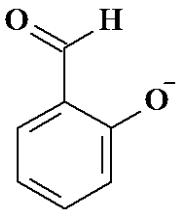
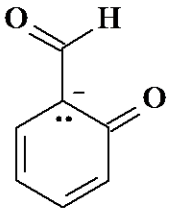
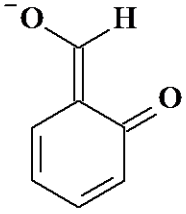
ACS Review Phenols

1. Which one of the following is not a resonance form of the phenolate ion shown below?

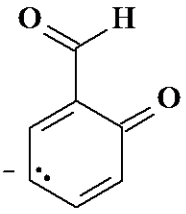




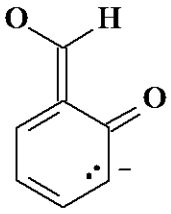
I



II



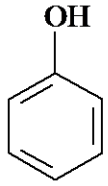
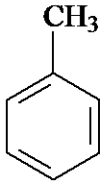
III

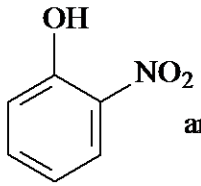
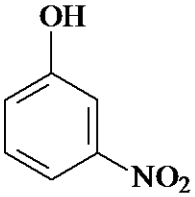


IV

A. I
B. II
C. III
D. IV

2. Which compound in each of the following pairs of compounds has the higher boiling point?

I.  and II. 

III.  and IV. 

A. I and III
B. I and IV
C. II and III
D. II and IV

3. Arrange the following in order of decreasing acidity.

I. benzoic acid ($C_6H_5CO_2H$)
II. benzyl alcohol ($C_6H_5CH_2OH$)
III. phenol (C_6H_5OH)

A. III > I > II
B. III > II > I
C. I > II > III
D. I > III > II

4. Arrange the following in order of decreasing acidity.

I. phenol II. *m*-nitrophenol III. *p*-nitrophenol

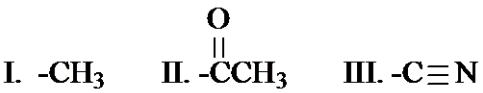
A. III > I > II
B. III > II > I
C. II > I > III
D. II > III > I

5. Which compound in each of the pairs of compounds shown below is the stronger acid?

I. phenol and II. Cyclohexanol III. Phenol and IV. *p*-nitrophenol

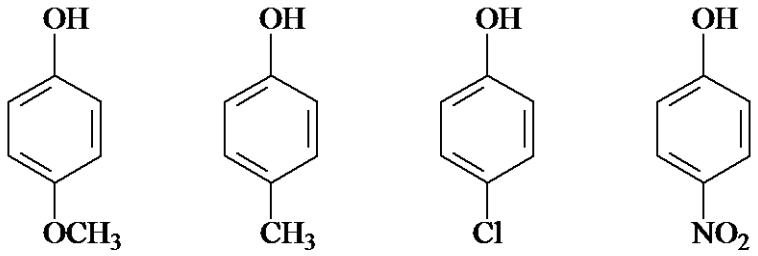
A. I and III
B. I and IV
C. II and III
D. II and IV

6. Which one of the following groups increases the acidity of a phenol when positioned *para* to a hydroxy group?



A. only I
B. only II
C. II and III
D. I, II, and III

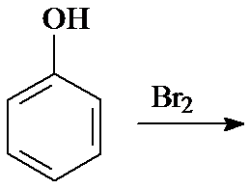
7. Which one of the following phenols is most acidic?

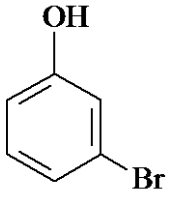


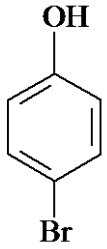
I II III IV

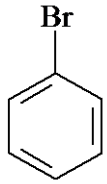
A. I
B. III
C. III
D. IV

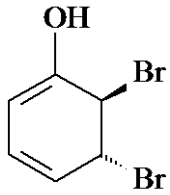
8. Which of the following is the product of the reaction below?



A) 

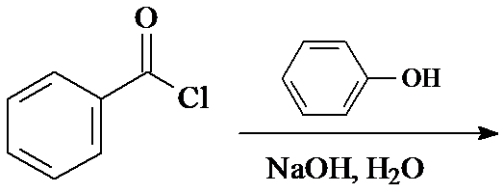
B) 

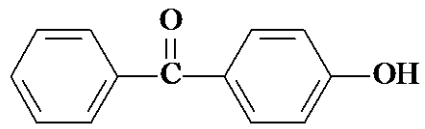
C) 

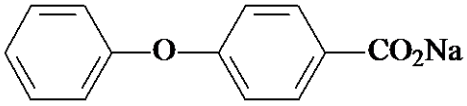
D) 

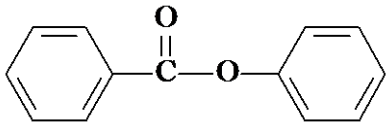
A. A
B. B
C. C
D. D

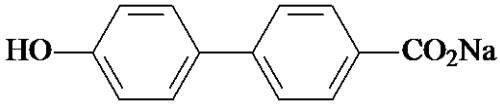
9. What is the product of the following reaction?



A) 

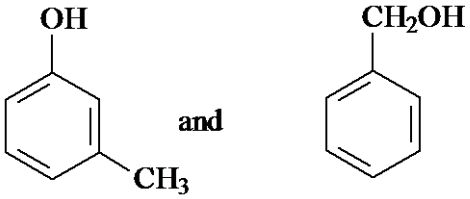
B) 

C) 

D) 

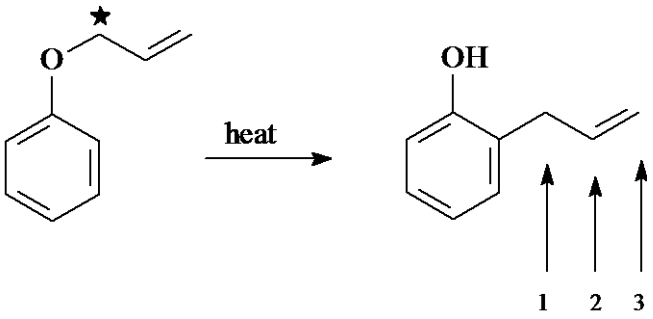
A. A
B. B
C. C
D. D

10. Which one of the following tests provides a simple method of distinguishing between the two compounds shown below?



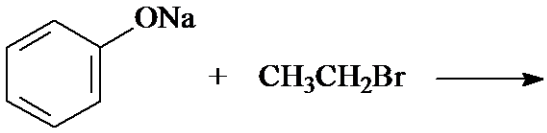
A. Reaction of each with sodium metal.
B. Reaction of each with acetic anhydride and catalytic sulfuric acid.
C. Solubility test of each in water.
D. Solubility test of each in aqueous sodium hydroxide.

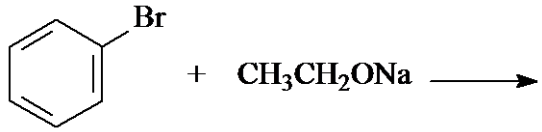
11. Indicate where the isotopically labeled carbon atom (*) is located in the product.

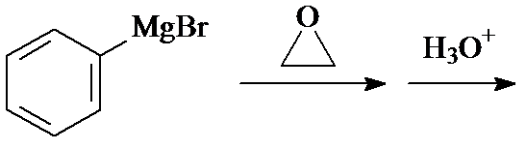


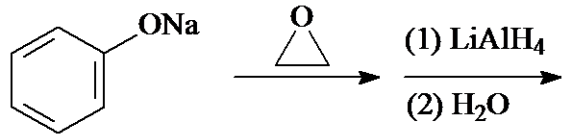
A. #1
B. #2
C. #3
D. equally distributed between #1 and #2

12. Which one of the following reactions gives ethyl phenyl ether, $CH_3CH_2OC_6H_5$, as the major product?

A) 

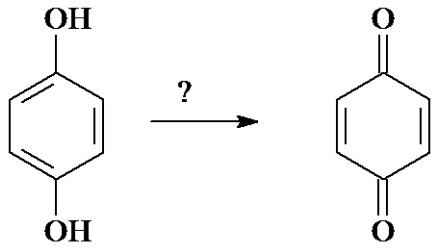
B) 

C) 

D) 

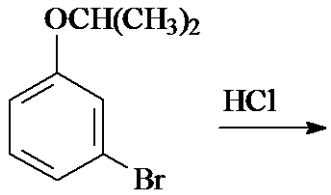
A. A
B. B
C. C
D. D

13. Identify the reagent(s) needed to carry out the following conversion.



A. Na metal
B. $LiAlH_4$
C. $Na_2Cr_2O_7$, H_2SO_4/H_2O
D. NaOH

14. Which of the following are the products of the reaction shown below?

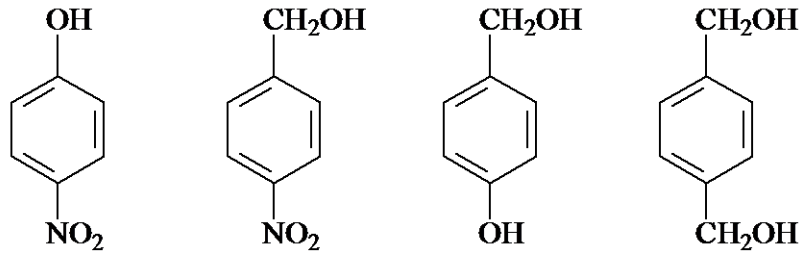


A. $(CH_3)_2CHCl$ and *meta*-bromophenol
B. $(CH_3)_2CHOH$ and *meta*-bromophenol
C. $(CH_3)_2CHCl$ and *meta*-bromochlorobenzene
D. $(CH_3)_2CHOH$ and *meta*-bromochlorobenzene

15. Which one of the following ethers is the most unreactive to cleavage with HBr?

A. $C_6H_5OCH_2C_6H_5$
B. $C_6H_5OC_6H_5$
C. $H_2C{=}CHCH_2OCH_2CH{=}CH_2$
D. $(CH_3)_3COC(CH_3)_3$

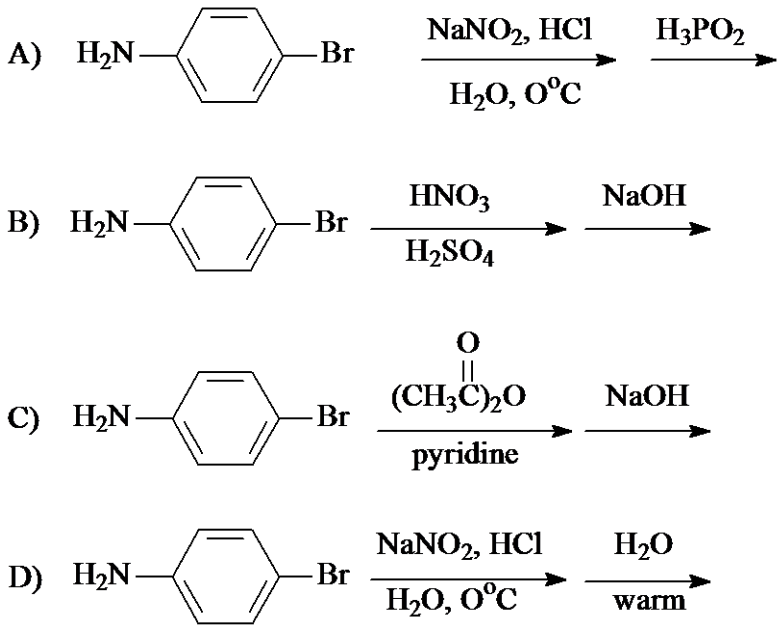
16. Which one of the following is the strongest acid?



I II III IV

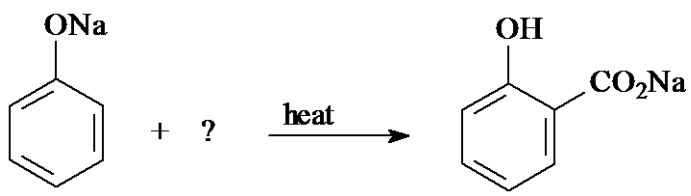
A. I
B. II
C. III
D. IV

17. Which reaction sequence below converts *para*-bromoaniline into *para*-bromophenol?



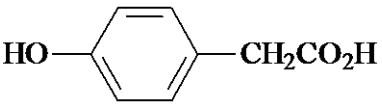
A. A
B. B
C. C
D. D

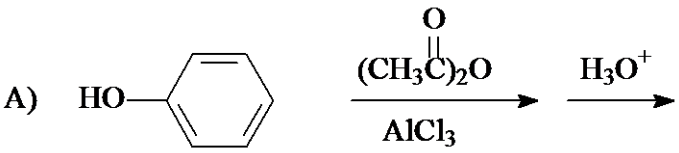
18. Which one of the following is the missing reagent in the Kolbe-Schmitt reaction?

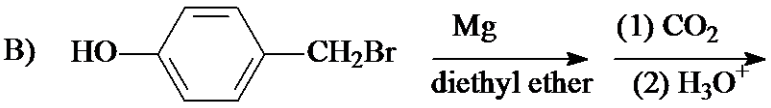


A. HCO_2Et
B. $(EtO)_2C{=}O$
C. CO_2
D. HCO_2Na

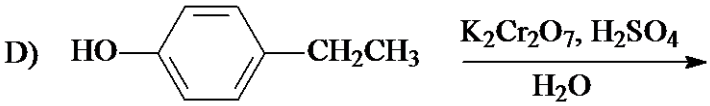
19. Which of the following methods works best to synthesize the compound shown below?



A) 

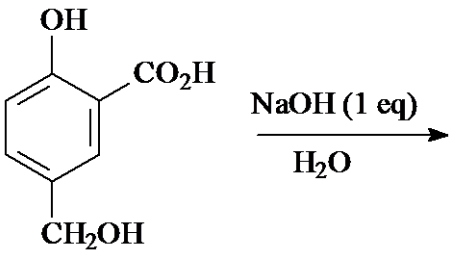
B) 

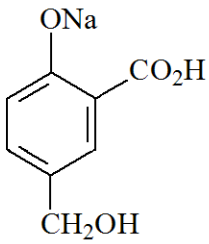
C) 

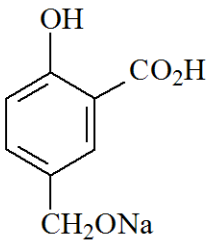
D) 

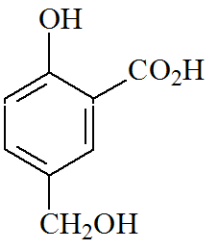
A. A
B. B
C. C
D. D

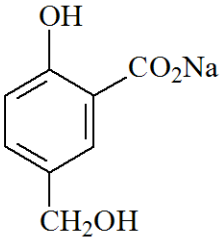
20. Identify the major species in solution from the reaction shown below.



A) 

B) 

C) 

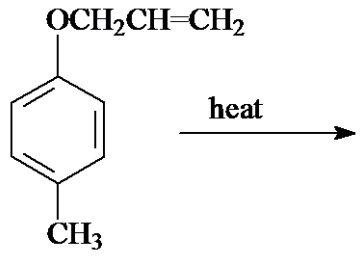
D) 

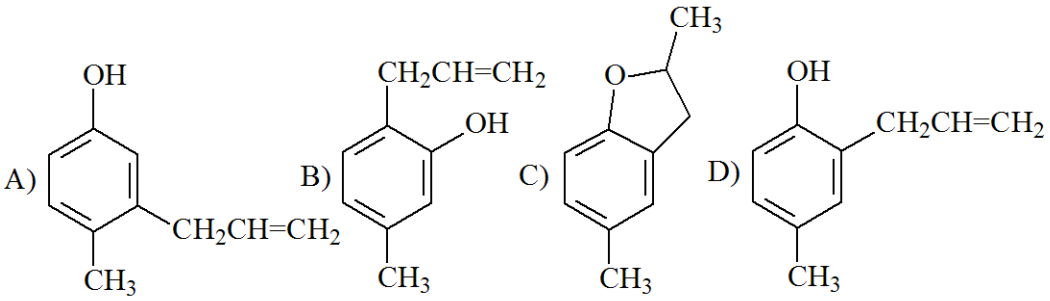
A. A
B. B
C. C
D. D

21. Which one of the following reacts with aqueous HCl to give phenol?

A. C_6H_5CN
B. $CH_3CO_2C_6H_5$
C. $C_6H_5CH{=}O$
D. $C_6H_5NHNH_2$

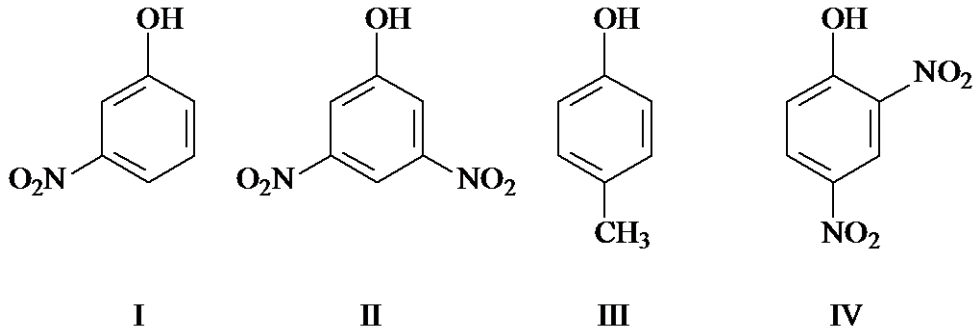
22. Which of the following is the Claisen rearrangement product from the reaction below?





A. A
B. B
C. C
D. D

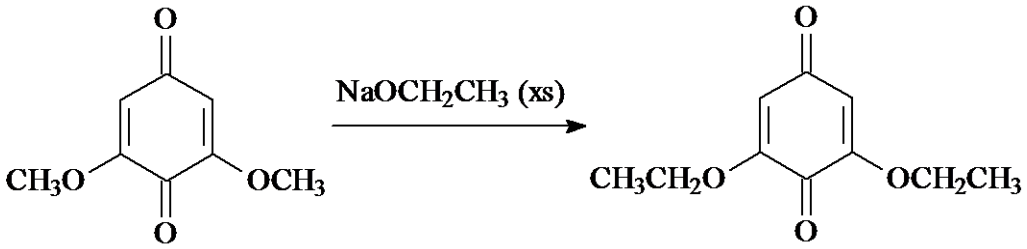
23. Rank the following four phenols from least acidic to most acidic.



I II III IV

A. III < II < I < IV
B. IV < II < I < III
C. III < I < II < IV
D. I < II < IV < III

24. The following substitution reaction is mechanistically described as:



A. S_N1
B. S_N2
C. nucleophilic addition - elimination
D. electrophilic addition - elimination

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1. D
2. B
3. D
4. B
5. B
6. C
7. D
8. B
9. C
10. D
11. C
12. A
13. C
14. A
15. B
16. A
17. D
18. C
19. C
20. D
21. B
22. D
23. C
24. C