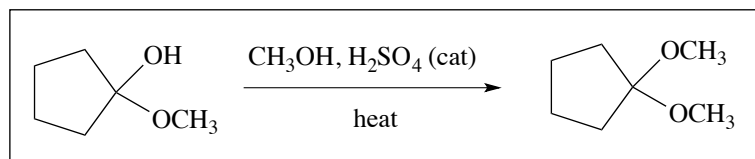
5. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



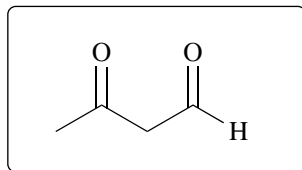
6. Which one of the following compounds is the **enol** form of 3-hydroxypropanal?



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

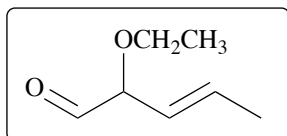


8. What is the **IUPAC name** for the compound in the box?



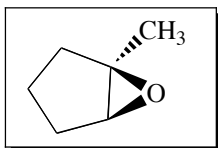
- A) 4-butanal-2-one   B) 3-butanone-1-al  
C) 3-oxobutanal   D) 4-oxo-2-butanone

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



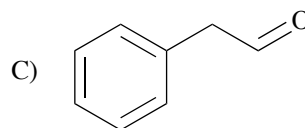
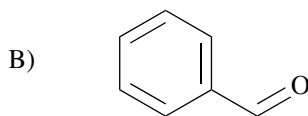
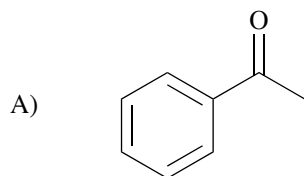
- A) (Z)-2-ethoxy-3-pentenal   B) (E)-2-ethoxy-3-pentenal  
C) (Z)-2-ethoxy-1-oxo-3-pentenal   D) (E)-2-ethoxy-1-oxo-3-pentenal

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

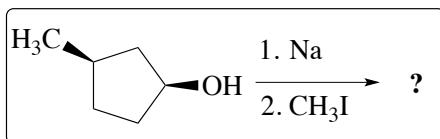


- A) *cis*-1-methylcyclopentane epoxide   B) *trans*-1-methylcyclopentane epoxide  
C) *cis*-1-methyl-1,2-oxycyclopentane   D) 1-methyl-1,2-epoxycyclopentane

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

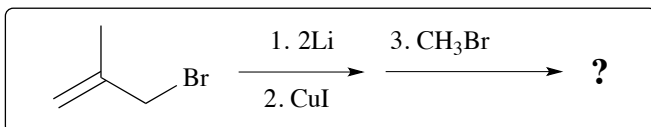


12. What is the IUPAC name of the major **product** for the reaction shown in the box?



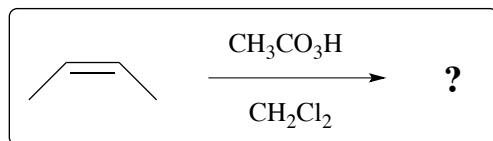
- A) *trans*-1-methoxy-3-methylcyclopentane   B) *cis*-3-methoxycyclopentanol  
C) *cis*-1-methoxy-3-methylcyclopentane   D) 3-methylcyclopentene

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



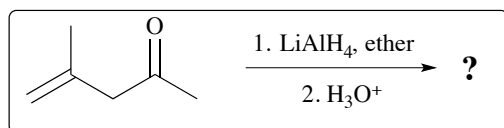
- A) 2-methyl-1-butene   B) 2-methyl-1,3-butadiene  
C) 2-methyl-1-pentene   D) 2-methyl-1,4-pentadiene

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



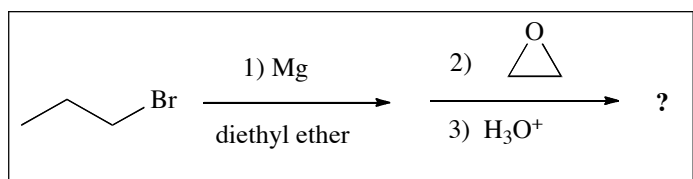
- A) *cis*-3,4-dimethylepoxiide    B) *trans*-2,3-dimethyloxirane  
C) *trans*-2,3-dimethylepoxiide    D) *cis*-2,3-dimethyloxirane

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



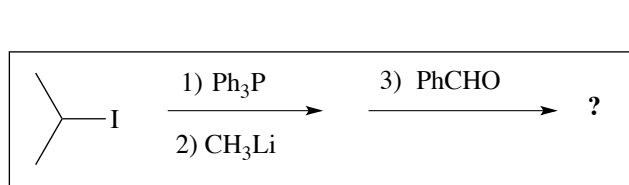
- A) 4-methyl-2-pentanol    B) 4-methyl-4-penten-2-one  
C) 4-methyl-4-penten-2-ol    D) 4-methyl-4-hydroxy-2-pentanone

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



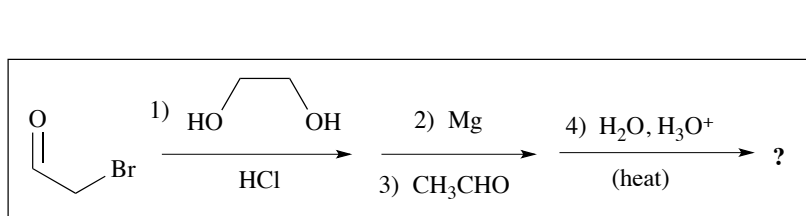
- A)    B)   
C)    D)

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



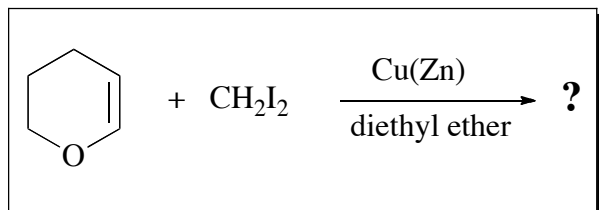
- A)    B)  $\text{Ph}_3\text{P}^+ - \text{C}^-(\text{CH}_3)_2$   
C)    D)  $(\text{CH}_3)_2\text{CHCH}_2\text{Ph}$

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



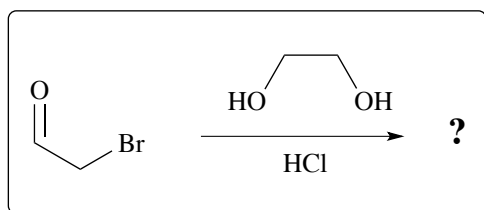
- A)    B)   
C)    D)

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



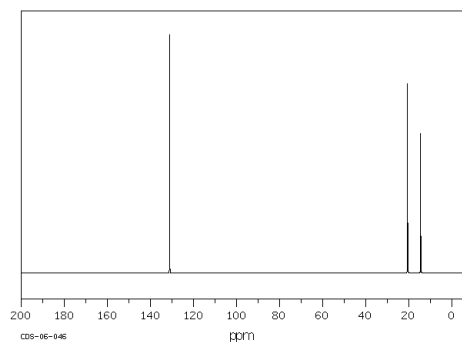
- A)
- B)
- C)
- D)

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



- A)
- B)
- C)
- D)

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



- A)
- B)
- C)
- D)

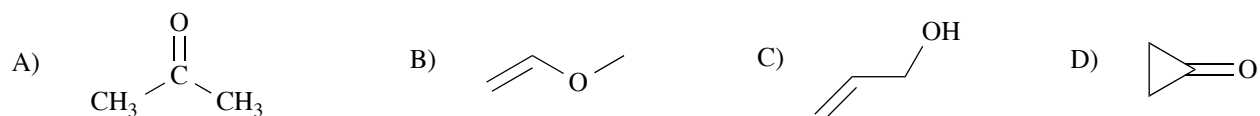
22. Which of the following compounds will have the most **shielded** carbon atoms?

- A)  $\text{CH}_4$       B)  $\text{H}_2\text{C}=\text{O}$       C)  $(\text{CH}_3)_4\text{Si}$       D)  $\text{CH}_3\text{Cl}$

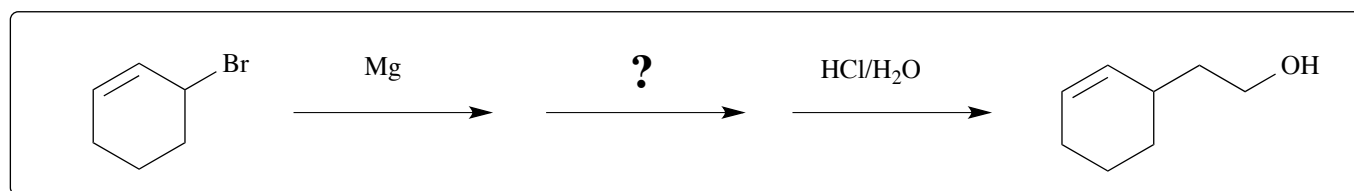
23. How many signals would you expect to observe in the  $^1\text{H}$  NMR spectra of the molecule of **acetone**?

- A) 4      B) 3      C) 2      D) 1

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

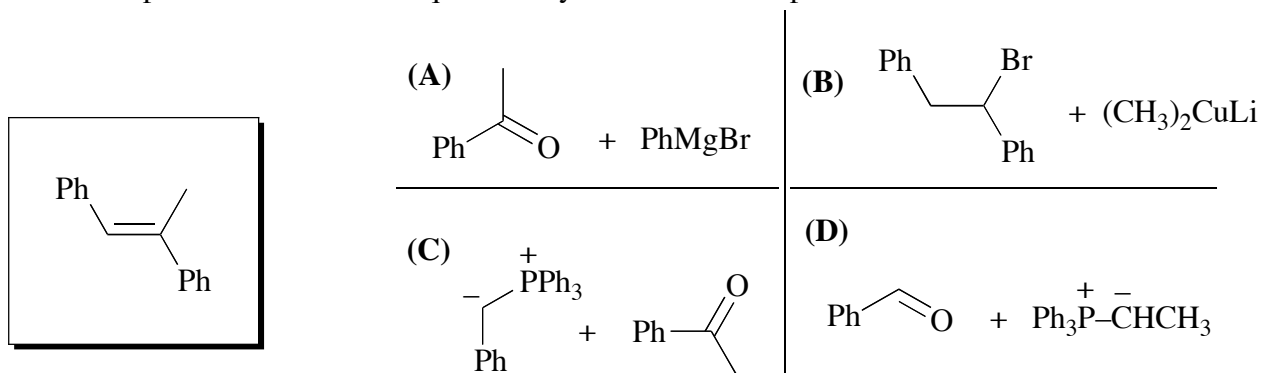


25. What is the name of the missing **reactant**?

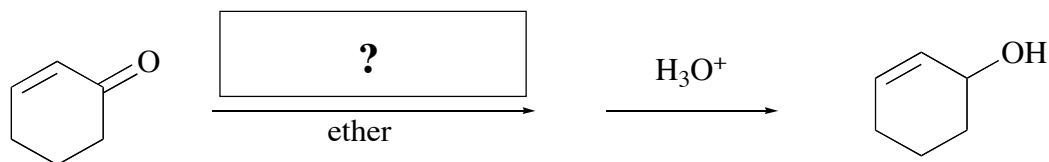


- A) formaldehyde      B) acetaldehyde      C) cyclohexanone      D) ethylene oxide

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

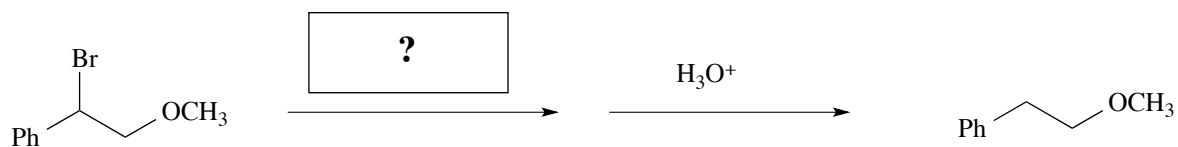


27. Which **reagent** can be used for the reaction shown in the box?



- A)  $\text{LiAlH}_4$       B)  $\text{CH}_3\text{MgBr}$       C)  $\text{CH}_3\text{Li}$       D)  $\text{Ag}_2\text{O}$

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



A)  $\text{LiAlH}_4$

B)  $\text{CH}_3\text{MgBr}$

C)  $\text{Mg}$

D)  $\text{NH}_2\text{NH}_2$

**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):

