

## CHEMISTRY

### BOOKS - DISHA PUBLICATION CHEMISTRY (HINGLISH)

#### ALCOHOLS, PHENOLS AND ETHERS

##### Jee Main 5 Years At A Glance

1. Phenol on treatment with  $CO_2$  in the presence of  $NaOH$  followed by acidification produces compound X as the major product. X on treatment with  $(CH_3CO)_2O$  in the presence of catalytic amount of  $H_2SO_4$  produces

A. 

B. 

C. 

D. 

**Answer: A**

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2. Phenol reacts with methyl chloroformate in the presence of  $NaOH$  to form product A. A reacts with  $Br_2$  to form product B. A and B are respectively

A. 

B. 

C. 

D. 

**Answer: C**

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3. The major product formed in the following reaction is:



A. 

B. 

C. 

D. 

**Answer: D**



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4. The major product of the following reaction is:



A. 

B. 

C. 

D. 

**Answer: A**

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5. Which of the following , upon treatment with tert-BuONa followed by addition of bromine water , fails to decolourise the colour of bromine ?

A. 

B. 

C. 

D. 

**Answer: A**

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6. The gas evolved on heating  $CH_3MgBr$  in methanol is :

A. Methane

B. Ethane

C. Propane

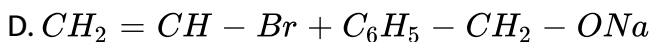
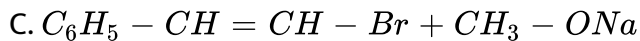
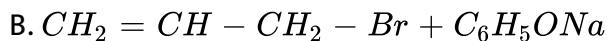
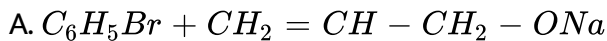
D.  $HBr$

Answer: A



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7. Allyl phenyl ether can be prepared by heating:



**Answer: A**

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8. In the Victor Meyer's test, the colours given by  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols are respectively :

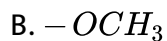
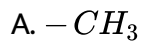
- A. Red, colourless, ble
- B. Red, blue, colourless
- C. Colorless, red, blue
- D. Red, blue, violet

**Answer: B**

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9. Which one of the following substituents at para-position is most effective in stabilizing the phenoxide

 ion?



**Answer: C**



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10. Williamson synthesis of ether is an example of:

A. Nucleophilic addition

B. Electrophilic addition

C. Electrophilic substitution

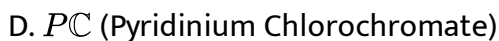
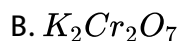
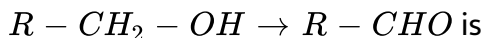
D. Nucleophilic substitution

**Answer: D**



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11. The most suitable reagent for the conversion of



Answer: D



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12. Sodium phenoxide when heated with  $CO_2$  under pressure at  $125^\circ C$

yields a product which on acid acetylation produces C



The major product C would be



A. 

B. 

C. 

D. 

**Answer: A**

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## Exercise 1 Concept Builder Topicwise Topic 1 General Characteristics Of Alcohols Phenols And Ethers

1. Methylated spirit is :

A. methanol

B. methanol + ethanol

C. methanoic acid

D. methanamide

**Answer: B**



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2. The IUPAC name of  $CH_3 - \underset{\substack{| \\ OH}}{CH} - CH_2 - \overset{\substack{CH_3 \\ |}}{\underset{\substack{| \\ OH}}{C}} - CH_3$  is :

- A. 1, 1 - dimethyl -1, 3 - butanediol
- B. 2 - methyl - 2, 4 - pentanediol
- C. 4 - methyl - 2, 4 - pentanediol
- D. 1, 3, 3 - trimethyl - 1, 3 - propanediol

**Answer: B**



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3. Carboic acid is

- A. phenol

B. phenyl benzoate

C. phenyl acetate

D. salol

**Answer: A**

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**4. Alcoholic beverages contain**

A. isopropyl alcohol

B. n - propyl alcohol

C. ethyl alcohol

D. methyl alcohol

**Answer: C**

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5. Why is the  $C - O - H$  bond angle in alcohols slightly less than the tetrahedral angle whereas the  $C-O-C$  bond angle in ether is slightly greater?

A.  $90^\circ$

B.  $104^\circ$

C.  $120^\circ$

D.  $180^\circ$

**Answer: B**



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6. Which of these is a reducing agent ?

A.  $CrO_3 / H^+$

B.  $KMnO_4$

C.  $LiAlH_4$

D.  $O_3$

**Answer: C**



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7. Migratory aptitude of the following in decreasing order is



A.  $a > c > b > d$

B.  $a > d > b > c$

C.  $a > d > c > b$

D.  $b > c > a > b$

**Answer: B**



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8. Which one of the following statements is not correct?

A. Alcohols are weaker acids than water

B. Acids strength of alcohols decreases in the following



C. Carbon - oxygen bond length in methanol,  $CH_3OH$  is shorter than that of  $C - O$  bond length in phenol.

D. The bond angle  in methanol is  $108.9^\circ$ .

Answer: C

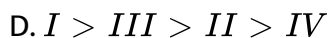
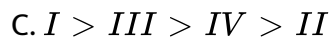
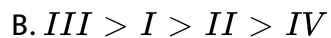
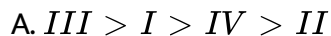
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## Exercise 1 Concept Builder Topicwise Topic 2 Preparation And Properties Of Alcohols

1. Consider the following alcohols,



The order of decreasing reactivities of these alcohols towards nucleophilic substitution with HBr is :



**Answer: A**



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2. 

Product of the reaction is :

A. 

B. 

C. 

D. 

**Answer: B**

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3. Which are not cleaved by  $HIO_4$ ?

I : glycerol    II : glycol

III : 1, 3-propenediol    IV : methoxy - 2 - propanol

A. I, II, III, IV

B. I, II

C. II, III

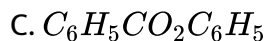
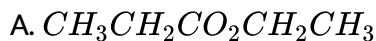
D. III, IV

**Answer: D**

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4. Which of the esters shown, after reduction with  $LiAlH_4$  and aqueous workup, will yield two molecules of only a single alcohol ?



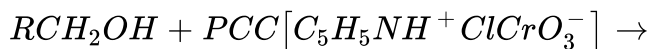
D. None of these

**Answer: B**



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5. For the following reaction, select the statement that best describes the change.



A. The alcohol is oxidised to an acid, and the  $Cr(VI)$  is reduced.

B. The alcohol is oxidized to an aldehyde, and the  $Cr(VI)$  is reduced.

C. The alcohol is reduced to an aldehyde, and the  $Cr(III)$  is oxidized.

D. The alcohol is oxidized to a ketone, and the  $Cr(VI)$  is reduced.

**Answer: B**

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6. 

Product (D) in the above reaction is :

A. 

B. 

C. 

D. 

**Answer: B**

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7. 

Product (B) of the above reaction is :

A. 

B. 

C. 

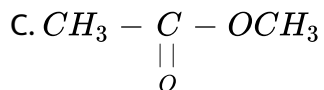
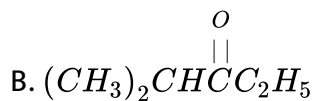
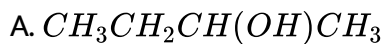
D. 

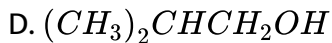
Answer: C



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8. Iodoform can be obtained on warming  $NaOH$  and iodine with :



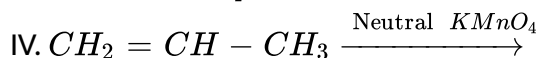
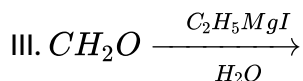
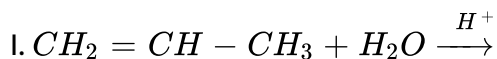


Answer: A



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9. Which of the following reactions will yield propan-2-ol ? Select the right answer from (a), (b), (c) and (d)



A. I and II

B. II and III

C. III and I

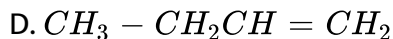
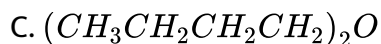
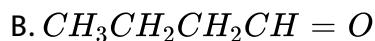
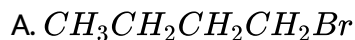
D. II and IV

Answer: A



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10. Formation of which compound given below from 1- butanol needs an oxidising agent?



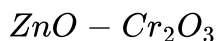
Answer: B



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11. An industrial method of preparation of methanol is

A. catalytic reduction of carbon monoxide in presence of



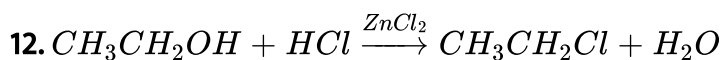
B. by reacting methane with steam at  $900^{\circ}C$  with nickel catalyst

C. by reducing formaldehyde with lithium aluminium hydride

D. by reacting formaldehyde with aqueous sodium hydroxide solution

**Answer: A**

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In the above reaction, the leaving group is

A.  $OH^-$

B.  $H_2O$

C.  $HO - \bar{ZnCl}_2$

D.  $H_3O^+$

**Answer: C**

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13. 

Which carbocation is involved in the above reaction?

A. 

B. 

C. Both

D. None

**Answer: C**

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14. Rate of dehydration of alcohols follows the order

A.  $2^\circ > 1^\circ > CH_3OH > 3^\circ$

B.  $3^\circ > 2^\circ > 1^\circ > CH_3OH$

C.  $2^\circ > 3^\circ > 1^\circ > CH_3OH$

D.  $CH_3OH > 1^\circ > 2^\circ > 3^\circ$

**Answer: B**

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15. Reagent used to convert allyl alcohol to acrolein is :

A.  $MnO_2$

B.  $H_2O_2$

C.  $OsO_4$

D.  $KMnO_4$

**Answer: A**

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16.  $HBr$  reacts fastest with



A. 2 - Methylpropan -1- ol

B. 2 - Methylpropan - 2 - ol

C. propan - 2- ol

D. propan - 1 - ol.

**Answer: B**

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17. The best method to prepare cyclohexene from cyclohexanol is by using

A. Conc.  $HCl + ZnCl_2$

B. Conc.  $H_3PO_4$

C.  $HBr$

D. Conc.  $HCl$

**Answer: B**

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18. Acid catalysed hydration of alkenes except ethene leads to the formation of

- A. primary alcohol
- B. secondary or tertiary alcohol
- C. mixture of primary and secondary alcohols
- D. mixture of secondary and tertiary alcohols

**Answer: B**



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19. Which of the following reagent will convert glycerol to acrolein ?

- A.  $P_2O_5$
- B. Conc.  $H_2SO_4$
- C. Anhydrous  $CaCl_2$

D.  $KHSO_4$

Answer: D

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20. Which of the following alcohols is least soluble in water ?

A.  $CH_3OH$

B.  $C_3H_7OH$

C.  $C_4H_9OH$

D.  $C_{10}H_{21}OH$

Answer: D

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21. Which of the following will not give iodoform test?

A. Isopropyl alcohol

B. Ethanol

C. Ethanal

D. Benzyl alcohol

**Answer: D**



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22. Ethyl alcohol can be prepared from grignard reagent by the reaction of?

A.  $HCHO$

B.  $R_2CO$

C.  $RCN$

D.  $RCOCl$

**Answer: A**

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23. Glycerol is more viscous than ethanol due to :

- A. high molecular weight
- B. high boiling point
- C. many hydrogen bonds per molecule
- D. Fajan's rule

**Answer: C**

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24. Ethanol and dimethyl ether form a pair of functional isomers. The boiling point of Ethanol is higher than that of dimethyl ether, due to the presence of

- A. H - bonding in ethanol

B. H - bonding in dimethyl ether

C.  $CH_3$  group in ethanol

D.  $CH_3$  group in dimethyl ether

**Answer: A**

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25. When glycerol is treated with excess of HI, the product formed is.....

A. glycerol triiodide

B. 2 - iodopropane

C. allyl iodide

D. propene

**Answer: B**

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26. Which of the following compounds can be used as antifreeze in automobile radiators?

A. Methyl alcohol

B. Glycol

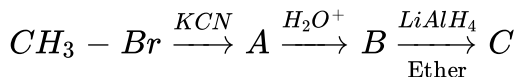
C. Nitrophenol

D. Ethyl alcohol

**Answer: B**

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27. In the following sequence of reaction, the product C is



A. Acetone

B. Methane

C. Acetaldehyde

D. Ethyl alcohol

**Answer: D**

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28. Number of isomeric alcohols of molecular formula of  $C_6H_{14}O$  which give positive iodoform test is

A. two

B. three

C. four

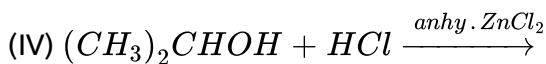
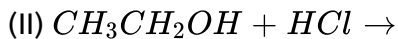
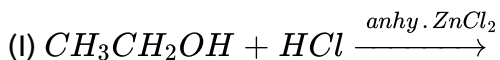
D. five

**Answer: C**

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29. Which of the following reaction(s) can be used for the preparation of alkyl halides?



A. (I), (III) and (IV) only

B. (I) and (II) only


C. (IV) only

D. (III) and (IV) only

**Answer: A**



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30. Which of the following is not the product of the dehydration of  ?

A. 

B. 

C. 

D. 

**Answer: B**

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31.  The compound X is

A. 

B. 

C. 

D. Both (b) and (c)

**Answer: B**

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32. Which carbocation is more likely to be formed in the dehydration of



A.

B.

C.

D.

**Answer: C**



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33. Major product is

A.

B.

C.

D.

**Answer: C**



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**34.** 

The above reaction is an example of

- A. regiospecific
- B. regioselective
- C. stereoselective
- D. stereospecific

**Answer: B**



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**35.** The most probable product in the reaction given below is



A. 

B. 

C. 

D. 

**Answer: C**

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**36.** The precursor Carbocation to the product in the following reaction is



A. 

B. 

C. Either of the two

D. None of these

**Answer: A**

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37. 

The driving force in the above reaction is

- A. conversion of  $1^\circ$  carbocation to  $2^\circ$  carbocation.
- B. conversion of  $1^\circ$  carbocation to  $3^\circ$  carbocation.
- C. relief in steric strain due to expansion of ring.
- D. both a & c.

**Answer: C**

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Exercise 1 Concept Builder Topicwise Topic 3 Preparation And Properties Of Phenols

1. The major reason that phenol is a better Bronsted acid than cyclohexanol is that :

A. it is a better proton donor.

B. the cyclohexyl group is an electron donating group by induction, which destabilizes the anion formed in the reaction by resonance.

C. Phenol is able to stabilize the anion formed in the reaction.

D. the phenyl group is an electron withdrawing group by induction, which stabilizes the anion formed in the reaction.

**Answer: D**



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2. Which of the following compounds will be most easily attacked by an electrophile?

A. Chlorobenzene

B. Benzene

C. Phenol

D. Toluene

**Answer: C**



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**3. Benzyl alcohol is obtained from benzaldehyde by:**

A. Perkin's reaction

B. Wurtz reaction

C. Cannizzaro's reaction

D. Claisen's reaction

**Answer: C**



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4. Phenol is less acidic than

- A. acetic acid
- B. p - methoxyphenol
- C. acetylene
- D. ethanol

**Answer: A**



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5. To distinguish between salicylic acid and phenol, one can use:

- A.  $NaHCO_3$  solution
- B. 5 %  $NaOH$  solution
- C. neutral  $FeCl_3$
- D. bromine water

**Answer: A**

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6. Which one of the following compounds has the most acidic nature ?

A. 

B. 

C. 

D. 

**Answer: B**

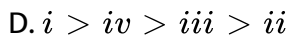
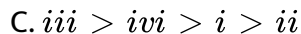
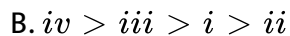
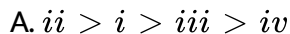
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7. among the following four compounds

(i) phenol (ii) methylphenol

(iii) meta - nitrophenol (iv) para - nitrophenol

the acidity order is:

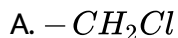


**Answer: B**



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8. Reaction of phenol with chloroform in presence of dilute sodium hydroxide finally introduces which one of the following functional group ?



D.  $-CHO$

**Answer: D**

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9. Acid catalysed hydration, hydroboration - oxidation, and oxymercuration - demercuration will give different products in

A. 


B. 

C. 

D. 

**Answer: D**

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10.  The compound P should be

A. 

B. 

C. 

D. 

**Answer: C**



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11. Which of the following ion is formed in the following reaction ?



A. 


B. 

C. 

D. All the three

**Answer: B**

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12.  Here P is

A. 

B. 

C. 

D. Reaction not possible

**Answer: C**

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13. 

Here P is

A. 

B. 

C. Both

D. 

**Answer: B**

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14. 

A. 

B. 

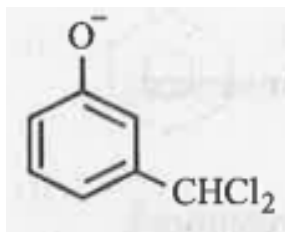
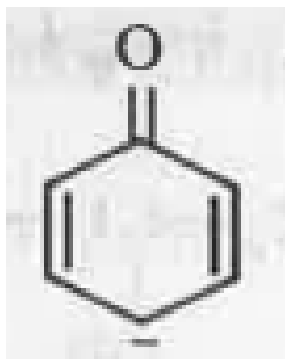
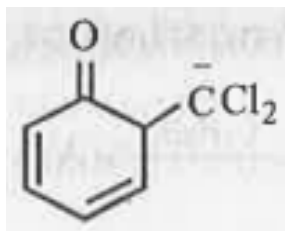
C. 

D. 

**Answer: C**

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15. Which of the following is not formed as an intermediate in the Reimer-Tiemann reaction between phenol and alkaline chloroform?




Answer: D





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16.  . Here Z is

A. 

B. 

C. 

D. 

**Answer: B**



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17. Identify the product [B] in the following reaction



A. 

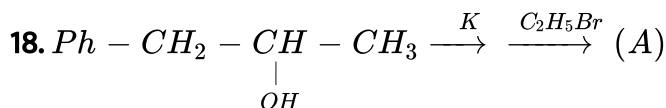
B. 

C. 

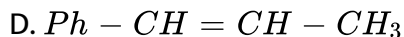
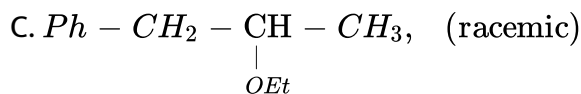
D. 

**Answer: D**

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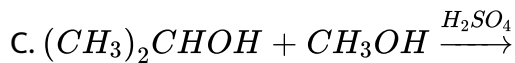
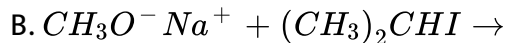
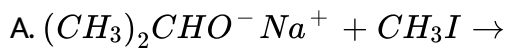
Product (A) in above reaction is :



**Answer: B**

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19. Which yields isopropyl methyl ether with little or no by-products?

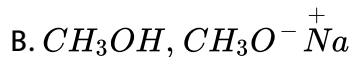


D. All fo these

Answer: A

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20. What is X in the following reaction?



D.  $CH_3MgBr$  / ether followed by  $H_3O^+$

Answer: A

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21. tert-Butyl ether can't be prepared by which reaction?

A. tert-Butanol + ethanol  $\xrightarrow{H^+}$

B. tert-Butyl bromide + sodium ethoxide  $\rightarrow$

C. Sodium tert-butoxide + ethyl bromide  $\rightarrow$

D. Isobutene + ethanol  $\xrightarrow{H^+}$

Answer: B

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22. Which one is formed when sodium phenoxide is heated with ethyl iodide?

- A. Phenetole
- B. Ethyl phenyl alcohol
- C. Phenol
- D. None of these

**Answer: A**



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23. In Williamson's synthesis, ethoxyethane is prepared by

- A. passing ethanol over heated alumina
- B. sodium ethoxide with ethyl bromide
- C. ethyl alcohol with sulphuric acid
- D. ethyl iodide and dry silver oxide

**Answer: B**

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**24.** Which of the following compounds are soluble in water?

A. Oils & fats

B. Water

C.  $NaCl$

D.  $PCl_5$

**Answer: A**

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**25.** The reaction of sodium ethoxide with ethyl iodide to form diethyl ether is termed

A. electrophilic substitution

B. nucleophilic substitution

C. electrophilic addition

D. radical substitution

**Answer: B**

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**26.** Which of the following product is formed , when ether is exposed to air :

A. Oxide

B. Alkanes


C. Alkenes

D. Peroxide of diethyl ether

**Answer: D**

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## Exercise 2 Concept Applicator

1. , Product (P) is :

A. 

B. 

C. 

D. 

**Answer: B**

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2. Identify the major product,





A. 

B. 

C. 

D. 

**Answer: A**

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3. An alcohol of formula  $C_9H_{12}O$  reacts with  $Na_2Cr_2O_7$  to form a compound having formula  $C_9H_{10}O$ . The original alcohol might be :

A. 

B. 

C. 

D. 

**Answer: B**

4. An optically active alcohol of formula  $C_9H_{12}O_2$  produced the following compound when refluxed with  $KMnO_4$ .



The original compound show these properties also :



What is structure of (A) ?

A. 

B. 

C. 

D. both (a) and (b)

**Answer: D**

5. Succinic acid  $\xrightarrow{\Delta}$  (A)  $\xrightarrow[\Delta]{NH_3}$  (B)  $\xrightarrow[KOH]{Br_2}$  (C), Product (C) will be :

- A.  $\begin{array}{c} CH_2 - CO_2H \\ | \\ CH_2 - CH_2 - NH_2 \\ | \\ CH_2 - CO_2H \end{array}$
- B.  $\begin{array}{c} | \\ CH_2 - NH_2 \\ | \\ CH_2 - CO_2^- K^+ \end{array}$
- C.  $\begin{array}{c} | \\ CH_2 - NH_2 \\ | \\ CH_2 - CO_2H \end{array}$
- D.  $\begin{array}{c} | \\ CH_2 - CH_2 - Br \end{array}$

Answer: C



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6. The structure of product formed in the reaction given below is:



A.

B.

C. 

D. 

**Answer: C**

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7. Which of the following compound is differentiated by  $NaHCO_3$  as well as by  $NaOH$ ?

A. 

B. 

C. 

D. 

**Answer: C**

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8. Which of the following is most reactive towards aqueous  $HBr$ ?

A. 1 - Phenyl - 2- propanol

B. 1 - Phenyl - 1 - propanol

C. 3 - Phenyl - 1 - propanol

D. 2 - Phenyl - 1 - propanol

**Answer: B**



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9. Which of the following alcohols on dehydration with conc.  $H_2SO_4$  will yield But-2-ene ?

A. 

B. 

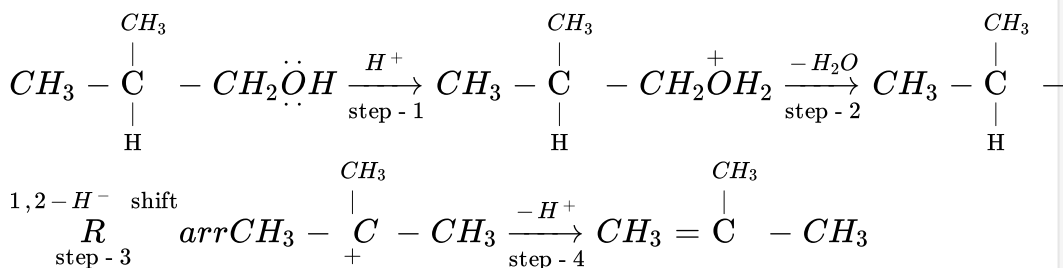
C. 

D. 

Answer: B

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10. Dehydration of alcohol by conc.  $H_2SO_4$  takes place according to following steps:



The lowest and fastest steps in the above reaction are

- A. step 1 is lowest, by 3 is fastest
- B. step 2 is lowest while 3 is fastest
- C. step 2 is lowest, while 4 is fastest
- D. all steps proceed at equal rate

Answer: C

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11.  Product is

A. 

B. 

C. mixture of (a) and (b)

D. 

**Answer: D**

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12. During the dehydration of alcohols to alkenes by heating with conc.

$H_2SO_4$ , the initiating step is :

A. formation of carbocation

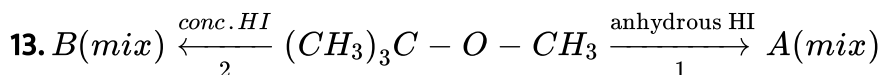
B. elimination of water

C. formation of an ester

## D. protonation of alcohol molecule

Answer: D

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A. X and Y are identical mixture of  $\text{CH}_3\text{I}$  and  $(\text{CH}_3)_3\text{C} - \text{OH}$

B. X and Y are identical mixture of  $\text{CH}_3\text{OH}$  &  $(\text{CH}_3)_3\text{C} - \text{I}$

C. X is mixture of  $\text{CH}_3\text{O}$  and  $(\text{CH}_3)_3\text{C} - \text{OH}$

D. Y is mixture of  $\text{CH}_3\text{OH}$  &  $(\text{CH}_3)_3\text{C} - \text{I}$

Answer: B

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14.  $\text{ClCH}_2\text{CH}_2\text{OH}$  is stronger acid than  $\text{CH}_3\text{CH}_2\text{OH}$  because of :

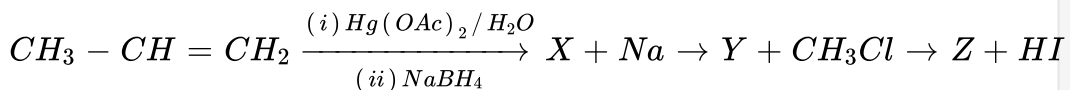


- A. – I effect of Cl increases negative charge on O atom of alcohol.
- B. – I effect of Cl disperses negative charge on O atom to produce more stable cation.
- C. – I effect of Cl disperses negative charge on O atom to produce more stable anion.
- D. None of these.

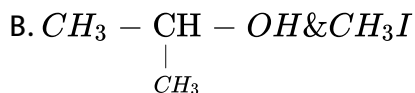
**Answer: C**

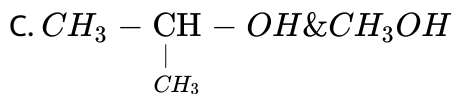
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**15.**



What are A and B?

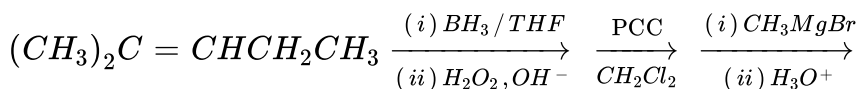




**Answer: D**

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**16.** What is product of the following sequence of reactions ?



A. 2, 4 - dimethyl - 3- pentanol

B. 2, 3 - dimethyl - 3- pentanol

C. 2, 3 - dimethyl - 2- pentanol

D. 2, 2 - dimethyl - 3 - pentanol

**Answer: B**

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17. Identify the nature of product in the following reaction



A.

B.

C.

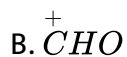
D.

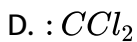
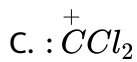
**Answer: D**



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18. Which electrophile is likely to be formed as an intermediate in the following electrophilic substitution reaction?





**Answer: D**

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**19. Phenol is**

- A. a base stronger than ammonia
- B. an acid stronger than carbonic acid
- C. an acid weaker than carbonic acid
- D. a neutral compound

**Answer: C**

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20. What is the structure of the major product when phenol is treated with bromine water?

A. 

B. 

C. 

D. 

**Answer: A**



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21. The structure of the compound that gives a tribromo derivative on treatment with bromine water is :

A. 

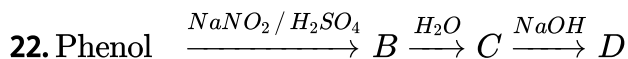
B. 

C. 

D. 

**Answer: C**

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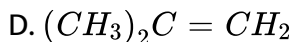
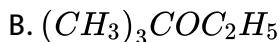
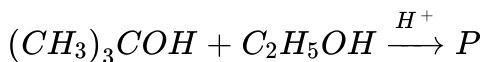
Name of the above reaction is

- A. Liebermann's reaction
- B. Phthalein fusion test
- C. Reimer - Tiemann reaction
- D. Schotten - Baumann reaction

**Answer: A**

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23. The major product P in the following reaction is



**Answer: B**



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24. An ether, (A) having molecular formula,  $C_6H_{14}O$ , when treated with excess of HI produced two alkyl iodides which on hydrolysis yield compounds (B) and (C). Oxidation of (B) gives an acid (D), whereas oxidation of (C) results in the formation of a mixed ketone, (E). Give graphic representation of (A) to (E).

A. 2 - ethoxypropane

B. ethoxypropane

C. methoxybutane

D. 2 - methoxybutane

**Answer: A**

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25. HBr reacts with  $H_2C = CH - OCH_3$  under anhydrous conditions at room temperature to give:

A.  $BrCH_2 - CH_2 - OCH_3$

B.  $H_3C - CH(Br) - OCH_3$

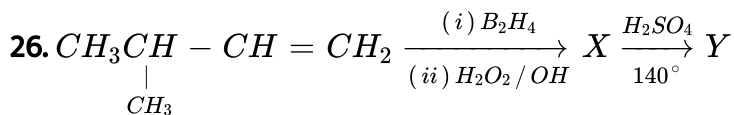
C.  $CH_3CHO$  and  $CH_3Br$

D.  $BrCH_2CHO$  and  $CH_3OH$

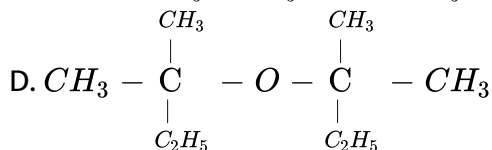
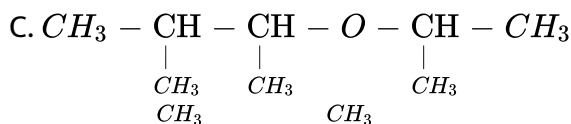
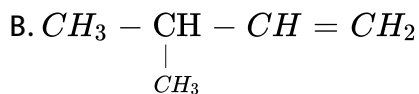
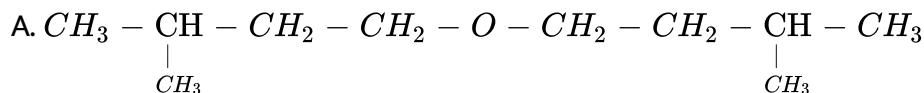
**Answer: B**



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What is Y ?



Answer: A

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27. The reaction



can be classified as:-

- A. Williamson ether synthesis reaction
- B. Alcohol formation reaction
- C. Dehydration reaction
- D. Williamson alcohol synthesis reaction

**Answer: A**



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**28. Which one is the most acidic compound?**

A. 

B. 

C. 

D. 

**Answer: C**



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