

Chemistry 2542, Fall 2016

Midterm Exam 2

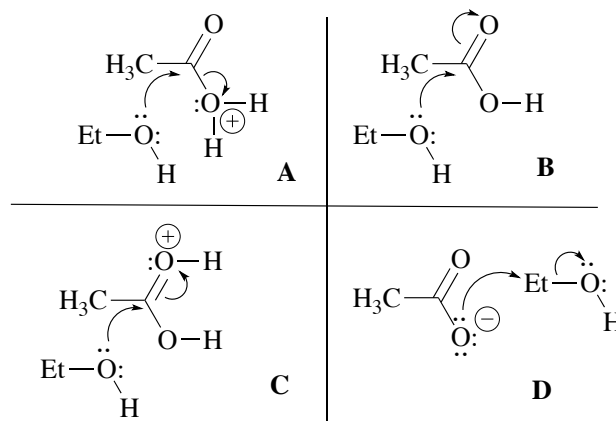
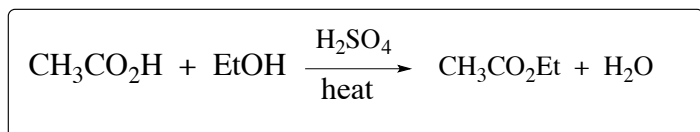
(100 points)

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).

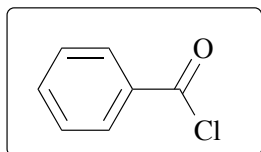
1. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



2. What is the order of **acidity** of: (1) 2,2-difluoropropanoic acid, (2) 2-fluoropropanoic acid, (3) 3-fluoropropanoic acid?

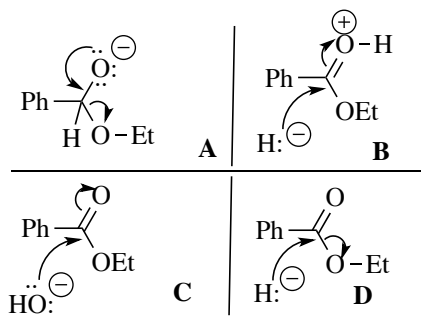
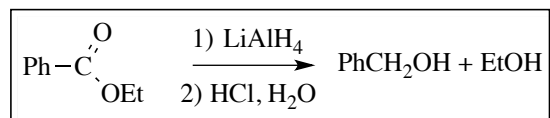
- A) 1 (strongest) > 2 > 3 (weakest) B) 2 (strongest) > 3 > 1 (weakest)
 C) 2 (strongest) > 1 > 3 (weakest) D) 3 (strongest) > 2 > 1 (weakest)

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

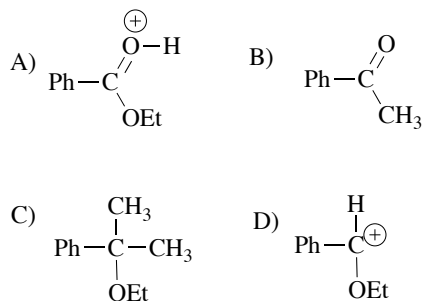
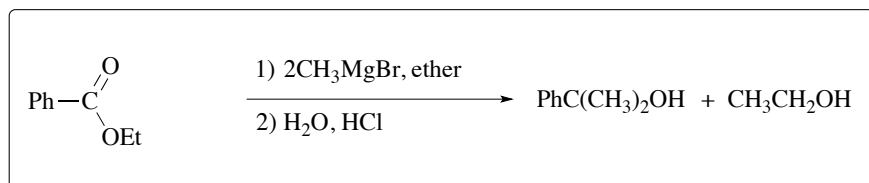


- A) benzoyl chloride B) chloro benzoate
 C) benzenyl chloride D) chlorobenzaldehyde

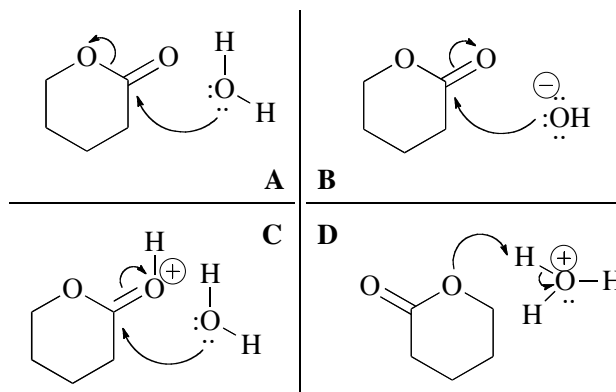
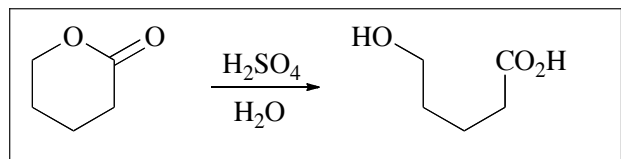
4. Which one of the following four schemes (A-D) represents a **step** in the **mechanism** of the reaction in the box?



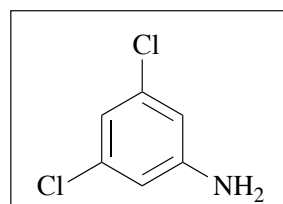
5. Which of the following is a key **intermediate** of the reaction shown in the box?



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

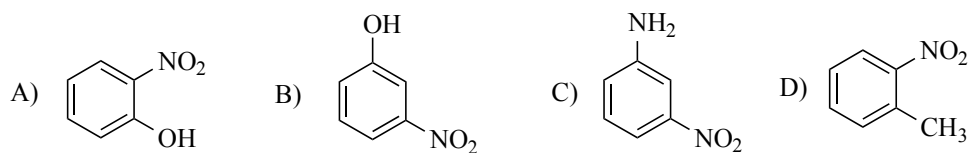


7. What is the **IUPAC name** of the compound shown in the box?

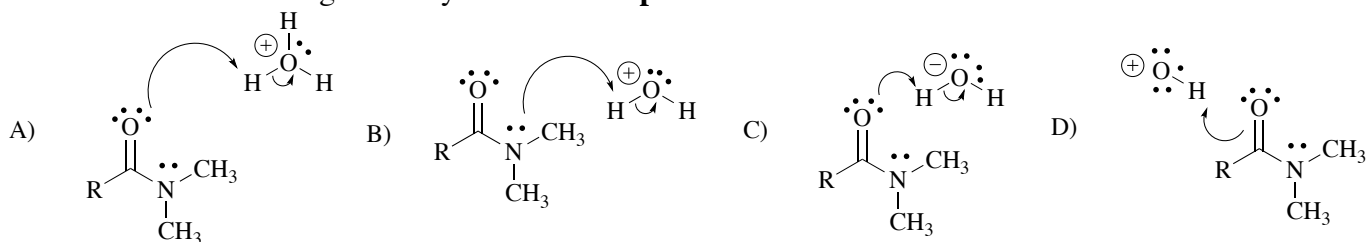


- A) *m*-dichloroaniline B) 3,5-dichlorophenol
 C) 1,3-dichloro-5-nitrobenzene D) 3,5-dichloroaniline

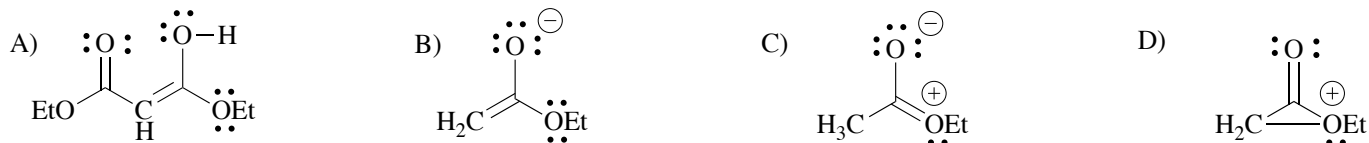
8. What is the correct structure of ***o*-nitrophenol**?



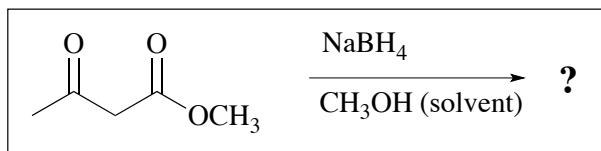
9. Which of the following correctly describes the **protonation of an amide**?



10. Which of the following represents the **enolate** of ethyl acetate (CH_3COOEt)?

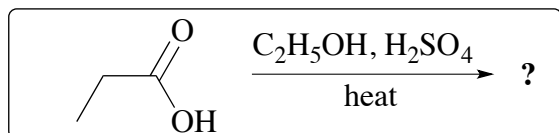


11. What is the IUPAC name of the major **product** for the reaction shown in the box?



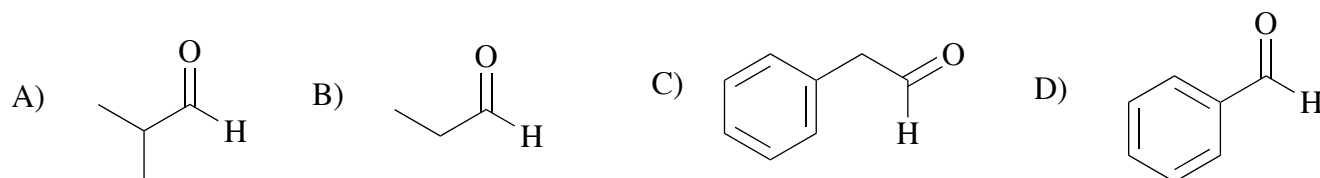
- A) methyl 3-hydroxybutanoate B) 1-methoxy-1,3-butandiol
C) 3-methoxybutanoic acid D) methyl butanoate

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

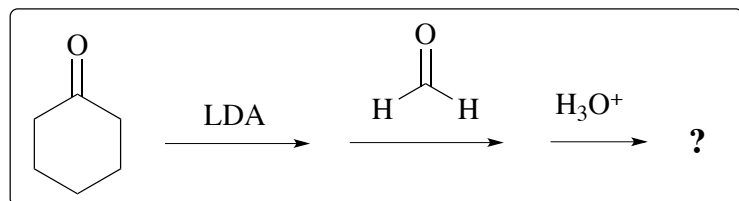


- A) 2-ethylethanoic acid B) methyl pentanoate
C) ethyl 2-methylpropanoate D) ethyl propanoate

13. In the presence of a base which of the following compounds **WILL NOT** undergo **condensation** to give an **aldol** product?

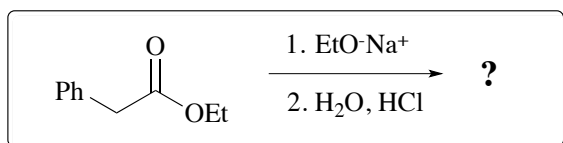


14. Which of the following is a major **product** of the reaction shown in the box? (LDA, lithium diisopropylamide, is a strong base)?



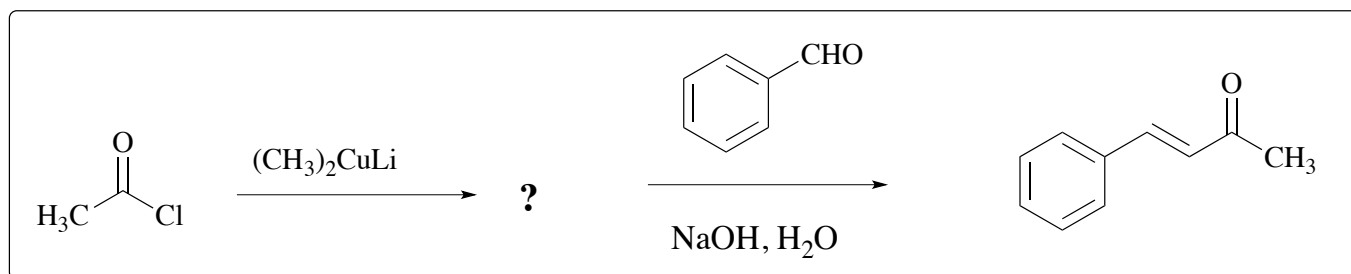
- A)
- B)
- C)
- D)

15. Which of the following is a major product of the **Claisen condensation** reaction shown in the box?



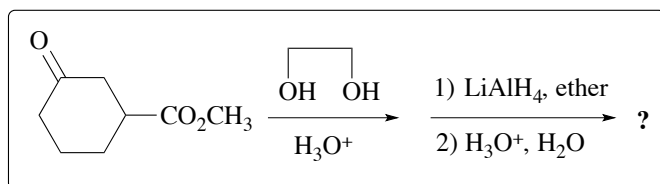
- A)
- B)
- C)
- D)

16. What is the structure of the **ketone intermediate** in the reaction sequence shown in the box?



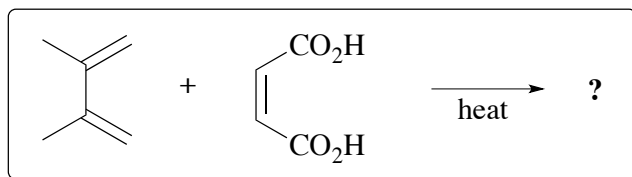
- A)
- B)
- C)
- D)

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



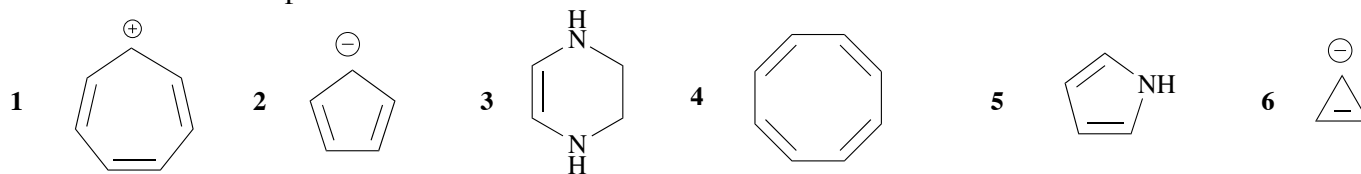
- A)
- B)
- C)
- D)

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



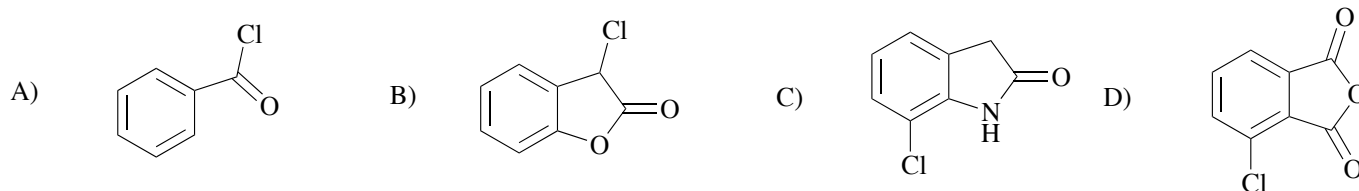
- A)
- B)
- C)
- D)

19. Which of the compounds shown in the box are **aromatic**?

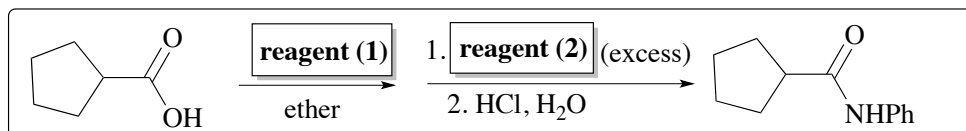


- A) 1, 2, and 3 B) 1, 2, and 5 C) 3, 5, and 6 D) 1, 4, and 5

20. Which acid derivative is the most **reactive** in nucleophilic acyl substitution reaction?

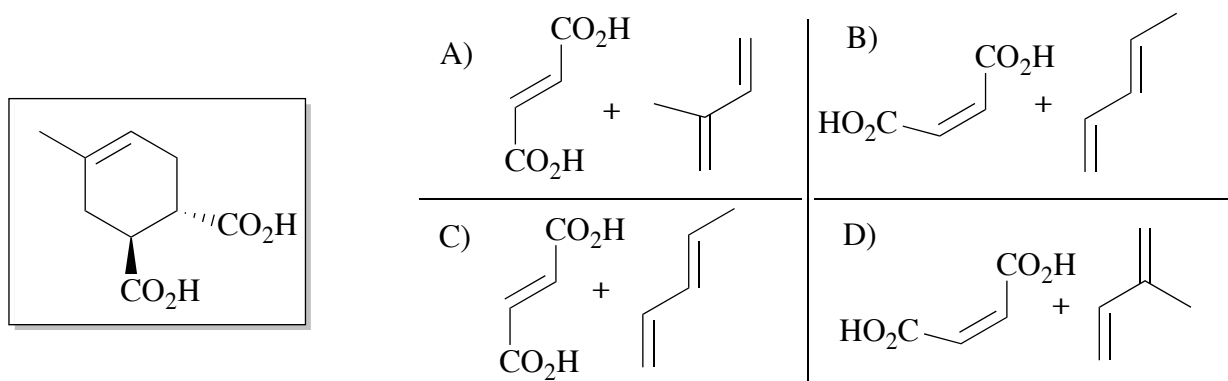


21. Which **reagents** can be used for the reaction shown in the box?

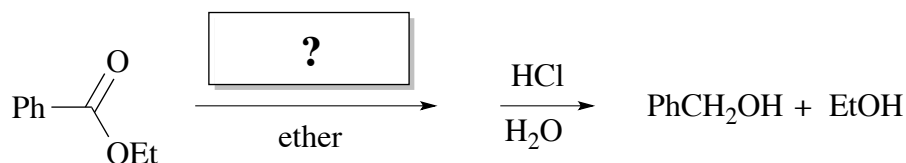


- A) (1) PhNH_2 , (2) SOCl_2
 B) (1) SOCl_2 , (2) PhNH_2
 C) (1) PhLi , (2) CO_2
 D) (1) SOCl_2 , (2) PhCH_2NH_2

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

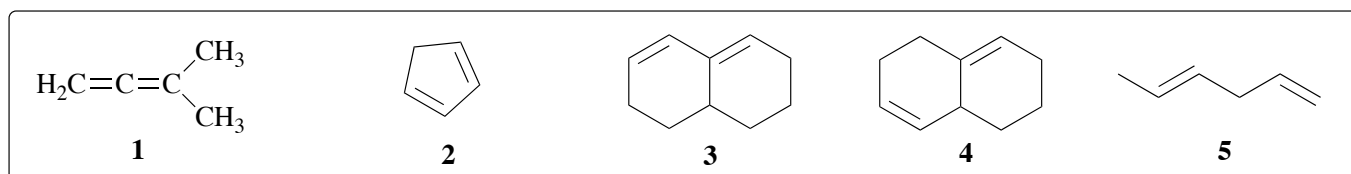


23. Which **reagent** can be used for the following reaction?



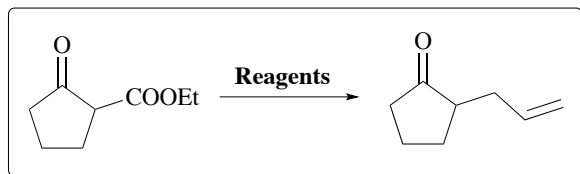
- A) NaBH_4 B) CH_3MgBr C) Mg D) LiAlH_4

24. Which of these compounds are **conjugated** dienes?



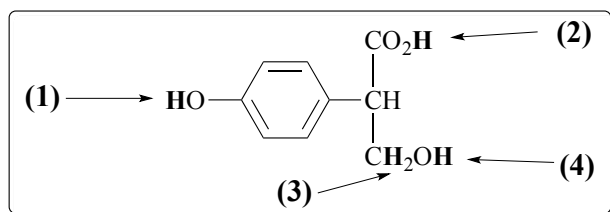
- A) 1 and 3 B) 2 and 3 C) 2 and 4 D) 1 and 5

25. Which of the following schemes is expected to give the product of the reaction in the box in high yield?



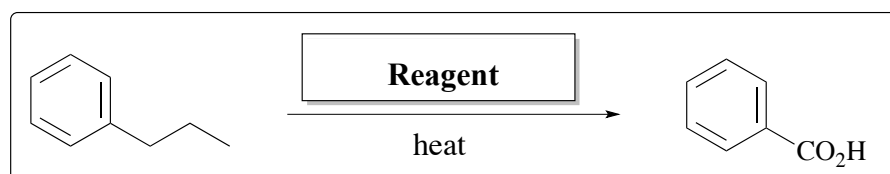
- A) $\xrightarrow{\text{NaOH, H}_2\text{O}}$ $\xrightarrow{\text{CH}_2=\text{CHCH}_2\text{OCH}_3}$ $\xrightarrow{\text{EtO}^-\text{Na}^+}$ $\xrightarrow[\text{heat}]{\text{H}_2\text{O, HCl}}$
- B) $\xrightarrow{\text{EtO}^-\text{Na}^+}$ $\xrightarrow{\text{CH}_2=\text{CHCH}_2\text{Br}}$ $\xrightarrow[\text{heat}]{\text{H}_2\text{O, HCl}}$
- C) $\xrightarrow{\text{CH}_2=\text{CHCH}_2\text{MgBr}}$ $\xrightarrow{\text{H}_2\text{O, HCl}}$ $\xrightarrow[\text{heat}]{\text{NaOH, H}_2\text{O}}$
- D) $\xrightarrow[\text{heat}]{\text{H}_2\text{O, HCl}}$ $\xrightarrow{\text{CH}_2=\text{CHCH}_2\text{OH}}$

26. Which is the order of **acidity** of hydrogen atoms for compound shown in the box?



- A) **1** (lowest pK_a) > **2** > **4** > **3** (highest pK_a)
 B) **4** (lowest pK_a) > **2** > **1** > **3** (highest pK_a)
 C) **1** (lowest pK_a) > **2** > **3** > **4** (highest pK_a)
 D) **2** (lowest pK_a) > **1** > **4** > **3** (highest pK_a)

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



- A) PCC B) Cl₂, light
 C) H₂CrO₄ D) CO₂/AlCl₃

28. Which one of the following compounds is the **highest acidity**?

- A) phenol B) benzyl alcohol C) toluene D) *p*-nitrophenol

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

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

