

**Chem 2320
Final Exam**

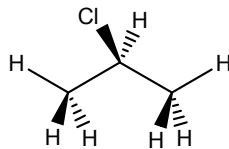
May 3, 2006

Name: _____ **(Please print)**
(First) (Last)

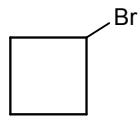
Last 4 digits of Banner No.	Score				
<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>					
I. Multiple Choice (/40)	/120				
II	/40				
III	/10				
IV	/10				
V	/20				
Total score	/200				

I. Multiple choice questions. (3 points each). Please put your answers on Scantron sheet. Your score will be graded based only on your answers from Scantron sheet.

How many types of peaks (signals) would you expect to see in the ^1H NMR spectrum for the following compounds in questions 1 and 2?

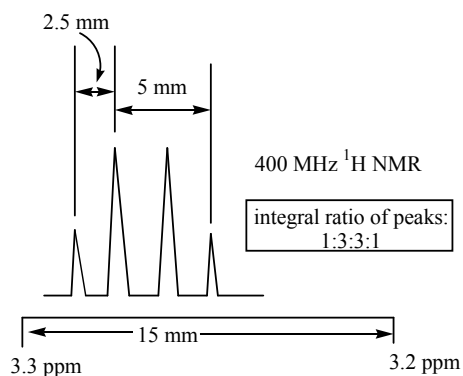
1.  (a) 3
(b) 4
(c) 5
(d) 6
(e) None of the above

From ^1H NMR

2.  (a) 4
(b) 5
(c) 6
(d) 7
(e) None of the above

From ^1H NMR

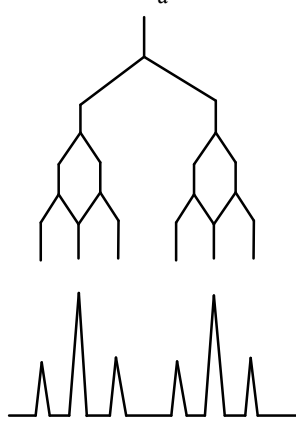
3. Base on the following enlarged signal from a 400 MHz ^1H NMR spectrum, what could be the coupling constant(s)



- (a) 6.7 Hz and 13.3 Hz
(b) 6.7 Hz
(c) 13.3 Hz
(d) 5 Hz
(e) None of the above

4. How will you describe the splitting pattern (diagram) of the following signal (H_a) from ^1H NMR?

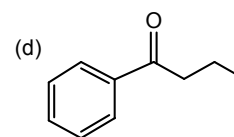
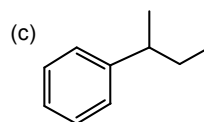
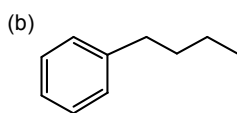
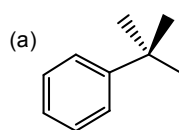
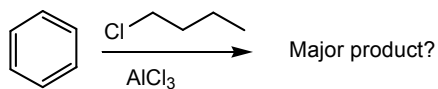
H_a



integral ratio: 1 : 2 : 1 : 1 : 2 : 1

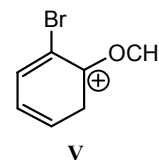
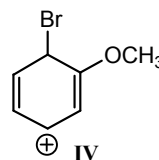
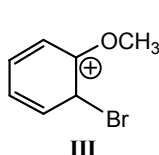
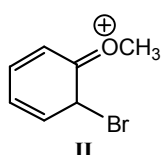
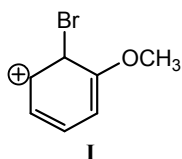
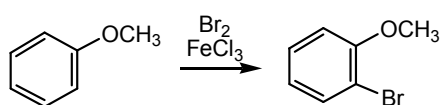
- (a) sextet
(b) triplet of doublet (or doublet of triplet)
(c) triplet
(d) doublet
(e) None of the above

5. What should be the major product for the following reaction?



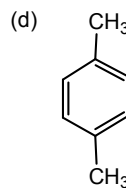
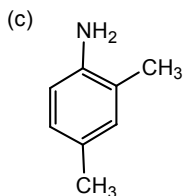
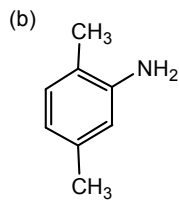
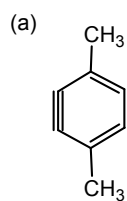
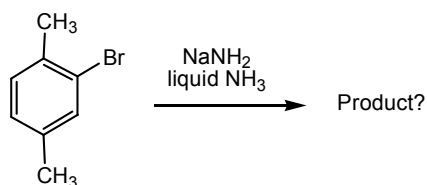
(e) None of the above

6. Which of the following is **not** the resonance structure of intermediate from the listed electrophilic aromatic substitution?



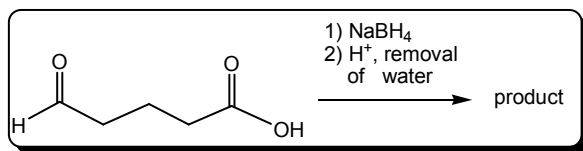
- (a) I
- (b) II
- (c) III
- (d) IV
- (e) V

7. What could be the product for the following reaction?



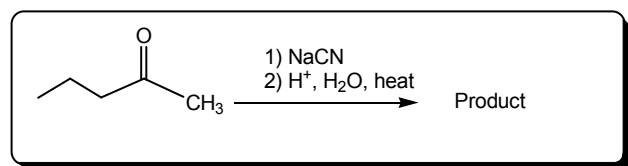
(e) None of the above

8. What should be the product from the following reaction?



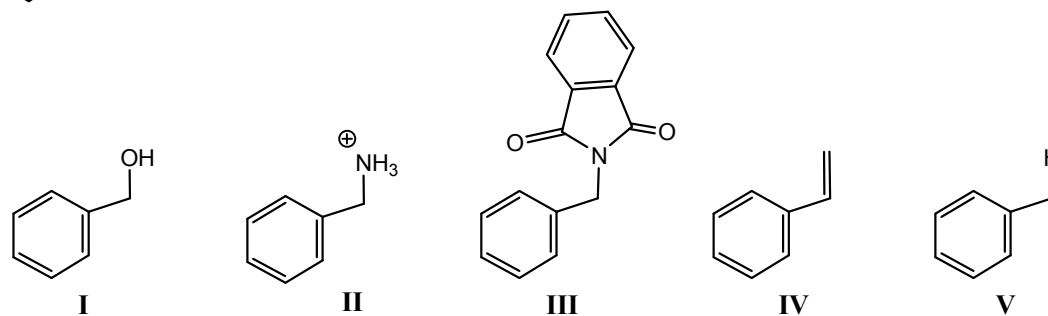
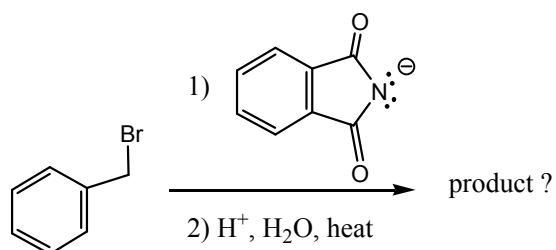
- (a) (b) (c) (d)
(e) none of the above

9. What should be the product from the following reaction?



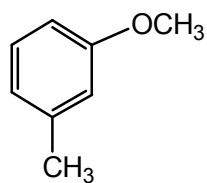
- (a) (b) (c) (d)
(e) none of the above

10. What could be the product for the following reaction?



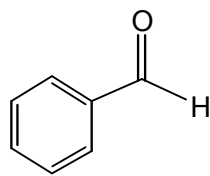
- (a) **I**
(b) **II**
(c) **III**
(d) **IV**
(e) **V**

11. What is the name for the following compound?



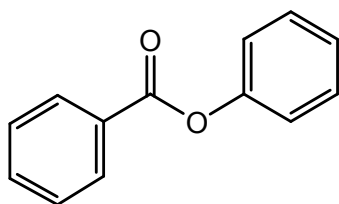
- (a) *p*-methylphenol
- (b) *m*-methylphenol
- (c) *o*-methylanisole
- (d) *m*-methylanisole
- (e) None of the above

12. What is the name for the following compound?



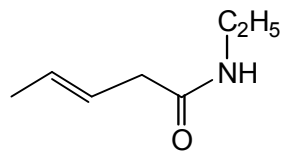
- (a) benzylcarbonyl
- (b) benzaldehyde
- (c) phenylaldehyde
- (d) phenylketone
- (e) None of the above

13. What is the name for the following compound?



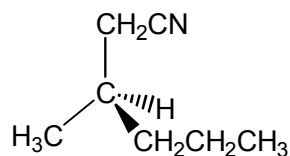
- (a) benzyl phenoate
- (b) phenyl benzoate
- (c) benzyl benzoate
- (d) phenyl phenoate
- (e) None of the above

14. What is the name for the following compound?



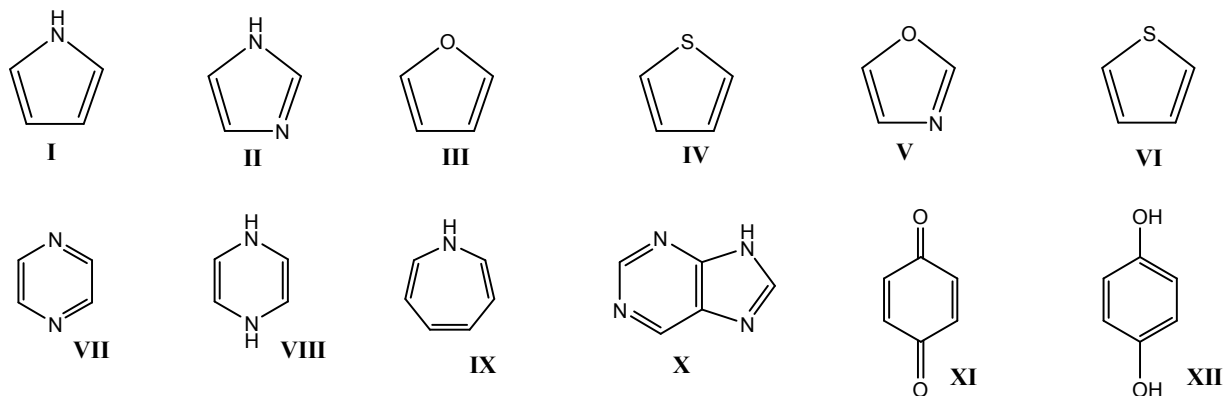
- (a) *trans*-*N*-ethyl-3-pentenamide
- (b) *trans*-1-ethyl-3-pentenamide
- (c) *trans*-*N*-ethyl-4-pentenamide
- (d) *trans*-1-ethyl-4-pentenamide
- (e) None of the above

15. What is the name for the following compound?



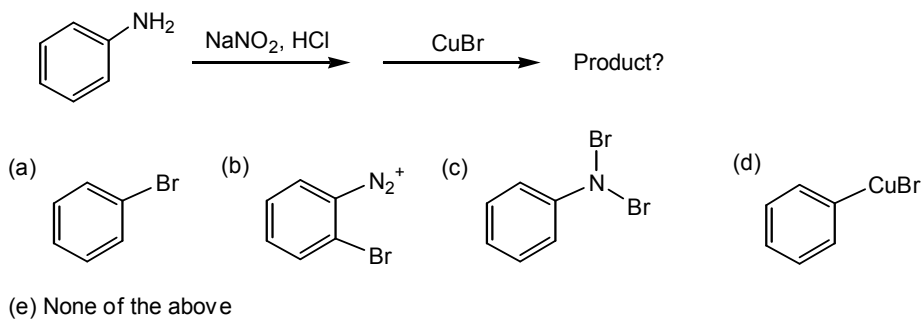
- (a) (R)-3-methylhexaneamine
- (b) (S)-3-methylhexaneamine
- (c) (R)-3-methylhexanenitrile
- (d) (S)-3-methylhexanenitrile
- (e) None of the above

16. Which of the following compounds are aromatic compounds?

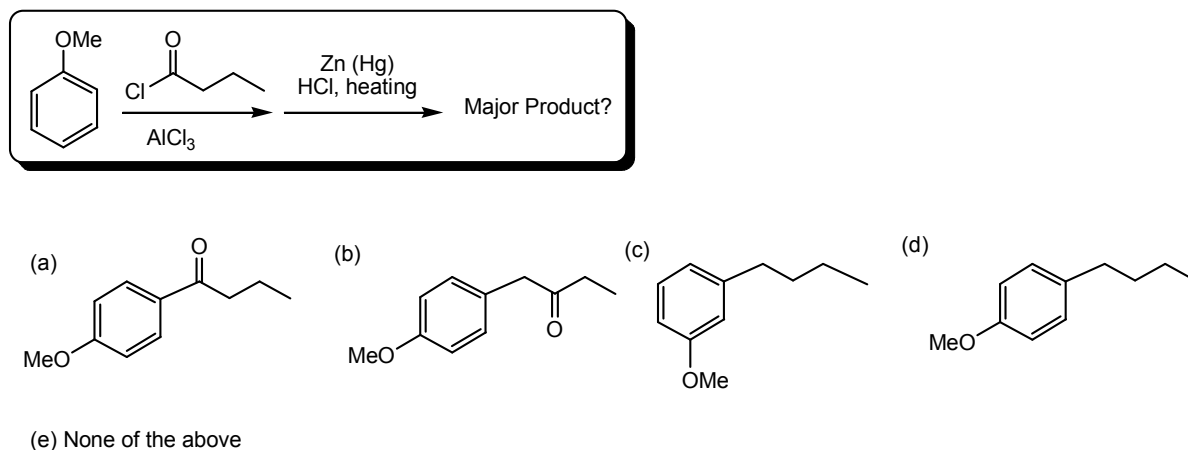


- (a) I, II, III, IV, V, VI, VIII, X, XII
 (b) I, II, III, V, VII, VIII, IX, X, XII
 (c) I, II, III, VI, VIII, X, XI, XII
 (d) I, II, III, IV, V, VI, VII, X, XII
 (e) None of the above

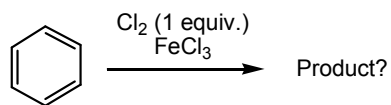
17. What could be the product for the following reaction?

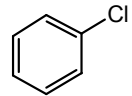
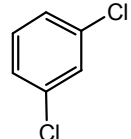
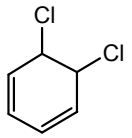
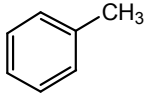


18. What could be the major product for the following reaction?

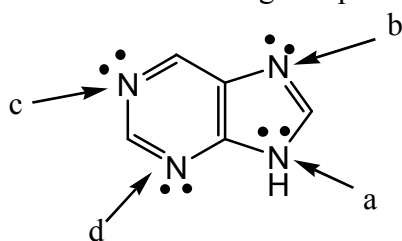


19. What is the expected product for the following reaction?



- (a)  (b)  (c)  (d)  (e) None of the above

20. For the following compound, which nitrogen is the **most** apt to be protonated?

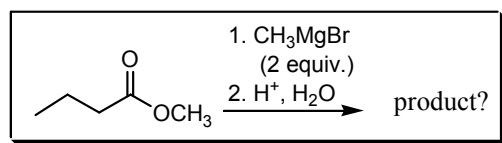


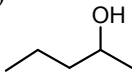
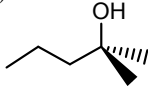
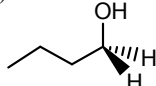
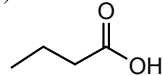
- (a) Nitrogen indicated by arrow "a"
(b) Nitrogen indicated by arrow "b"
(c) Nitrogen indicated by arrow "c"
(d) Nitrogen indicated by arrow "d"
(e) None of the above

21. Which molecular formula has molecular ions ratio as: $M^+/[M+2]^+ = 3/1$?

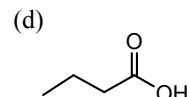
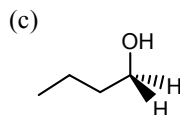
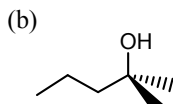
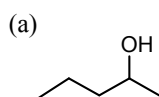
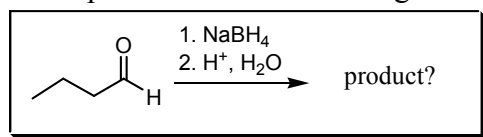
- (a) $C_7H_{18}Cl_2$
(b) $C_9H_{10}Cl$
(c) $C_{10}H_{16}Br_2$
(d) $C_{11}H_{14}Br$
(e) None of the above

22. What could be the product for the following reaction?



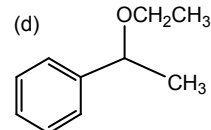
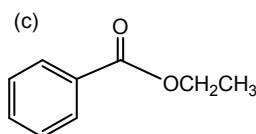
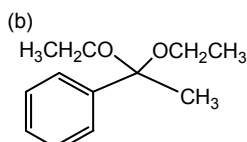
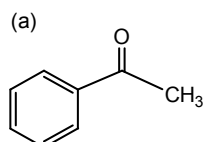
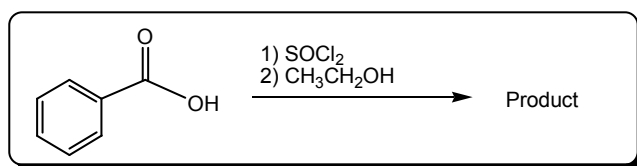
- (a)  (b)  (c)  (d) 
(e) None of the above

23. What could be the product for the following reaction?



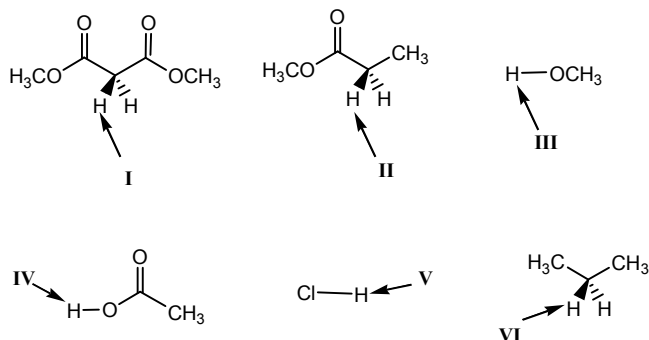
(e) None of the above

24. What could be the product for the following reaction?



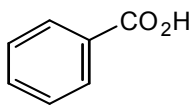
(e) none of the above

25. What is the correct order of decreasing acidity (strongest to weakest) for the protons indicated by arrow in the following compounds?

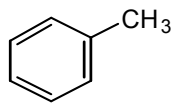


- (a) V>IV>III>II>I>VI
 (b) V>II>III>IV>I>VI
 (c) V>IV>I>III>II>VI
 (d) V>III>I>IV>II>VI
 (e) None of the above

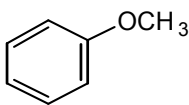
26. What is the correct order of decreasing reactivity (fastest to slowest) toward the electrophilic aromatic substitution for the following compounds?



I



II



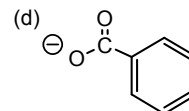
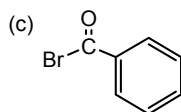
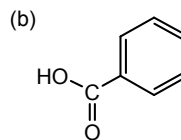
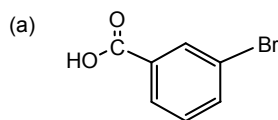
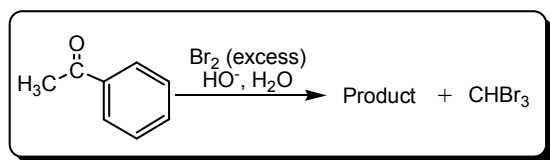
III



IV

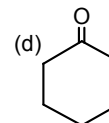
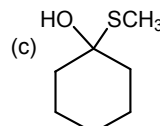
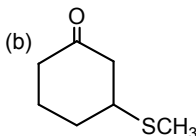
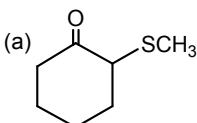
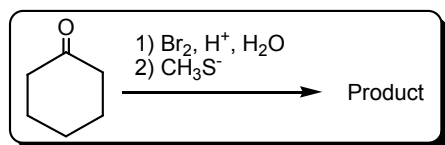
- (a) I>II>III>IV
 (b) II>I>IV>III
 (c) III>II>IV>I
 (d) IV>III>II>I
 (e) None of the above

27. What could be the product for the following reaction?



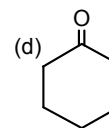
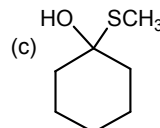
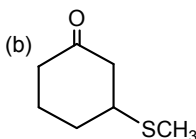
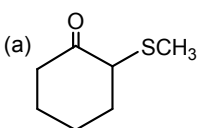
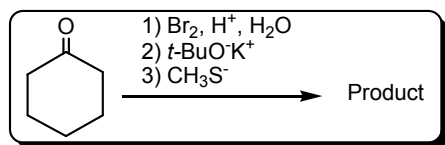
(e) none of the above

28. What could be the product for the following reaction?



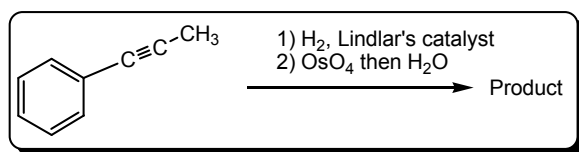
(e) none of the above

29. What could be the product for the following reaction?



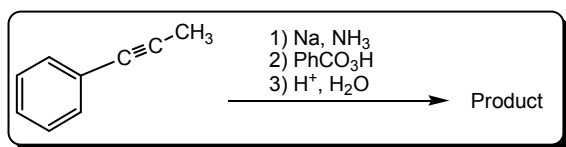
(e) none of the above

30. What could be the product for the following reaction?



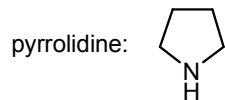
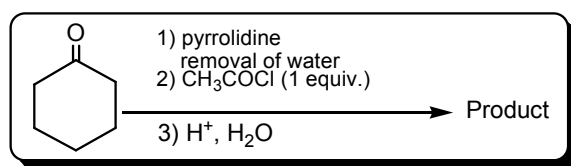
- (a) (b) (c) (d)
- (e) none of the above

31. What could be the product for the following reaction?



- (a) (b) (c) (d)
- (e) none of the above

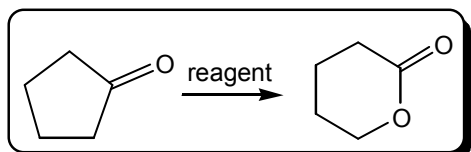
32. What could be the product for the following reaction?



- (a) (b)
- (c) (d)

(e) none of the above

33. What could be the reagent for the following reaction?

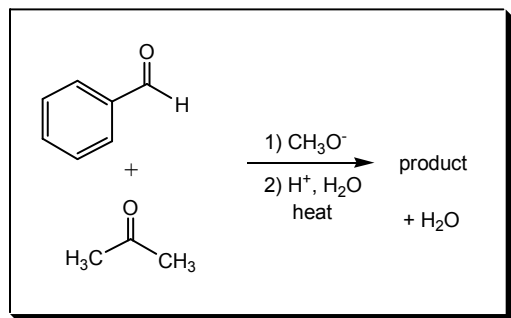


- (a) PhCO_2H
 (c) OsO_4
 (e) none of the above

- (b) PhCO_3H
 (d) $\text{Na}_2\text{Cr}_2\text{O}_7$

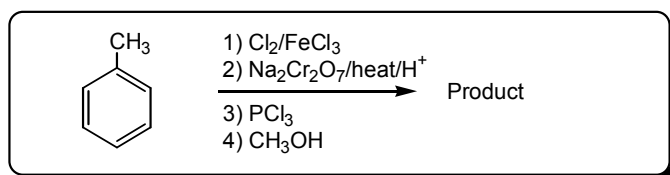
$\text{Ph} = \text{C}_6\text{H}_5$

34. What could be the product for the following reaction?



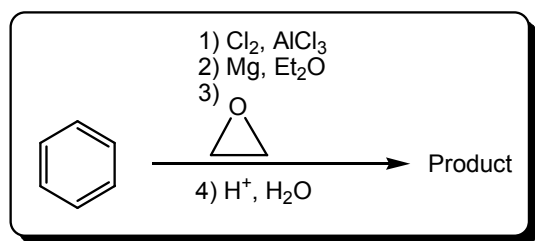
- (a) CC(=O)CC(=O)c1ccccc1 (a) CC(=O)CC(O)(OC)c1ccccc1
 (c) CC(=O)C=Cc1ccccc1 (d) CC(=O)CC(O)c1ccccc1
 (e) None of the above

35. What could be the product for the following reaction?



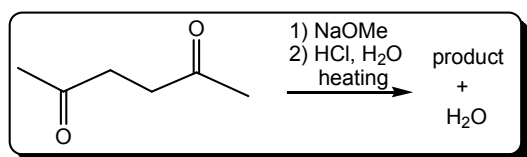
- (a) COC(=O)c1ccccc1Cl (b) COC(=O)c1ccc(Cl)cc1 (c) COC(O)(OC)c1ccccc1 (d) COC(O)(Cl)c1ccccc1
 (e) none of the above

36. What could be the product for the following reaction?



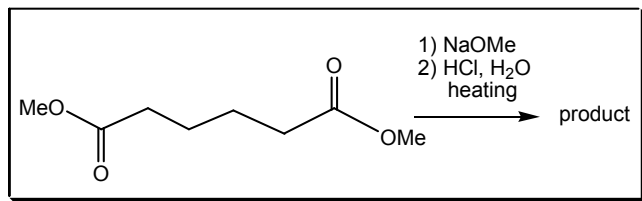
- (a) OCCc1ccccc1 (b) C=Cc1ccccc1
 (c) ClCCc1ccccc1 (d) OC(=O)c1ccccc1
 (e) none of the above

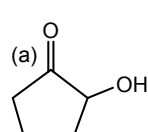
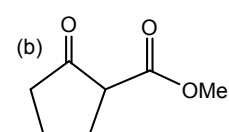
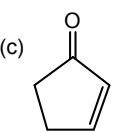
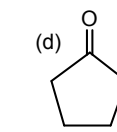
37. What could be the product for the following reaction?



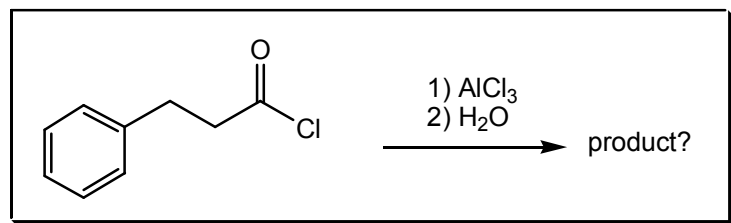
- (a) CC1(O)CCCC1=O (b) CCOC(=O)C1CCCC1=O (c) CC1=CCCC1=O (d) CC1(O)CCCC1=O
 (e) none of the above

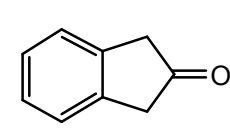
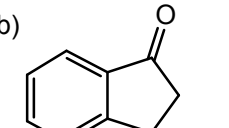
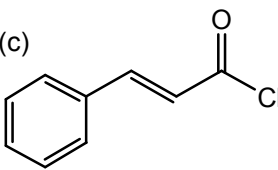
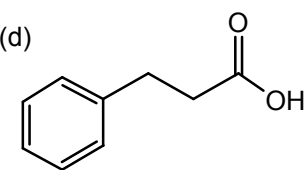
38. What could be the product for the following reaction?



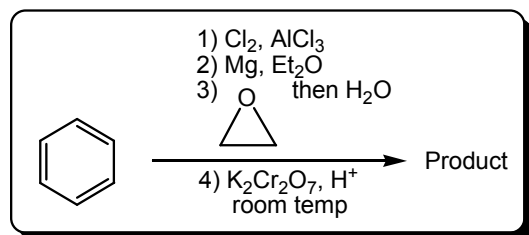
- (a)  (b)  (c)  (d) 
- (e) none of the above

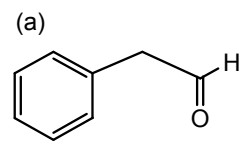
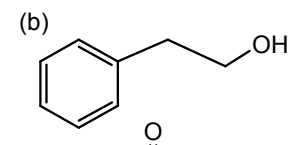
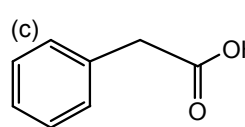
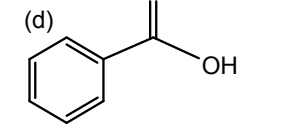
39. What could be the product for the following reaction?



- (a)  (b)  (c)  (d) 
- (e) None of the above

40. What could be the product for the following reaction?



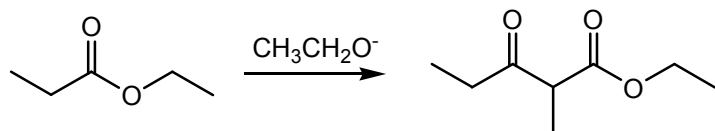
- (a)  (b) 
- (c)  (d) 
- (e) none of the above

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A:	B:	C:
D:	E:	F:
I:	II:	III:
IV:	V:	VI:
VII:	VIII:	IX:
X:	XI:	XII:
XIII:	XIV:	

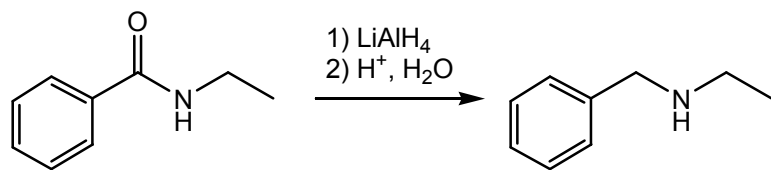
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III. Propose an electron-pushing mechanism for the following reaction. (10 points)



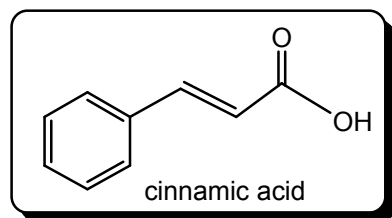
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IV. Propose an electron-pushing mechanism for the following reaction. (10 points)

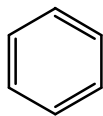


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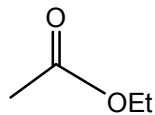
V. Propose a synthesis for one of the compounds circled in the boxes using the provided starting material and any reagents you know: (20 points)



from



+



+

any suitable compounds
that can provide **one-**
carbon unit