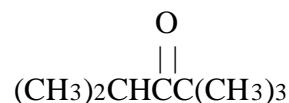
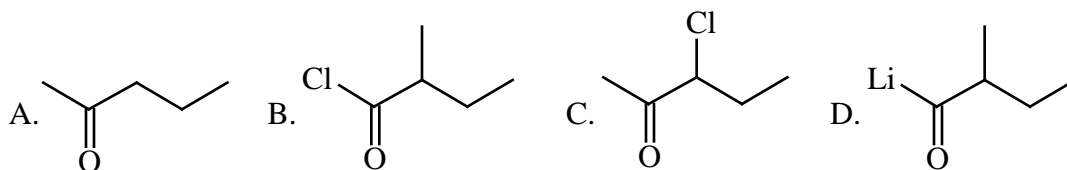
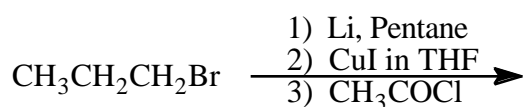


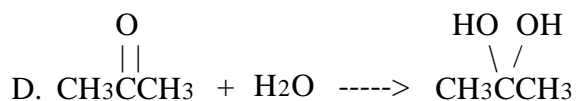
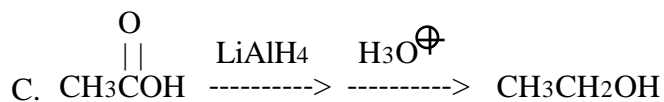
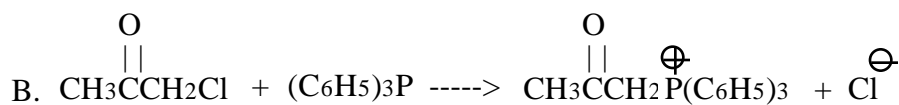
1. What is the name of the compound shown?



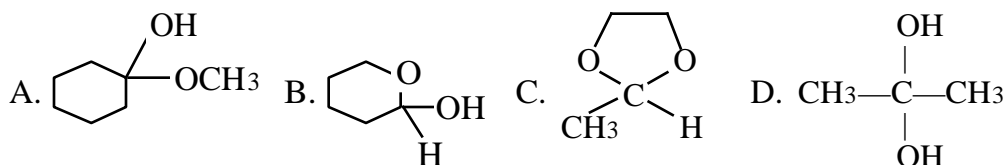
- A. *tert*-butyl isopropyl aldehyde
 B. pentamethyl ketone
 C. 2,2,4-trimethyl-3-pentanone
 D. 2,2,4-trimethylpentanal
2. What is the major organic product of the reaction sequence shown?



3. The mechanism of which of these reactions does NOT involve nucleophilic addition to a carbonyl group?



4. Which of these compounds is an acetal?



5. Which of the following reactions yields an aldehyde?

- A. $\text{CH}_3\text{CH}=\text{CHCH}_3 \xrightarrow{\text{O}_3} \xrightarrow{\text{Zn, H}_2\text{O}}$
- B. $\text{C}_6\text{H}_5\text{NO}_2 + \text{CH}_3\text{COCl} \xrightarrow{\text{AlCl}_3}$
- C. $\text{CH}_3\text{CH}=\text{CHCH}_3 \xrightarrow{\text{KMnO}_4, \text{OH}^\ominus, \text{heat}} \xrightarrow{\text{H}_3\text{O}^\oplus}$
- D. $\text{CH}_3\text{C}\equiv\text{CH} + \text{H}_2\text{O} \xrightarrow{\text{H}_2\text{SO}_4, \text{HgSO}_4}$

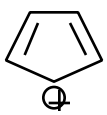
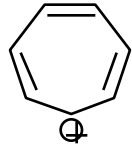
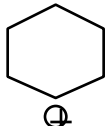
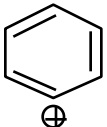
6. Which of the following reactions occurs as written?

- A. $\text{C}_6\text{H}_6 + \text{CH}_2=\text{CHCl} \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{CH}=\text{CH}_2 + \text{HCl}$
- B. $\text{C}_6\text{H}_6 + \text{C}_6\text{H}_5\text{COCl} \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{COC}_6\text{H}_5 + \text{HCl}$
- C. $\text{C}_6\text{H}_6 + (\text{CH}_3)_2\text{CHCH}_2\text{Cl} \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{CH}_2\text{CH}(\text{CH}_3)_2 + \text{HCl}$
- D. $\text{C}_6\text{H}_6 + \text{C}_6\text{H}_5\text{Cl} \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{C}_6\text{H}_5 + \text{HCl}$

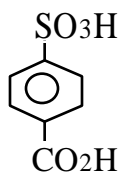
7. Which of the following compounds reacts most SLOWLY with $\text{Cl}_2/\text{FeCl}_3$?

- A. $\text{C}_6\text{H}_5\text{F}$ B. $\text{C}_6\text{H}_5\text{NHCH}_3$ C. $\text{C}_6\text{H}_5\text{NO}_2$ D. $\text{C}_6\text{H}_5\text{COCH}_3$

8. Which of the following carbocations is the most stable?

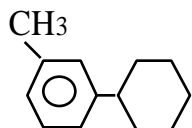
- A.  B.  C.  D. 

9. Which of these reaction sequences gives the compound shown from benzene?

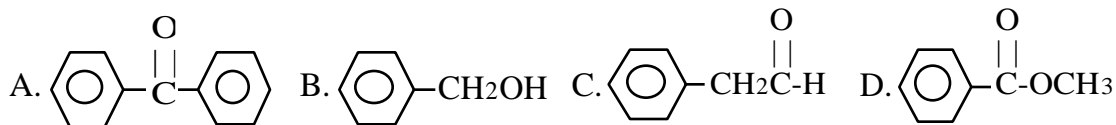


- A. $\xrightarrow[\text{AlCl}_3]{\text{CH}_3\text{Cl}}$ $\xrightarrow[\text{H}_2\text{SO}_4]{\text{SO}_3}$ $\xrightarrow[\text{heat}]{\text{KMnO}_4, \text{OH}^-}$ $\xrightarrow{\text{H}_3\text{O}^+}$
- B. $\xrightarrow[\text{H}_2\text{SO}_4]{\text{SO}_3}$ $\xrightarrow[\text{AlCl}_3]{\text{CH}_3\text{Cl}}$ $\xrightarrow[\text{heat}]{\text{KMnO}_4, \text{OH}^-}$ $\xrightarrow{\text{H}_3\text{O}^+}$
- C. $\xrightarrow[\text{AlCl}_3]{\text{CH}_3\text{Cl}}$ $\xrightarrow[\text{heat}]{\text{KMnO}_4, \text{OH}^-}$ $\xrightarrow{\text{H}_3\text{O}^+}$ $\xrightarrow[\text{H}_2\text{SO}_4]{\text{SO}_3}$
- D. $\xrightarrow[\text{H}_2\text{SO}_4]{\text{SO}_3}$ $\xrightarrow[\text{heat}]{\text{KMnO}_4, \text{OH}^-}$ $\xrightarrow{\text{H}_3\text{O}^+}$ $\xrightarrow[\text{AlCl}_3]{\text{CH}_3\text{Cl}}$

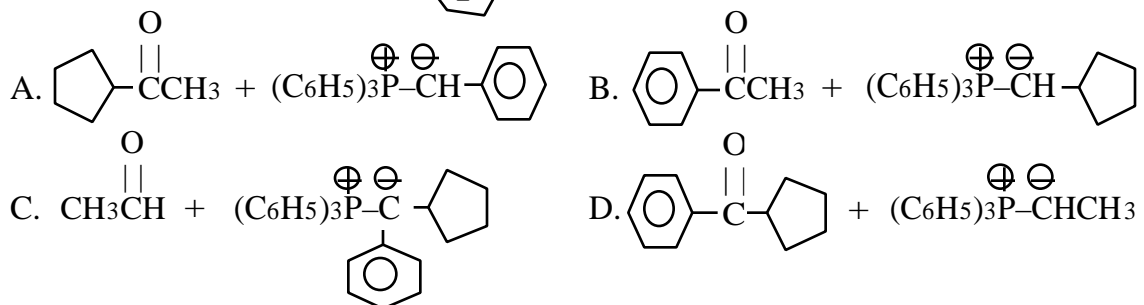
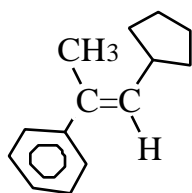
10. What is the name of the compound shown?



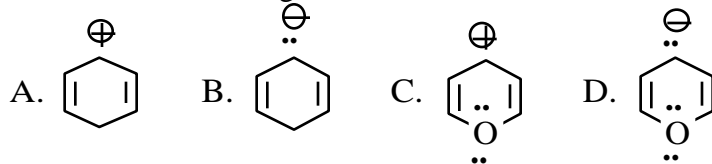
- A. *p*-methylphenylbenzene
 B. *p*-methylcyclohexylbenzene
 C. *m*-phenyltoluene
 D. *m*-cyclohexyltoluene
11. Which of the following compounds gives a negative 2,4-dinitrophenylhydrazine (DNP) test, a negative Tollens' test, and a negative chromic acid test?



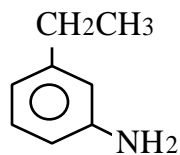
12. Which of the sets of reactants below gives the product shown?



13. Which of the following is aromatic?

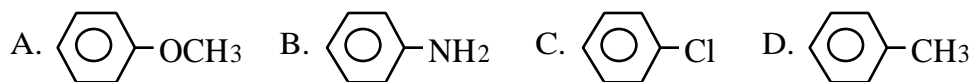


14. What is the name of the compound shown?

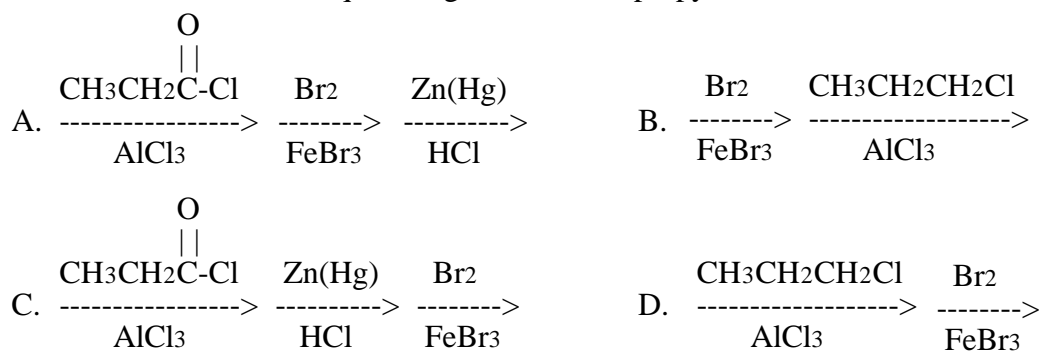


- A. 1-ethyl-3-nitrobenzene
 B. *m*-aminoethylbenzene
 C. 3-ethylaniline
 D. 3-anilinostyrene

15. Which of the following compounds reacts most SLOWLY with $\text{CH}_3\text{Cl}/\text{AlCl}_3$?



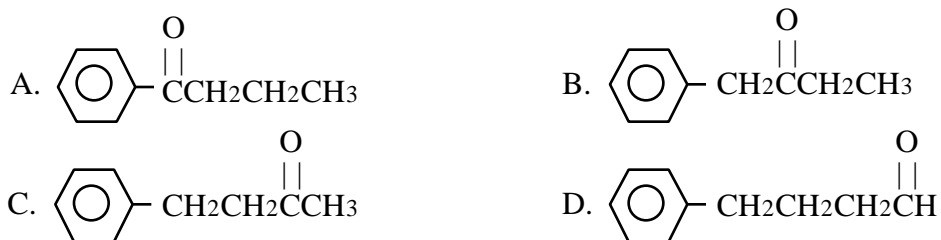
16. Which of these reaction sequences gives *m*-bromopropylbenzene from benzene?



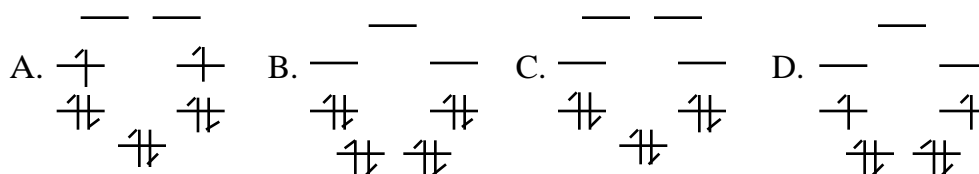
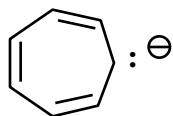
17. A compound having the formula $\text{C}_{10}\text{H}_{12}\text{O}$ had a peak near 1710 cm^{-1} in its IR spectrum. The proton magnetic resonance spectrum follows.

triplet, 1.0, 3H
 quartet, 2.3, 2H
 singlet, 3.6, 2H
 multiplet, 7.2, 5H

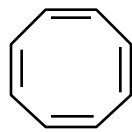
What is the structure of this unknown?



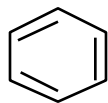
18. Which of the following is the orbital energy level diagram for the species shown?



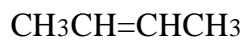
19. Which of the following decolorize bromine in CCl_4 in the dark?



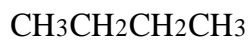
I



II



III



IV

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

20. What is the major organic product of the reaction shown?

