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Class: 12
Subject: chemistry
Topic: Alcohols phenols and ethers
No. of Questions: 25

Directions: The following question has four choices out of which ONLY ONE is correct.

1.Phenol is less acidic then

a. ethanol
b. methanol
c. o-nitrophenol
d. p-cresol

Sol.(c) Nitro group deactivates the benzene ring when present at ortho position. So Phenol is less acidic then o-nitrophenol

2. Which of the following is an isomer of propanal?

a. Acetone
b. Propane
c. Propanol
d. Propionic acid

Sol.(a) Propanal and acetone both have the same molecular formula. Hence, both are isomers.

3.Directions: The following question has four choices out of which ONLY ONE is correct.

$CH_3CH_2CH_2CH_2OH$ and $CH_3\ CH_2O\ C_2H_5$ are

a. position isomers
b. chain isomers
c. geometrical isomers
d. functional isomers

Sol.(d)$CH_3CH_2CH_2CH_2OH$ and $CH_3\ CH_2O\ C_2H_5$ are functional isomers as both have the same molecular formula but different functional groups.

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4. Directions: The following question has four choices out of which ONLY ONE is correct.

The catalyst used in the manufacture of methanol from water gas is

a. V_2O_5
b. Ni + Mo
c. $CuO / ZnO / Cl_2O_3$
d. Pt + W

Sol.(c) The catalyst used in the manufacture of methanol from water gas is $CuO / ZnO / Cl_2O_3$.

5. Directions: The following question has four choices out of which ONLY ONE is correct.

Phenol when distilled with Zn-dust, gives

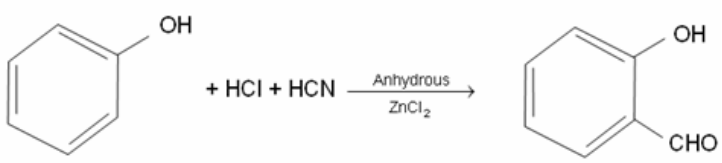
a. benzoic acid
b. benzene
c. benzaldehide
d. toluene

Sol.(b) Phenol on distillation with zinc dust gives benzene.

$C_6H_5OH + Zn \longrightarrow ZnO + C_6H_6$

6. Directions: The following question has four choices out of which ONLY ONE is correct.

The following reaction is known as



a. Perkin's reaction
b. Gattermann's reaction
c. Kolbe's reaction
d. Gattermann's aldehyde reaction

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Sol.(d)In the presence of anhydrous $ZnCl_2$ phenol form salicyaldehyde. It is Gattermann - aldehyde reaction

7. Directions: The following question has four choices out of which ONLY ONE is correct.

The conversion of RCOOH to RCH_2OH can be obtained by

a. LAH
b. $NaBH_4$
c. Zn/HCl
d. Sn/HCl

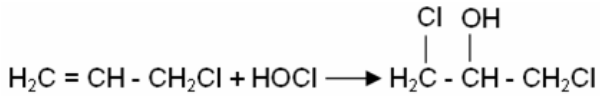
Sol.(a) The conversion of RCOOH to RCH_2OH can be obtained by lithium aluminium hydride.

8. Directions: The following question has four choices out of which ONLY ONE is correct.

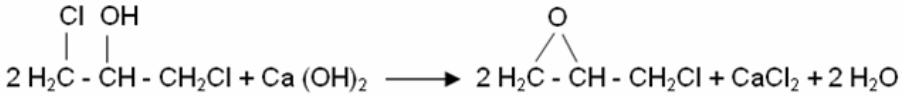
Glycerol is synthesized from

a. ethane
b. propyne
c. propene
d. ethane

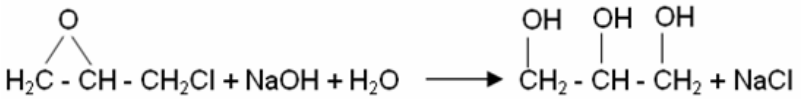
Sol. (c) The first synthetic glycerol was produced in 1943 by I.G. Farben in Oppau and Heydebreck and in 1948 by Shell in Houston, Texas. This method became available once the high-temperature chlorination of propene to allyl chloride could be controlled properly Allyl Compounds A 1, p. 427). The allyl chloride produced is oxidized with hypochlorite to dichlorohydrin, which is converted without isolation to epichlorohydrin [*106-89-8*] by ring closure with calcium or sodium hydroxide Epoxides, A 9, p. 539). Hydrolysis to glycerol is carried out with sodium hydroxide or sodium carbonate.
Chlorination of propene to allyl chloride:
$H_2C=CH-CH_3 + Cl_2 \rightarrow H_2C=CH-CH_2Cl + HCl$
Hypochlorination:



Dehydrochlorination:



Hydrolysis of epichlorohydrin to glycerol:



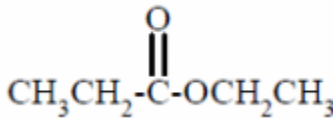
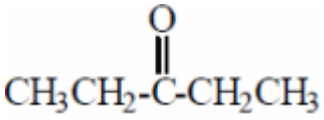
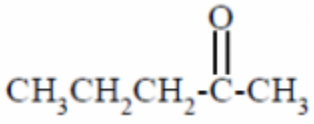
9. Directions: The following question has four choices out of which ONLY ONE is correct.

Of the following chemical compounds, which one may soon be used as a fuel for driving vehicles?

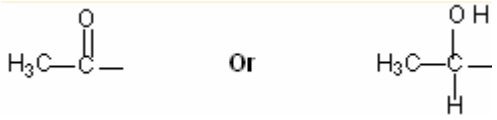
a. Ethanol
b. Methane
c. Ethyne
d. Ethane

Sol.(a) Ethanol fuel is ethanol (ethyl alcohol), the same type of alcohol found in alcoholic beverages. It is most often used as a motor fuel, mainly as a biofuel additive for gasoline.

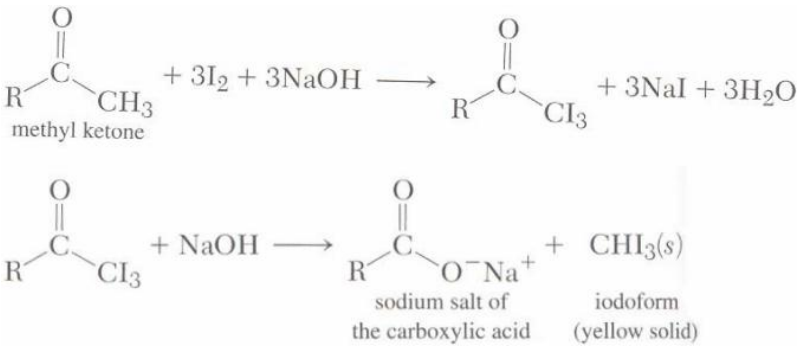
10. Which will give positive iodoform test?

a. 
b. 
c. 
d. All of the above

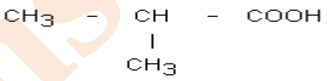
Sol.(c) The reaction is used as a diagnostic test for the presence of the groups.



Example:

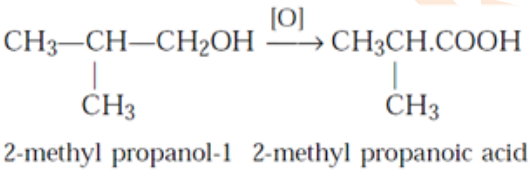


11. Directions: The following question has four choices out of which ONLY ONE is correct.

Which of the following alcohols is most likely to yield carboxylic acid  on oxidation?

a. 2 - methyl propan - 1 - ol
b. 2 - methyl propan - 2 - ol
c. Propan - 2 - ol
d. Butan -1 – ol

Sol.(a)



12. Directions: The following question has four choices out of which ONLY ONE is correct.

Which of the following functional compounds do not give Schotten-Baumann reaction?

a. Alcohols
b. Phenols
c. Amines
d. Ether

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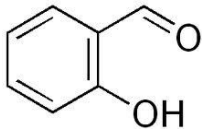
Sol.(d)Schotten-Baumann reaction is the acyclation of alcohols, phenols and amines and not ethers by shaking with aromatic acyl chloride in the presence of a base, usually aqueous sodium hydroxide. Hence, this test is not given by ethers.

13. Directions: The following question has four choices out of which ONLY ONE is correct.

Identify the given structure:



a. Salicylaldehyde
b. Salicylic acid
c. Benzaldehyde
d. Picric acid

Sol.(a) This option is correct because the given structure is known as salicylaldehyde.

14. Directions: The following question has four choices out of which ONLY ONE is correct.

Which one of the following has the bond greater than the tetrahedral angle (109° - 28')?

a. Methanol
b. Phenol
c. Methoxymethane
d. None of these

Sol.(c)The bond angle in methoxymethane(111.7°) is slightly greater than the tetrahedral angle due to repulsive interaction between two bulky groups.

15. Directions: The following question has four choices out of which ONLY ONE is correct.

Which one of the following has the lowest C-O bond length?

a. Methanol
b. Phenol
c. Methoxymethane
d. All of the above have same bond length

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Sol.(b)The C-O bod length in phenol is 136pm. The C-O bond length in phenol is lowest among the methanol(142pm), phenol(136pm) and methoxymethane(141pm).

16. Directions: The following question has four choices out of which ONLY ONE is correct.

Which one of the following sets of compounds is correct in order of the increasing boiling points?

a. Butane, ethoxyethane, pentanol
b. Butane, pentanol, ethoxyethane
c. Pentanol, butane, ethoxyethane
d. Pentanol, ethoxyethane, butane

Sol (a) The boiling point of alcohols are higher than other classes like hydrocarbons and ether and the boiling point of ether compounds are higher than the hydrocarbons, so the correct set in order of the increasing boiling points is: butane, ethoxyethane, pentanol.

17. Directions: The following question has four choices out of which ONLY ONE is correct.

Which of the following is correct in order of their decreasing acid strengths?

a. Methyl alcohol, iso-propyl alcohol, tertiary butyl alcohol
b. Tertiary butyl alcohol, iso-propyl alcohol, methyl alcohol
c. Tertiary butyl alcohol, methyl alcohol, iso-propyl alcohol
d. Methyl alcohol, tertiary butyl alcohol, iso-propyl alcohol

Sol (a)An electron realeasig group(CH_3) increases electron density on oxygen tending to decrease the polarity of O-H bond. This decreases acid strength. In methyl alcohol, the acid strength will be maximum due to presence of only one electron realeasing group followed by iso-propyl alcohol and tertiary butyl alcohol due to presence of two and three electron realeasing groups respectively. So correct order of their decreasing acid strength is: methyl alcohol, iso-propyl alcohol, tertiary butyl alcohol

18. Directions: The following question has four choices out of which ONLY ONE is correct.

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When phenol is heated with zinc dust, the product formed is

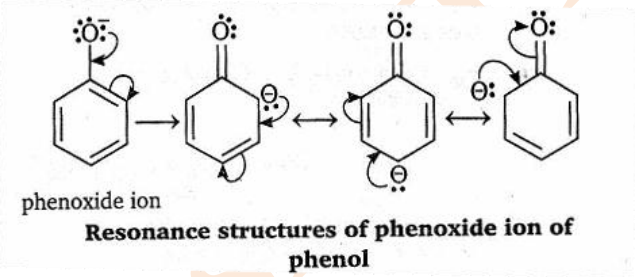
a. salicyaldehyde
b. salicylic acid
c. benzene
d. benzoquinone

Sol.(c)When phenol is heated with zinc dust, the product is benzene only.

19. Phenols are more acidic than alcohols because

a. phenoxide ion is stabilised by resonance
b. phenols are more soluble in polar solvents
c. phenoxide ions do not exhibit resonance
d. alcohols do not lose H atoms at all

Sol.(a)Phenols are more acidic than alcohols because phenoxide ion is stabilised by resonance.



Resonance structures of phenoxide ion of phenol

20. Directions: The following question has four choices out of which ONLY ONE is correct.

Order of reactivity of halogen acids towards an alcohol is

a. HCl > HBr > HI
b. HBr > HI > HCl
c. HI > HBr > HCl
d. HI > HCl > HBr

Sol. (c) Longer the bond length, lesser will be dissociation energy and hence, more reactivity.
Among halogen acids bond length increase from HCI to HI.
∴ Order of reactivity of halogen acids towards alcohol is
HI > HBr ? HCI

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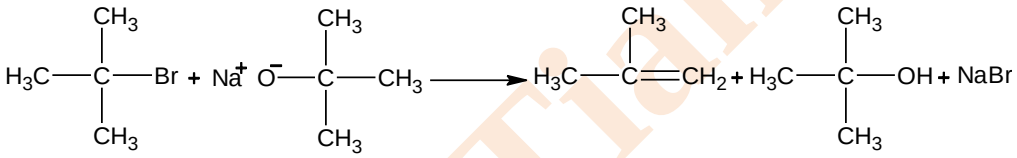
21. Why phenol has smaller dipole moment than methanol?

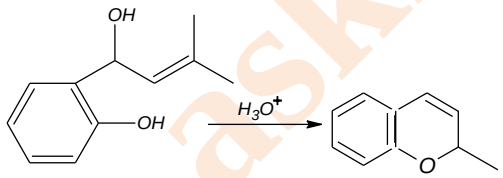
Sol. In case of phenol, the electron withdrawing inductive effect of oxygen is opposed by electron releasing resonance effect. Hence, phenol has smaller dipole moment. In case of methanol only electron withdrawing inductive effect is operative. Hence, it has higher dipole moment.

22. Why di tert – butyl ether cannot be obtained by Williamson's method?

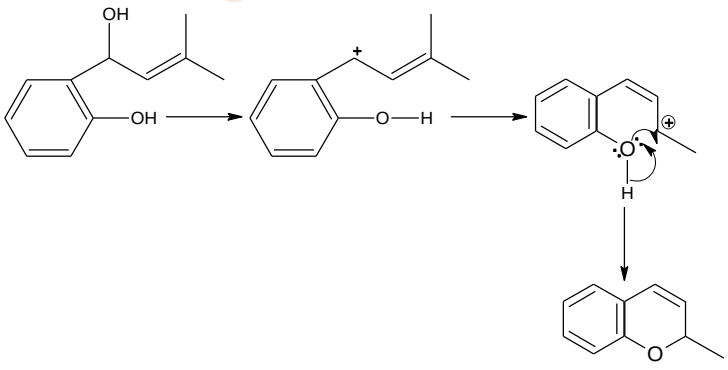
Sol. In order to prepare the above ether the reagents to be used are tert – butyl bromide and tert – butoxide. Since the tertiary bromide prefers to under go elimination, therefore, major product of the reaction shall be iso butylene and not di tert – butyl ether.



23. Write mechanism of the following reaction



Sol.



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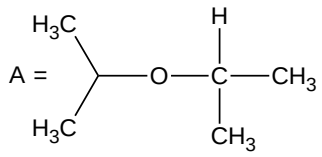
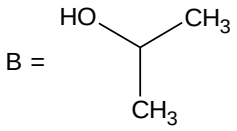
24. Compound (A) $C_6H_{14}O$ is insoluble in water and gives negative Lucas test. On treatment with conc. H_2SO_4 followed by hydrolysis it gives only one compound (B) (C_3H_8O). Compound (B) is soluble in water and gives red colour with ceric ammonium nitrate. (B) gives yellow precipitate (C) and compound (D) on treatment with I_2/Na_2CO_3 followed by acidification. Identify the compound A, B, C and D. Give the reasons.

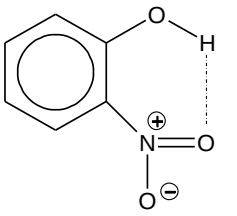
Sol. A = 

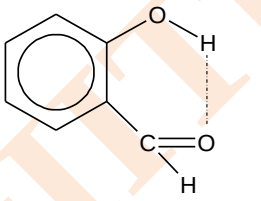
B = 

C = CHI_3 D = CH_3COOH

25. Explain the low a boiling point and decreased water solubility by o – nitro phenol and o – hydroxy benzaldehyde *as compared with this m and p – isomers.*

Sol. Intramolecular H-bonding (chelation) in the o-isomers inhibits intermolecular attraction, lowering the boiling point and reduces H-bonding with H_2O, decreasing water solubility. Intramolecular chelation can not occurs in m – and p – isomers.


o - nitro phenol


o - hydroxy benzaldehyd