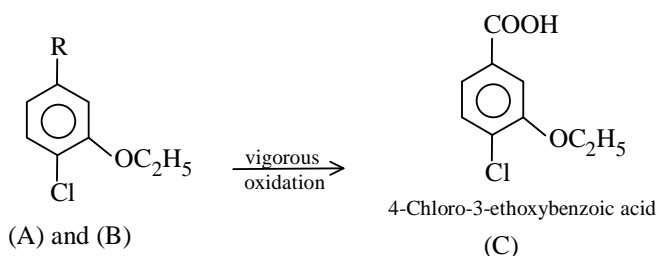


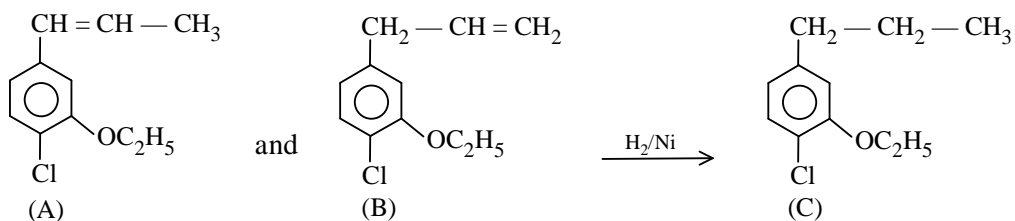
(C) is identical with (iii).

Example 3 : Two isomeric compounds (A) and (B), have same formula $\text{C}_{11}\text{H}_{13}\text{OCl}$. Both are unsaturated, and yield the same compound (C) on catalytic hydrogenation and produce 4-Chloro-3-ethoxybenzoic acid on vigorous oxidation. (A) exists in geometrical isomers, (D) and (E), but not (B). Give structures of (A) to (E) with proper reasoning.

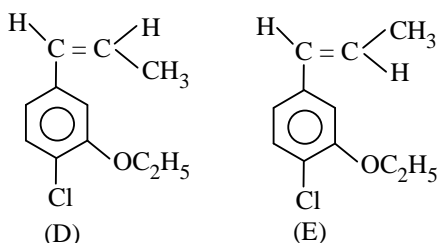
Solution : As oxidation of (A) and (B) gives 4-Chloro-3-ethoxybenzoic acid, the structures of (A) and (B) can be written as



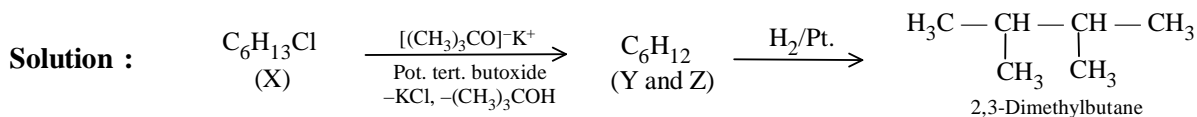
Since the molecular formula of A and B is $\text{C}_{11}\text{H}_{13}\text{OCl}$, therefore R must be C_3H_5 . As (A) and (B) are unsaturated compounds, both give the same compound (C) on catalytic hydrogenation. Therefore R must be $-\text{CH}=\text{CH}-\text{CH}_3$ or $-\text{CH}_2-\text{CH}=\text{CH}_2$. Thus structures of (A) and (B) can be



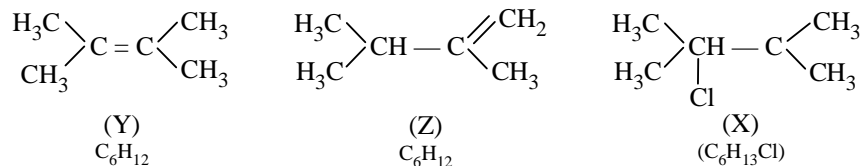
Only (A) can exist as geometrical isomers and not B. Thus structures of (D) and (E) are



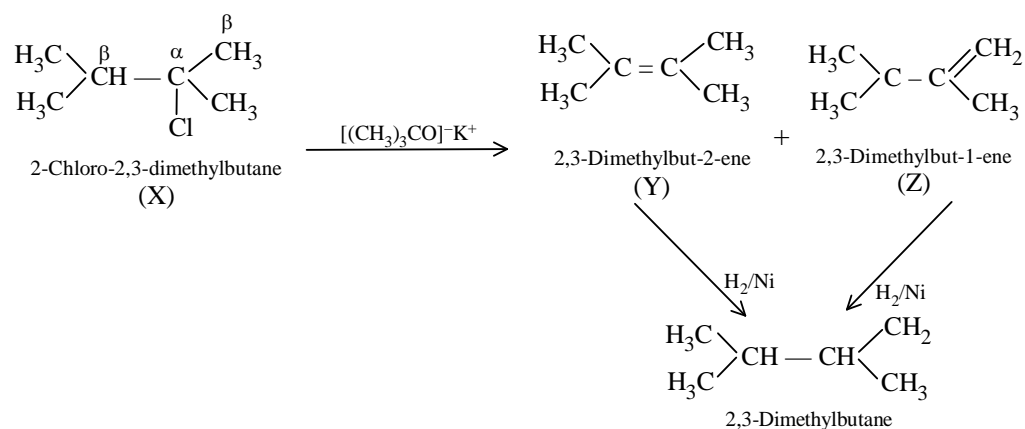
Example 4 : An alkyl halide, X, of formula $\text{C}_6\text{H}_{13}\text{Cl}$ on treatment with potassium tert. butoxide gives two isomeric alkenes Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2,3-Dimethyl butane. Predict structures of X, Y and Z.



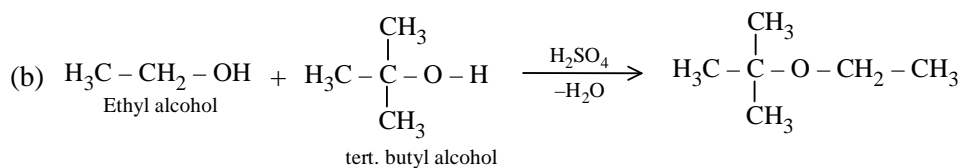
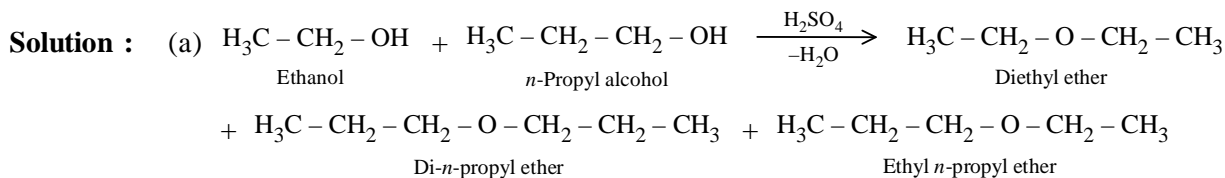
Product, 2, 3-Dimethyl butane suggest that (Y) and (Z) must be and X must be



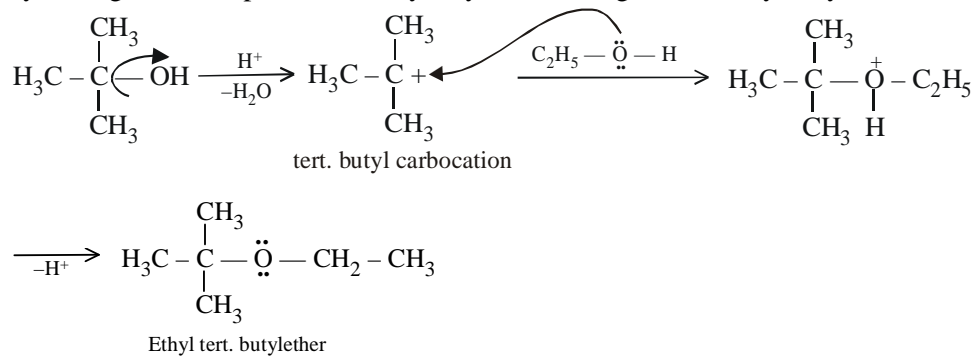
This series of reactions are



Example 5 : A mixture of ethyl alcohol and *n*-propyl alcohol on treatment with H_2SO_4 gives a mixture of three ethers. On the other hand, a mixture of tert. butyl alcohol and ethyl alcohol gives the good yield of a single ether. Identify the ether and account for its good yield.

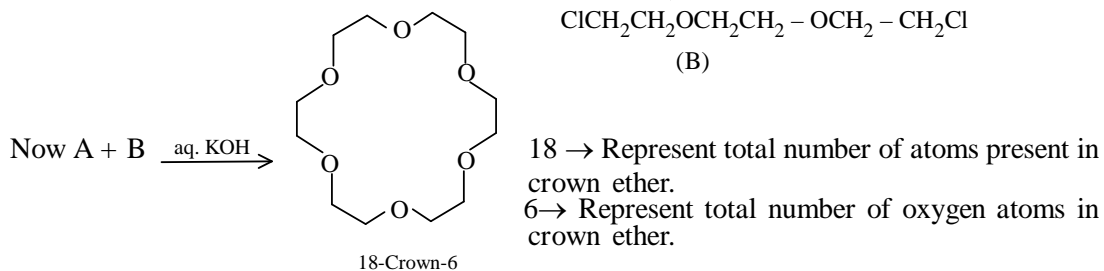
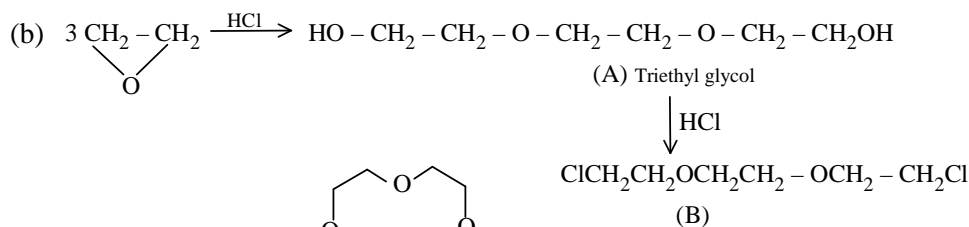
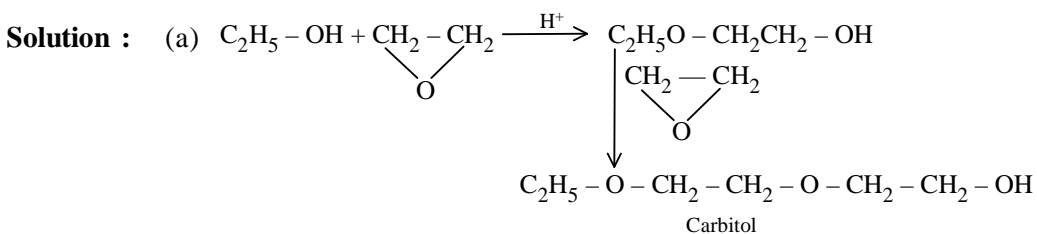


The mixture of ethyl alcohol and tert. butyl alcohol on treatment with H_2SO_4 gives tert. butyl ethyl ether in good yield, because tert. butyl alcohol gives stable tert. butyl carbocation which rapidly undergoes nucleophilic attack by ethyl alcohol to give tert. butyl ethyl ether.

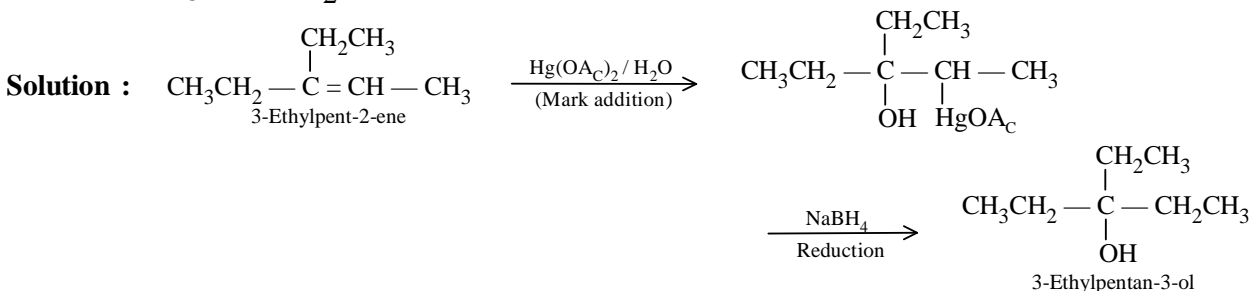


On the other hand, in first case, both ethyl alcohol and *n*-propyl alcohol yield almost equally stable carbocations, each one of which can be attacked either by ethyl or *n*-propyl alcohol giving a mixture of three ethers.

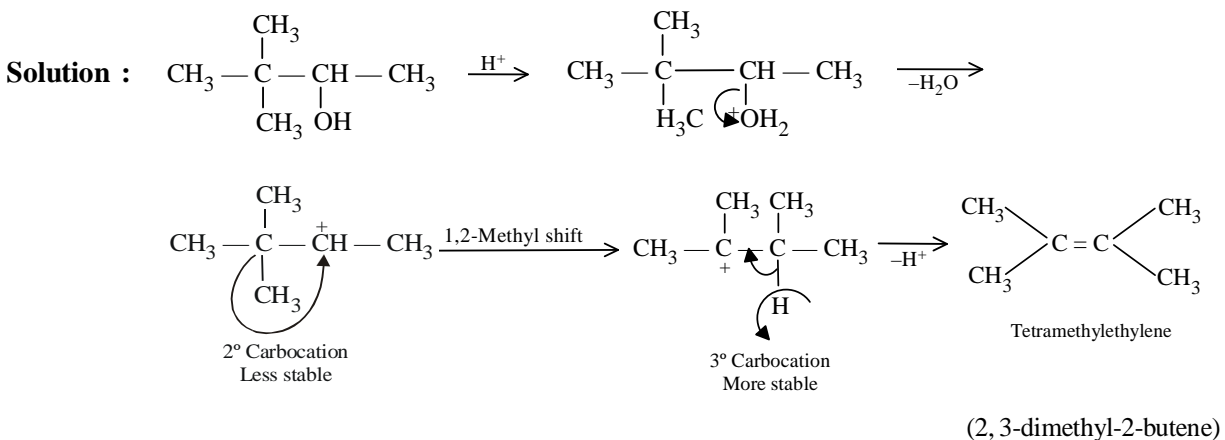
Example 6 : How will you prepare (a) carbitol (water soluble organic solvent) and (b) 18-crown-6 (a crown-ether) from ethylene oxide.



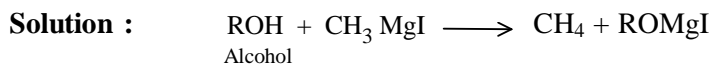
Example 7 : Give the structure of the major organic product when 3-Ethylpent-2-ene is treated with $\text{Hg}(\text{OAc})_2/\text{H}_2\text{O}$; NaBH_4 .



Example 8 : 3,3-Dimethylbutane-2-ol loses a molecule of water in the presence of concentrated sulphuric acid to give tetramethylethylene as a major product, suggest a suitable mechanism.



Example 9 : 0.037 g of an alcohol, ROH was added to CH_3MgI and the gas evolved measured 11.2 cm^3 at S.T.P. What is the molecular mass of ROH ? On dehydration ROH gives an alkene which on ozonolysis gives acetone as one of the products. ROH on oxidation easily gives an acid containing the same number of carbon atoms. Give structure of ROH and the acid with proper reasoning.



$\therefore 11.2 \text{ cm}^3 \text{ methane} = 0.037 \text{ g alcohol}$

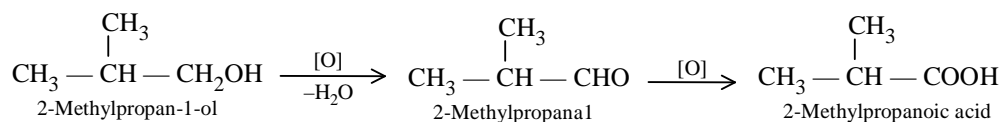
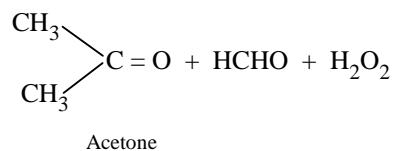
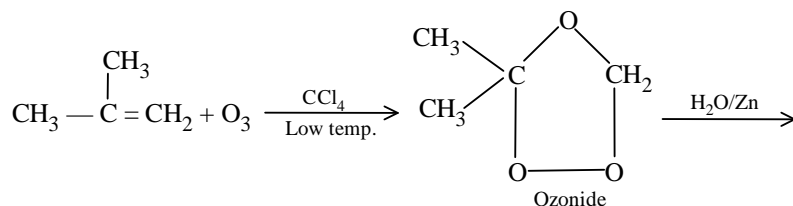
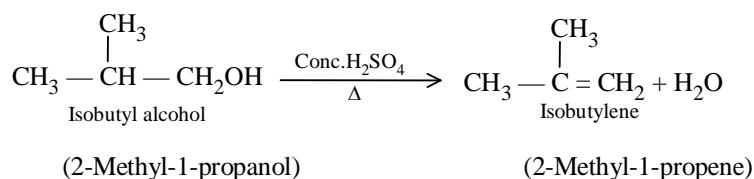
$\therefore 22,400 \text{ cm}^3 \text{ methane} = \frac{0.037 \times 22,400}{11.2} = 74 \text{ g alcohol}$

Molar mass of alcohol ($\text{C}_n\text{H}_{2n+1}\text{OH}$) is 74 g mol^{-1}

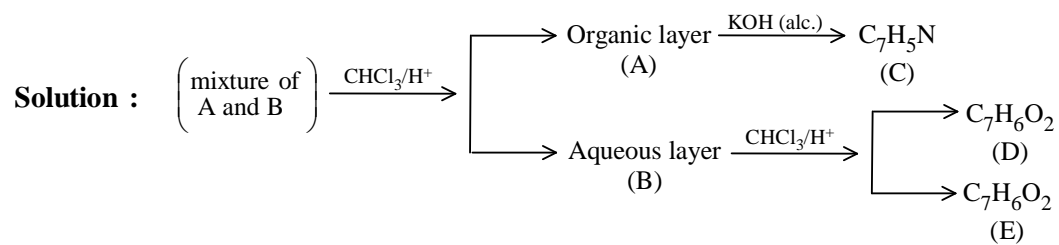
$\therefore 12n + 2n + 1 + 17 = 74 \quad \text{or} \quad 14n + 18 = 74$

$14n = 56 \quad \text{or} \quad n = \frac{56}{14} = 4$

Molecular formula of alcohol is $\text{C}_4\text{H}_9\text{OH}$. Since the alcohol can be easily oxidised to acid, it must be 1° alcohol. On dehydration alcohol gives alkene which on ozonolysis gives acetone as one of the products. Thus alcohol must consist of the fragment $(\text{CH}_3)_2\text{CH}-$ and hence the alcohol is isobutyl alcohol. The concerned reactions are as follows :



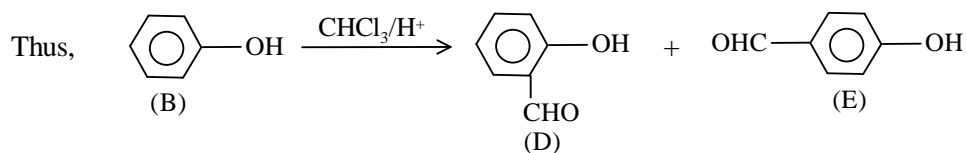
Example 10: A mixture of two aromatic compounds A and B was separated by dissolving in chloroform followed by extraction with aqueous KOH solution. The organic layer containing compound A, when heated with alcoholic solution of KOH produced a compound C ($\text{C}_7\text{H}_5\text{N}$) associated with an unpleasant odour. The alkaline aqueous layer on the other hand, when heated with chloroform and then acidified gave a mixture of two isomeric compounds D and E of molecular formula $\text{C}_7\text{H}_6\text{O}_2$. Identify the compound A, B, C, D, E and write their structures.



Since the compound C having the molecular formula $\text{C}_7\text{H}_5\text{N}$ has an unpleasant smell, it must be an isocyanide corresponding to the structure $\text{C}_6\text{H}_5 - \text{N} \equiv \text{C}$ (C).

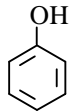
Consequently, (A) must be an amine corresponding to the structure $\text{C}_6\text{H}_5\text{NH}_2$ (A) (Aniline)

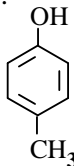
Since (B) gives positive Reimer-Teimann reaction, it must be a phenol corresponding to the structure $\text{C}_6\text{H}_5\text{OH}$.

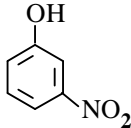


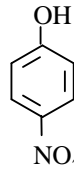
OBJECTIVE QUESTIONS

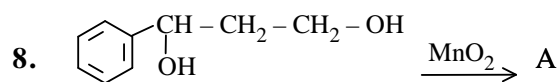
1. List the hydrogen halide acids in *decreasing order of reactivity* in the following reaction:

$$R-OH + HX \longrightarrow RX + H_2O$$
 (a) $HI > HBr > HCl > HF$ (b) $HBr > HI > HCl > HF$
 (c) $HI > HCl > HBr > HF$ (d) $HI > HF > HBr > HI$.
2. Place the following benzyl alcohols in decreasing order of reaction rate with HBr.
 (1) $p\text{-CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{OH}$ (b) $p\text{-ClC}_6\text{H}_4\text{CH}_2\text{OH}$
 (c) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (d) $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$
 (a) $1 > 2 > 3 > 4$ (b) $1 > 3 > 2 > 4$ (c) $1 > 3 > 4 > 2$ (d) None of these
3. An alcohol $\text{C}_5\text{H}_{11}\text{OH}$ on dehydration gives an alkene, which on oxidation yields a mixture of a ketone and an acid. The alcohol is
 (a) $\text{CH}_3\text{-}\underset{\text{OH}}{\text{CH}}\text{-CH}_2\text{-CH}_2\text{-CH}_3$ (b) $\text{CH}_3\text{-}\underset{\text{CH}_3}{\text{CH}}\text{-}\underset{\text{OH}}{\text{CH}}\text{-CH}_3$
 (c) $\text{CH}_3\text{CH}_2\text{CH(OH)CH}_2\text{CH}_3$ (d) $(\text{CH}_3)_3\text{CCH}_2\text{OH}$.
4. An industrial method of preparation of methanol is
 (a) Catalytic reduction of carbon monoxide in presence of $\text{ZnO-Cr}_2\text{O}_3$
 (b) By reacting methane with steam at 900°C with a nickel catalyst.
 (c) By reducing formaldehyde with lithium aluminium hydride
 (d) By reacting formaldehyde with aqueous sodium hydroxide solution.
5. Consider the following compounds :
 1. Phenol 2. *o*-Nitrophenol 3. *m*-Nitrophenol 4. *p*-Nitrophenol
 Place these *compounds* in the *decreasing order of acidity*.
 (a) $2 > 3 > 1 > 4$ (b) $2 > 3 > 4 > 1$ (c) $2 > 4 > 3 > 1$ (d) $4 > 2 > 3 > 1$
6. In the following compounds :
1. 

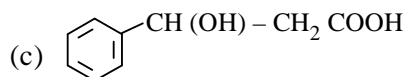
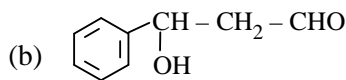
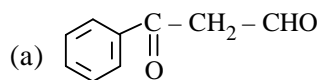
2. 

3. 

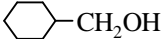
4. 
- the *order of acidity* is
 (a) $3 > 4 > 1 > 2$ (b) $1 > 4 > 3 > 2$ (c) $2 > 1 > 3 > 4$ (d) $4 > 3 > 1 > 2$
7. The most toxic of all alcohols is
 (a) $\text{C}_6\text{H}_5\text{OH}$ (b) $\text{C}_2\text{H}_5\text{OH}$ (c) $\text{C}_3\text{H}_7\text{OH}$ (d) CH_3OH
-

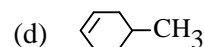
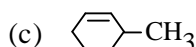
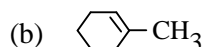
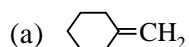


Here 'A' is



(d) None of these

9.  on dehydration predominantly forms



10. A neutral compound gives red colour with Ceric ammonium nitrates. This suggests compound is

(a) alcohol

(b) phenol

(c) aldehyde

(d) ketone

11. In Victor Meyer's test for alcohols the characteristic colour given by 2° alcohol is

(a) Blue

(b) Green

(c) Red

(d) Purple

12. Oxygen when passed through an ethereal solution of $\text{C}_6\text{H}_5\text{MgI}$ followed by acid hydrolysis gives

(a) Benzene

(b) Benzoic acid

(c) Phenol

(d) Salicylic acid

13. Carbolic acid is

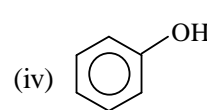
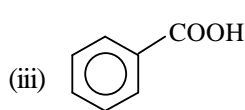
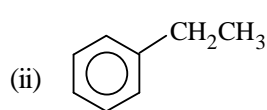
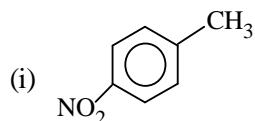
(a) Phenol

(b) Phenyl benzoate

(c) Phenyl acetate

(d) Salol

14. Which will undergo Friedel Crafts alkylation



(a) (i), (ii), (iv)

(b) (i), (iii)

(c) (ii), (iv)

(d) (i), (ii)

15. An aromatic ether is not cleaved by HI even at 525 K. The compound is

(a) $\text{C}_6\text{H}_5\text{OCH}_3$

(b) $\text{C}_6\text{H}_5\text{OC}_6\text{H}_5$

(c) $\text{C}_6\text{H}_5\text{OC}_3\text{H}_7$

(d) THF

16. OsO_4 is used for

(a) Hydroxylation of acetylenes

(b) Hydroxylation of olefins to form cis-diol

(c) Hydroxylation of olefine to form trans-diol

(d) Hydroxylation of carbonyl compounds

17. Which of the following alcohols cannot be prepared by Grignard reagents and carbonyl compound

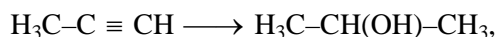
(a) $\text{C}_2\text{H}_5\text{OH}$

(b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

(c) $(\text{CH}_3)_2\text{CHOH}$

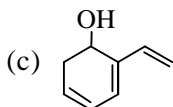
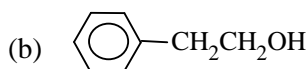
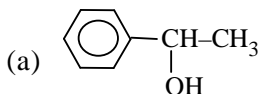
(d) CH_3OH

18. In the reaction,



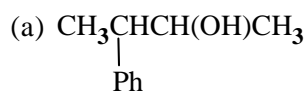
the reagent (s) used would include

- (a) 2 mol of H_2/Pt , followed by aqueous NaOH (b) 1 mol of H_2/Pt , followed by $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$
(c) Na in liquid NH_3 , followed by CH_3Cl (d) $\text{Hg}^{2+}/\text{H}_2\text{SO}_4$.
19. Compound (X) liberates hydrogen when treated with sodium metal. On oxidation, it gives a compound (Y) with the same number of carbon atoms. Compound (Y) gives orange coloured crystalline 2, 4-Dinitrophenyl hydrazone derivative with 2, 4-Dinitrophenyl hydrazine hydrochloride. Compound (Y) on treatment with NaOH (aq) and iodine gives compound (Z). Compound (Z) on treatment with dilute acid yields a compound, which is identified as benzoic acid. The structure of compound (X) is



(d) None of these

20. Alcohol (X) $\xrightarrow{\text{aq. NaOH} + \text{I}_2}$ $\text{CHI}_3 + (\text{Y}) \xrightarrow{\text{H}_3\text{O}^+}$ PhCH_2COOH . The alcohol (X) is



21. 1-Phenylethanol can be prepared by the reaction of benzaldehyde with

(a) Methyl bromide

(b) Ethyl iodide and magnesium

(c) Methyl iodide and magnesium

(d) Methyl bromide and aluminium bromide.

22. Conversion of cyclohexene to cyclohexanol can be conveniently achieved by

(a) $\text{NaOH} - \text{H}_2\text{O}$

(b) $\text{Br}_2 - \text{H}_2\text{O}$

(c) Hydroboration—oxidation

(d) Hyboration—hydrolysis

23. Phenol on reaction with Br_2 in CS_2 or a non-polar aprotic solvent furnishes

(a) 2, 4, 6-Tribromophenol

(b) *p*-Bromophenol

(c) *o/p*-Bromophenol

(d) *m*-Bromophenol

24. 1-Propanol and 2-propanol can be distinguished by

(a) Oxidation with alkaline KMnO_4 followed by reaction with Fehling solution

(b) Oxidation with acidic dichromate followed by reaction with Fehling solution

(c) Oxidation by heating with copper followed by reaction with Fehling solution

(d) Oxidation with concentrated H_2SO_4 followed by reaction with Fehling solution.

25. 2-Phenylethanol may be prepared by the reaction of phenylmagnesium bromide with

- (a) HCHO (b) CH₃CHO (c) CH₃COCH₃ (d) 

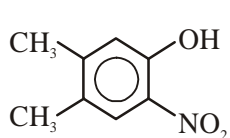
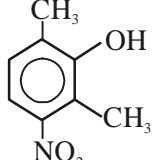
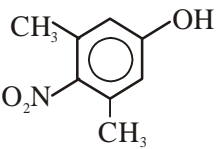
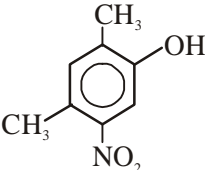
26. When 3, 3-dimethyl-2-butanol is heated with H₂SO₄, the major product obtained is

- (a) *cis*- and *trans*-isomer of product named under (c)
 (b) 3, 3-Dimethyl-1-butene
 (c) 2, 3-Dimethyl-2-butene
 (d) 2, 3-Dimethyl-1-butene

27. $B \xleftarrow[\text{(ii) H}_2\text{O}_2/\text{OH}^-]{\text{(i) B}_2\text{H}_6/\text{THF}} \text{Cyclohexane-CH}_2\text{=CH}_2 \xrightarrow{\text{H}_3\text{O}^+} \text{A}$; A & B are respectively

- (a) Both  (b) Both 
 (c) ,  (d) , 

28. Which one of the following phenols is the strongest acid?

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

29. Consider the following alcohols

- I. 1-Phenyl-1-propanol II. 3-Phenyl-1-propanol III. 1-phenyl-2-propanol


The correct sequence of decreasing order of reactivity of these alcohols in their reaction with HBr is

- (a) I > II > III (b) II > I > III (c) I > III > II (d) II > III > I

30. $\text{C}_6\text{H}_5\text{-CH(O)-CH}_2 \xrightarrow[\text{CHCl}_3]{\text{HCl}} ?$

The product of the above reaction is

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

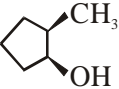
31. Consider the reaction,  $\xrightarrow{\text{C}_6\text{H}_5\text{CO}_3\text{H}} \text{A} \xrightarrow{\text{HBr}} \text{B}$ A and B respectively are

- (a) 1, 2-Epoxycyclohexane, *trans*-2-bromocyclohexanol
 (b) 1, 2-Epoxycyclohexane, *cis*-2-bromocyclohexanol
 (c) *trans*-2-Bromocyclohexanol, 1, 2-epoxyethane
 (d) *cis*-2-Bromocyclohexanol, 1, 2-epoxyethane

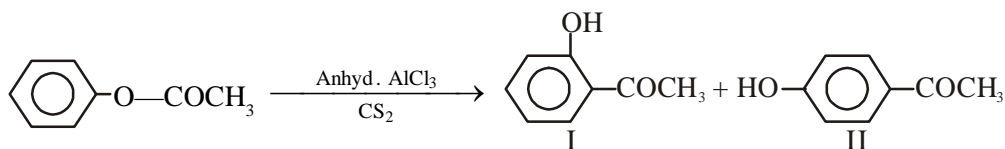
32. Which of the following ethers is cleaved even by hydrogen chloride at room temperature?

- (a) $C_6H_5 - O - CH_2CH_3$ (b) $CH_3CH_2 - O - CH_2CH_3$
 (c) $(CH_3)_3C - O - CH_2CH_3$ (d) $(CH_3)_3C - O - C(CH_3)_3$

33. The major product formed during hydroboration oxidation of 1-methylcyclopentene is

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

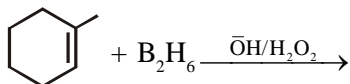
34. Choose the correct statement about the following reaction



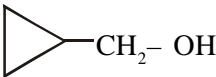
- (a) Low temperatures ($< 323 \text{ K}$) favour the formation of II
 (b) High temperatures ($> 423 \text{ K}$) favour the formation of I
 (c) I is more volatile than II
 (d) All are correct
35. A compound with molecular formula $C_4H_{10}O_3$ is converted by the action of acetyl chloride to a compound with molecular weight 190. The original compound has
- (a) One OH group (b) Two OH group (c) Three OH group (d) No OH group

MORE THAN ONE CORRECT ANSWERS TYPE

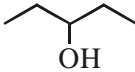
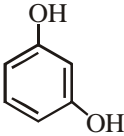
36. Choose incorrect statements regarding the following reaction.



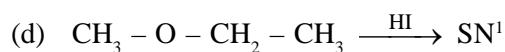
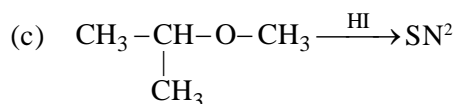
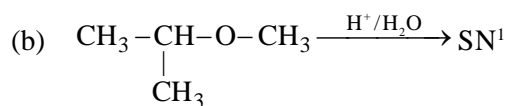
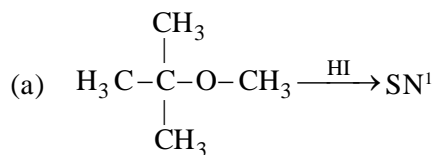
- (a) Syn-addition of $-H$ (from BH_3) and $-OH$ (from solution) occur.
 (b) Syn-addition of $-H$ (from BH_3) and $-OH$ (from H_2O_2) occur.
 (c) The product is optically active.
 (d) Addition follows anti-Markownikov's orientation.
37. Which of the following alcohols do not give white turbidity on treatment with $HCl/ZnCl_2$?

- (a) CH_3CH_2OH (b)  (c) $N \equiv C - \underset{\text{CH}_3}{\text{CH}} - OH$ (d) $CH_3 - \overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}} - OH$

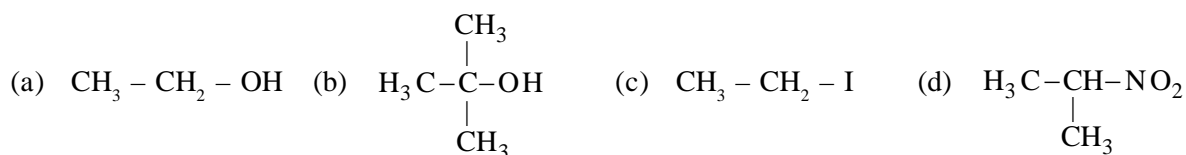
38. Which of the following will give Iodoform test?

- (a) CH_3CH_2OH (b) $H_3C - \underset{\text{OH}}{\text{CH}} - Ph$ (c)  (d) 

39. Which of the following reactions are correctly matched?



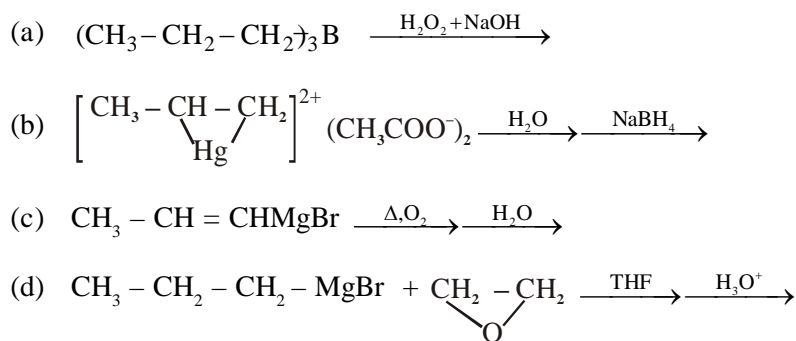
40. Which of the following compounds will give positive Victor Meyer's test?



41. Which of the following will result in the formation of an ether?

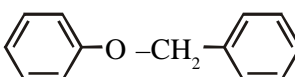


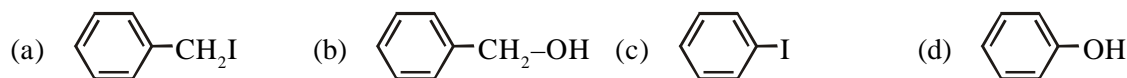
42. In which of the following reactions, alcohol will be formed as final product?

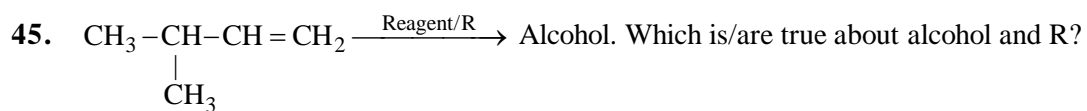


43. Select the correct statements about crown ether; 18-crown-6:

- (a) It is a cyclic polyether (b) It has total 18 atoms
 (c) It has 12 carbon atoms (d) It has 6 oxygen atoms

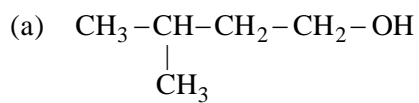
44. The ether  when treated with HI produces:



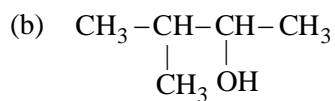


Alcohol

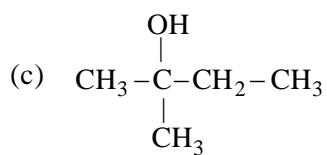
Reagent (R)



$\text{BH}_3/\text{THF}; \text{H}_2\text{O}_2/\text{OH}^-$



$\text{Hg}(\text{OAc})_2/\text{NaBH}_4-\text{H}_2\text{O}$



H_3O^+

(d) None of these

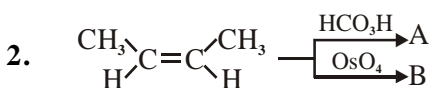
MISCELLANEOUS ASSIGNMENT

Comprehension-1

Epoxides are compounds containing three membered ring $\begin{array}{c} | \quad | \\ -\text{C}-\text{C}- \\ | \quad | \\ \text{O} \end{array}$. They are cyclic ethers but the

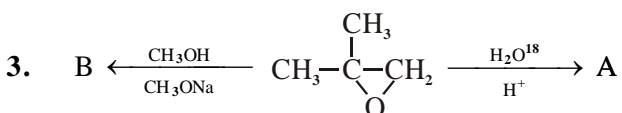
three membered ring gives them unusual properties. Epoxides are commonly made by the oxide of alkenes by peroxy compounds e.g., peroxybenzoic acid or by intramolecular nucleophilic substitution in chlorohydrins. Epoxides due to their importance to the ease of opening of the highly strained 3-membered ring, they undergo acid catalysed reactions with extreme ease and unlike ordinary ethers can even be cleaved by bases.

- The products of acidic hydrolysis and basic hydrolysis of optically active propylene oxide have
 - same optical rotation
 - opposite optical rotation
 - no optical activity due to external compensation
 - no optical activity due to internal compensation



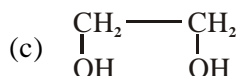
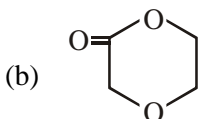
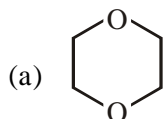
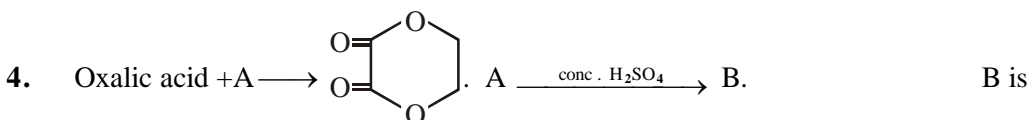
A and B have the same structural formulae but

- A is meso and B is racemic
- A is racemic and B is meso
- A and B are meso
- A and B are racemic



A and B are

- $\text{CH}_3-\overset{\text{CH}_3}{\underset{^{18}\text{OH}}{\text{C}}}-\text{CH}_2\text{OH}$; $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{OH}}{\text{C}}}-\text{CH}_2\text{OCH}_3$
- $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{OH}}{\text{C}}}-\text{CH}_2$; $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{OH}}{\text{C}}}-\text{CH}_2\text{OCH}_3$
- both (a) & (b) are correct
- none of these



(d) none of these

Comprehension-2

An organic compound (X) on treatment with CHCl_3 and KOH gives (Y) and (Z), both of which in turn give the same compound (T) when distilled with Zn . Oxidation of (T) yields (S) of formula $\text{C}_7\text{H}_6\text{O}_2$. The sodium salt of (S) with soda lime gives (P) which can also be obtained by distilling (X).

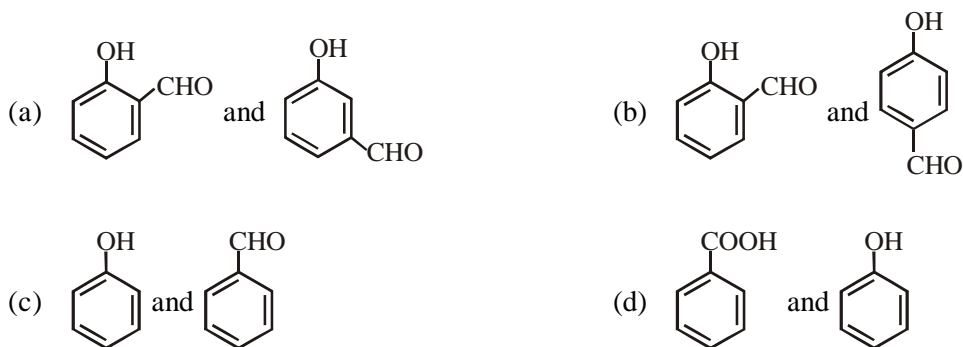
5. The molecular weight of compound (X) is

- (a) 122 (b) 94 (c) 106 (d) 78

6. The compound (T) is

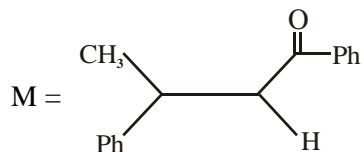


7. Compound (Y) and (Z) could be



Comprehension-3

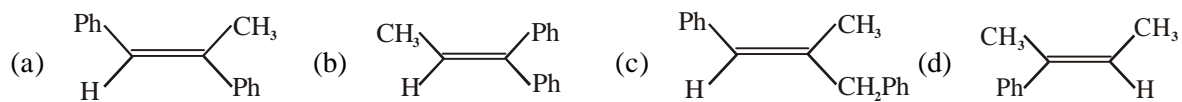
A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to the formation of compound J and K. Compound J upon reaction with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M having the following structure:



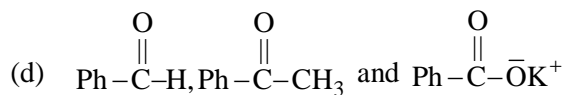
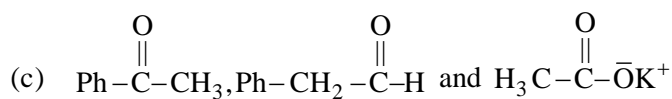
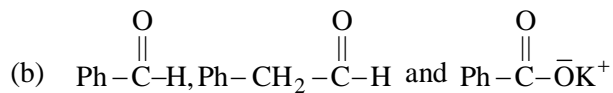
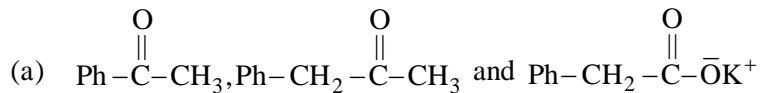
8. Compound H is formed by the reaction of



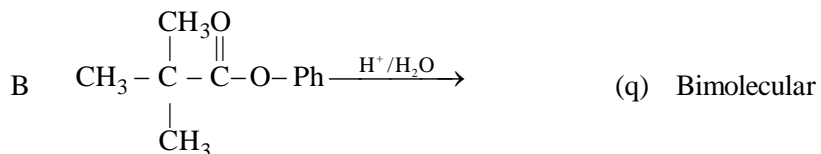
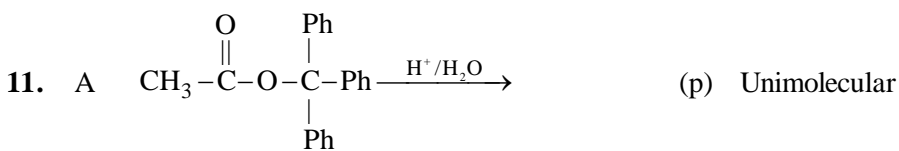
9. The structure of compound I is

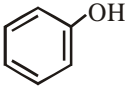


10. The structures of compound J, K and L respectively are:



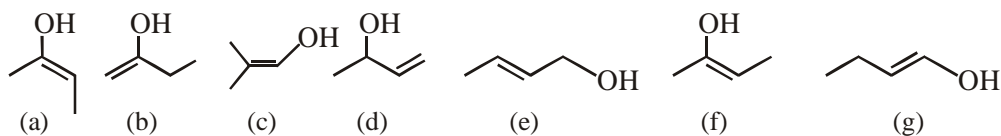
MATCH THE FOLLOWING



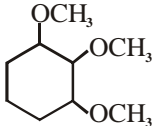
12. A  (p) White turbidity with HCl/ZnCl₂
- B CH₃ - CH₂ - OH (q) Violet colour with FeCl₃
- C. $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{OH} \\ | \\ \text{Ph} \end{array}$ (r) Colour change of Na₂Cr₂O₇, H⁺
- D. $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} - \text{OH} \\ | \\ \text{CH}_3 \end{array}$ (s) I₂/OH⁻, gives bright yellow precipitate.

INTEGER TYPE QUESTIONS

13. How many compounds (a) to (g) are en-ol tautomers of Butan-2-one



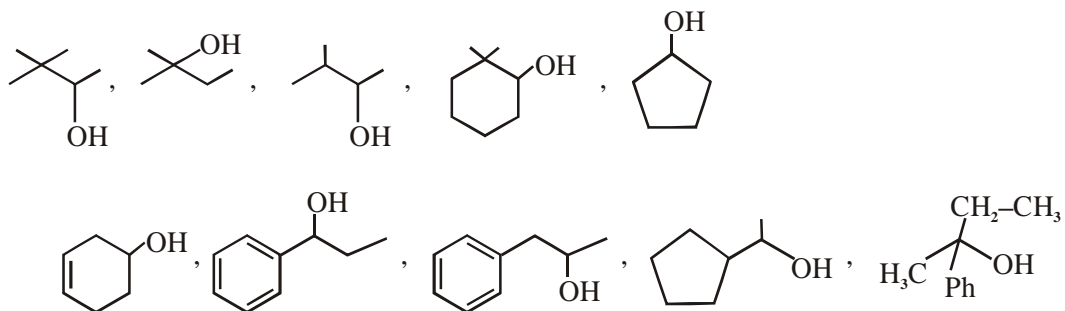
14. Find out number of moles of HIO₄ that will react with the following compound:
CHO - CH(OH) - CH(OH) - CH(OH) - CH(OH) - CH₂ - OH

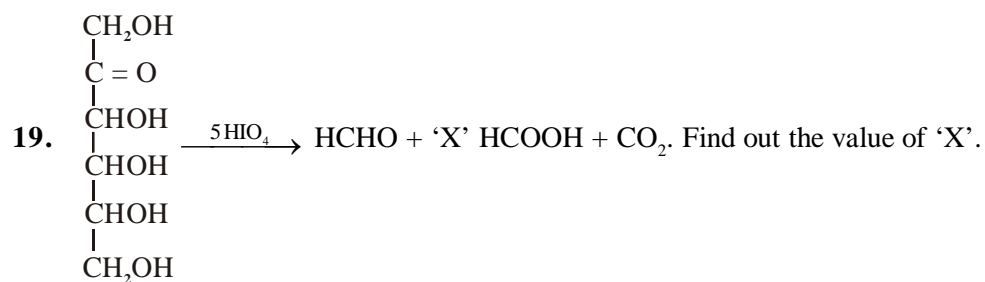
15. How many moles of HI will react with 

16. How many isomers of C₅H₁₁OH will be primary alcohol?

17. R - CH₂ - OH $\xrightarrow{?}$ R - CH₂ - Cl. Find out the number of reagents that can be used for above conversion from the following: HCl, ZnCl₂, PCl₃, PCl₅, POCl₃, SOCl₂, NaCl, TsCl.

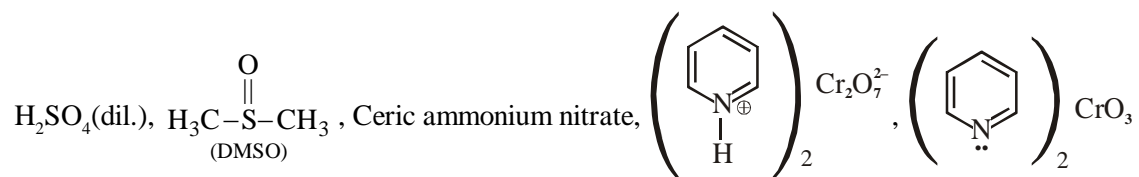
18. Identify the numbers of alcohol which will show rearrangement during dehydration with H₂SO₄(conc.)



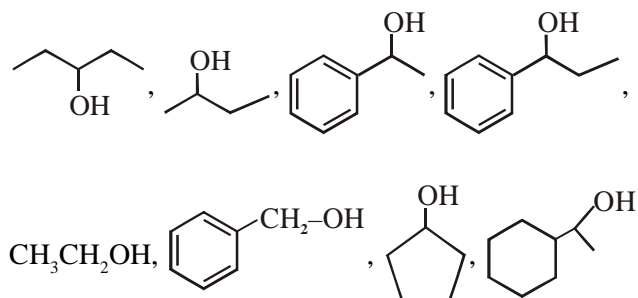


20. How many moles of HI reacts with glycerol to give 2-Iodopropane.

21. Find out the number of reagents that converts primary alcohol to aldehyde: $\text{KMnO}_4/\text{H}^+/\Delta$, $\text{K}_2\text{Cr}_2\text{O}_7/$



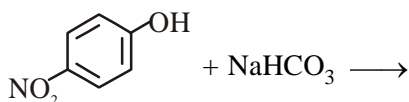
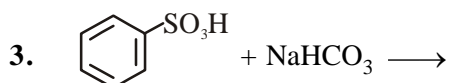
22. Find out the number of alcohols that can give positive Iodoform test:



PREVIOUS YEAR QUESTIONS

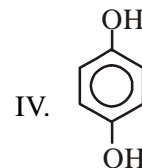
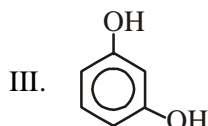
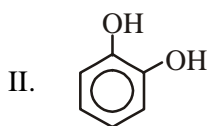
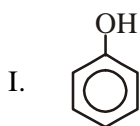
IIT-JEE/ JEE-ADVANCE QUESTIONS

1. How many optically active stereoisomers are possible for butane-2,3-diol?
(a) 1 (b) 2 (c) 3 (d) 4
2. An enantiometrically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be
(a) optically active mixture (b) pure enantiomer
(c) meso compound (d) racemic mixture



The gases produced are respectively

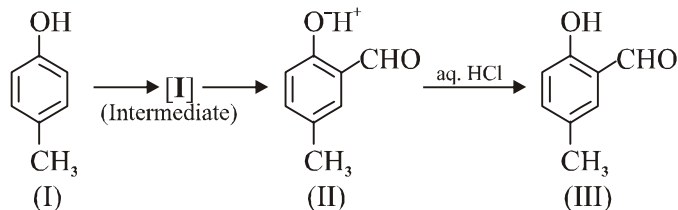
- (a) CO₂ and CO₂ (b) CO₂ and SO₂ (c) SO₂ and NO₂ (d) CO₁ and NO₁
4. The increasing order of boiling points of the following



- (a) I < IV < III < II (b) IV < III < II < I (c) I < II < III < IV (d) I < II < IV < III

Comprehension

Reimer-Tiemann reaction introduces an aldehyde group, on the aromatic ring of phenol, *ortho* to the hydroxy group. This reaction involves electrophilic aromatic substitution. This is a general method for the synthesis of substituted salicylaldehydes as depicted below.

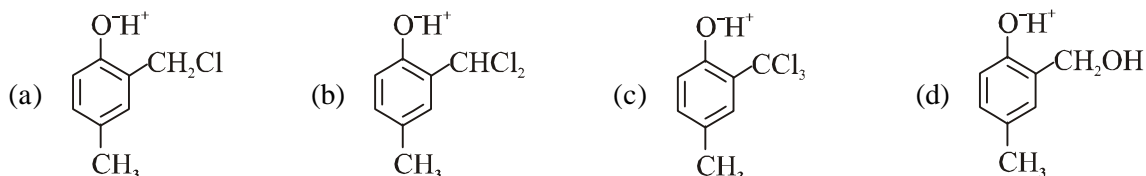


5. Which one of the following reagents is used in the above reaction?
(a) aq. NaOH + CH₃Cl (b) aq. NaOH + CH₂Cl₂
(c) aq. NaOH + CHCl₃ (d) aq. NaOH + CCl₄

6. The electrophile in this reaction is

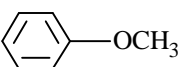
- (a) $:\text{CHCl}$ (b) $^+\text{CHCl}_2$ (c) $:\text{CCl}_2$ (d) $\cdot\text{CCl}_3$

7. The structure of the intermediate **I** is

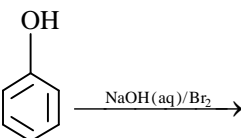


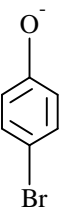
8. The correct statement(s) about the compound $\text{H}_3\text{C}/(\text{HO})\text{HC} - \text{CH} = \text{CH} - \text{CH}(\text{OH})\text{CH}_3$ (**X**) is(are)

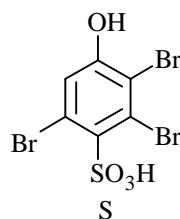
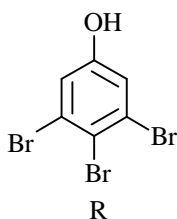
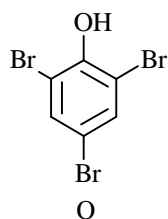
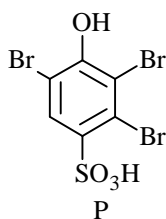
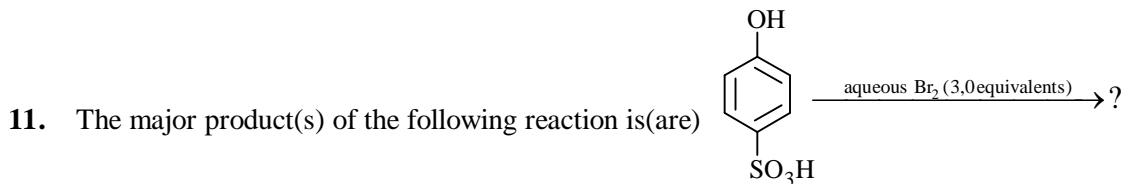
- (a) The total number of stereoisomers possible for **X** is 6
(b) The total number of diastereomers possible for **X** is 3
(c) If the stereochemistry about the double bond in **X** is *trans*, the number of enantiomers possible for **X** is 4
(d) If the stereochemistry about the double bond in **X** is *cis*, the number of enantiomers possible for **X** is 2.

9. In the reaction  $\xrightarrow{\text{HBr}}$ the product are

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

10. In the reaction  $\xrightarrow{\text{NaOH(aq)/Br}_2}$ the intermediate is(are)

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



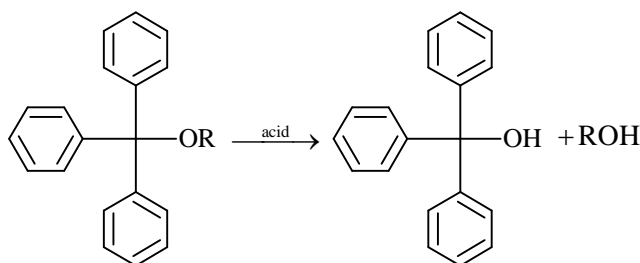
(A) P

(B) Q

(C) R

(D) S

12. The acidic hydrolysis of ether (X) shown below is fastest when



- (a) one phenyl group is replaced by a methyl group.
 (b) one phenyl group is replaced by a *para*-methoxyphenyl group.
 (c) two phenyl groups are replaced by two *para*-methoxyphenyl groups
 (d) no structural change is made to **X**.

DCE QUESTIONS

- Dynamite is prepared by mixing nitroglycerine with

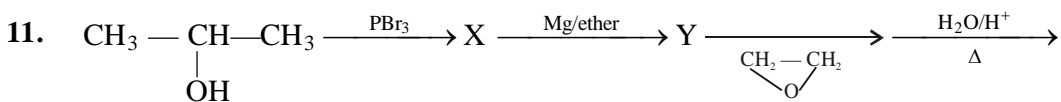
(a) Saw dust and NH_4NO_3	(b) Cellulose nitrate
(c) Cellulose nitrate and vaseline	(d) T.N.T.
- In its reaction with sodium, 1 mol of a compound X gives 1 mol of H_2 . When one of the following compounds might be X?

(a) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}$	(b) $\text{CH}_3\text{COOCH}_2\text{CH}_3$
(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	(d) $\text{CH}_2\text{OHCH}_2\text{CH}_2\text{CH}_2\text{OH}$
- Which one of the following cannot be obtained from a mixture of ethanol and concentrated sulphuric acid, if the composition of the mixture and the reaction conditions are suitably adjusted?

(a) C_2H_4	(b) CH_3CHO	(c) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$	(d) $\text{CH}_3\text{CH}_2\text{HSO}_4$
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- $\text{CH}_2=\text{CH}_2 \xrightarrow[\text{Ag}]{\text{O}_2} \text{X} \xrightarrow[473\text{K}]{\text{Steam}} \text{Y}$. The compound Y is

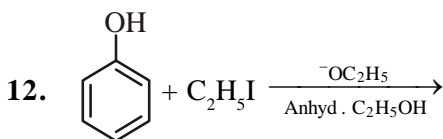
(a) Ethanol	(b) Ethanal	(c) Epoxyethane	(d) Ethylene glycol
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5. To prepare 3-ethylpentan-3-ol, the reagents needed are
- (a) $\text{CH}_3\text{CH}_2\text{MgBr} + \text{CH}_3\text{COCH}_2\text{CH}_3$ (b) $\text{CH}_3\text{MgBr} + \text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_2\text{CH}_3$
 (c) $\text{CH}_3\text{CH}_2\text{MgBr} + \text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$ (d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr} + \text{CH}_3\text{COCH}_2\text{CH}_3$
6. When phenol is treated with excess bromine water, it gives
- (a) *m*-Bromophenol (b) *o*- and *p*-Bromophenols
 (c) 2, 4-Dibromophenol (d) 2, 4, 6-Tribromophenol
7. Epichlorohydrin is
- (a) 3-Chloropropane (b) 3-Chloropropan-1-ol
 (c) 3-Chloro-1, 2-epoxypropane (d) none of these
8. Oxymercuration-demercuration reaction of 1-methylcyclohexene gives
- (a) *cis*-2-Methylcyclohexanol (b) *trans*-2-Methyl cyclohexanol
 (c) 1-Methylcyclohexanol (d) Mixture of *cis*- & *trans*-2-methylcyclohexanol
9. Which of the following is most acidic?
- (a) *p*-Nitrophenol (b) *o*-Cresol (c) Phenol (d) Anisole
10. The molecule with maximum boiling point is
- (a) $\text{CH}_3\text{—CHOH—CH}_3$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
 (c) $\text{CH}_3\text{—CHOH—CH}_2\text{CH}_2\text{OH}$ (d) $\text{CH}_3\text{—CHCl—CH}_3$



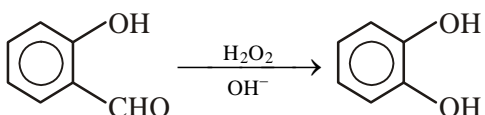
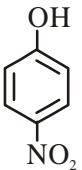
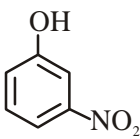
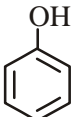

The final product is

- (a) $\text{CH}_3\text{—}\underset{\text{CH}_3}{\text{CH}}\text{—CH}_2\text{CH}_2\text{OH}$ (b) $\text{CH}_3\text{—O—}\underset{\text{CH}_3}{\text{CH}}\text{CH}_2\text{CH}_3$
 (c) $\text{CH}_3\text{—}\underset{\text{CH}_3}{\text{CH}}\text{—O—CH}_2\text{—CH}_3$ (d) $\text{CH}_3\text{CH}_2\text{—}\underset{\text{CH}_3}{\text{CH}}\text{—CH}_2\text{OH}$

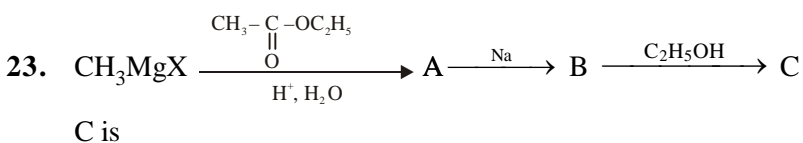


- (a) $\text{C}_6\text{H}_5\text{OC}_2\text{H}_5$ (b) $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$ (c) $\text{C}_6\text{H}_5\text{OC}_6\text{H}_5$ (d) $\text{C}_6\text{H}_5\text{I}$

13. In fermentation by zymase, ethyl alcohol and carbon dioxide are produced from which of the following sugars?
- (a) Glucose (b) Invert sugar (c) Fructose (d) all of these

14. . This reaction is called
- (a) Reimer-Tiemann reaction (b) Liebermann's nitroso reaction
(c) Dakin reaction (d) Leader-Manase reaction
15. Phenol of reaction with CHCl_3 and NaOH give Benzaldehyde intermediate of of this reaction is
- (a) carbocation (b) carbonion (c) radical (d) carbene
16. Which of the following is having maximum acidic strength
- (a)  (b)  (c)  (d) 
17. $\text{C}_2\text{H}_5\text{OH}$ and $\text{C}_6\text{H}_5\text{OH}$ can be distinguished by
- (a) $\text{Br}_2 + \text{H}_2\text{O}$ (b) FeCl_3 (c) $\text{Br}_2 + \text{NaOH}$ (d) both (b) and (c)
18. Write the IUPAC name of $\text{CH}_3 - \text{O} - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2 - \text{CH}_3$
- (a) 3-methoxy butane (b) 2-methoxy butane
(c) 3-methyl-3-methoxy propane (d) butoxy methane
19. Which of the following is not formed when glycerol reacts with HI ?
- (a) $\text{CH}_2 = \text{CH} - \text{CH}_2\text{I}$ (b) $\text{CH}_2\text{OH} - \text{CHI} - \text{CH}_2\text{OH}$
(c) $\text{CH}_3 - \text{CH} = \text{CH}_2$ (d) $\text{CH}_3 - \text{CHI} - \text{CH}_3$
20. Which of the following cannot be made by using Williamson's synthesis?
- (a) Methoxybenzene (b) Benzyl p-nitrophenyl ether
(c) Methyl tertiary butyl ether (d) Di-tert. butyl ether
21. The reagent required to convert propene to 1-propanol is
- (a) B_2H_6 followed by $\text{H}_2\text{O}_2/\text{NaOH}$
(b) Conc. H_2SO_4 followed by hydrolysis with boiling water
(c) HBr followed by hydrolysis with aqueous KOH
(d) $\text{Hg}(\text{OCOCH}_3)_2$ followed by reduction with NaBH_4

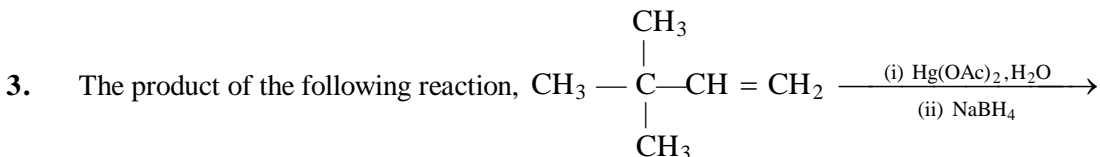
22. The end product (B) in the following reaction sequence is $\text{CH}_3\text{OH} \xrightarrow[300^\circ\text{C}]{\text{Cu}} \text{A} \xrightarrow{\text{NaOH}} \text{B}$
- (a) Alkane (b) Carboxylic acid
(c) Sodium salt of carboxylic acid (d) Ketone



- (a) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ (b) $(\text{CH}_3)_3\text{C}-\text{O}-\text{C}_2\text{H}_5$ (c) $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$ (d) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OC}_2\text{H}_5$

AIEEE/JEE-MAINS QUESTIONS

1. The reaction of $\text{CH}_3-\text{CH}=\text{CH}-\text{C}_6\text{H}_4-\text{OH}$ with HBr gives
- (a) $\text{CH}_3\text{CHBrCH}_2-\text{C}_6\text{H}_4-\text{OH}$ (b) $\text{CH}_3\text{CH}_2\text{CHBr}-\text{C}_6\text{H}_4-\text{OH}$
(c) $\text{CH}_3\text{CHBrCH}_2-\text{C}_6\text{H}_4-\text{Br}$ (d) $\text{CH}_3\text{CH}_2\text{CHBr}-\text{C}_6\text{H}_4-\text{Br}$
2. The reaction of an aromatic acyl chloride and phenol in the presence of a base such as NaOH or pyridine is called
- (a) Kolbe reaction (b) Perkin reaction
(c) Sandmeyer reaction (d) Schotten-Baumann reaction


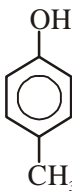



- (a) $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}-\underset{\text{OH}}{\text{CH}}-\text{CH}_3$ (b) $\text{CH}_3-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}-\text{CH}_2-\text{CH}_2\text{OH}$
(c) $\text{CH}_3-\overset{\text{OH}}{\underset{\text{CH}_3}{\text{C}}}-\underset{\text{CH}_3}{\text{CH}}-\text{CH}_3$ (d) $\text{HOCH}_2-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{C}}}-\text{CH}_2\text{CH}_3$

4. Which of the following fact(s) explain(s) as to why *p*-nitrophenol is more acidic than phenol?
- I. -I-Effect of nitro group II. Greater resonance effect of *p*-nitrophenoxy group
III. Steric effect of bulky nitro group

Select the correct answer using the codes given below:

- (a) I and II (b) I and III (c) II and III (d) II alone

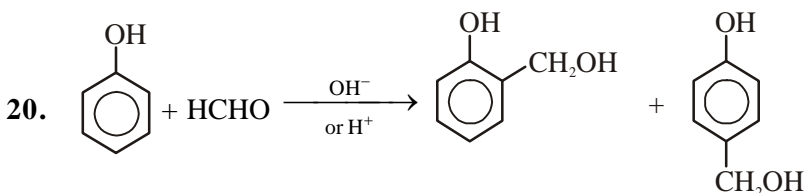
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5. The alcohol which does not give a stable compound on dehydration is
(a) Ethyl alcohol (b) Methyl alcohol (c) *n*-Propyl alcohol (d) *n*-Butyl alcohol
6. What amount of bromine will be required to convert 2 g of phenol into 2, 4, 6-tribromophenol?
(a) 4.0 (b) 6.0 (c) 10.22 (d) 20.44
7. *tert*-Butyl methyl ether on heating with HI of one molar concentration gives
(a) $\text{CH}_3\text{OH} + (\text{CH}_3)_3\text{CI}$ (b) $\text{CH}_3\text{I} + (\text{CH}_3)_3\text{COH}$
(c) $\text{CH}_3\text{I} + (\text{CH}_3)_3\text{CI}$ (d) none of these
8. The reaction of elemental sulphur with Grignard reagent followed by acidification leads to the formation of
(a) Mercaptan (b) Sulphoxide (c) Thioether (d) Sulphonic acid
9. Osmium tetroxide is a reagent used for
(a) Hydroxylation of acetylenes (b) Hydroxylation of olefins to give *cis*-diols
(c) Hydroxylation of olefins to form *trans*-diols
(d) Hydroxylation of carbonyl compounds
10. 3 moles of ethanol react with one mole of phosphorus tribromide to form 3 moles of bromoethane and one mole of X. Which of the following is X?
(a) H_3PO_4 (b) H_3PO_2 (c) HPO_3 (d) H_3PO_3
11. The correct acidic order of the following is
- I.  II.  III. 
- (a) I > II > III (b) III > I > II (c) II > III > I (d) I > III > II
12. During dehydration of alcohols to alkenes by heating with conc. H_2SO_4 , the initiation step is
(a) formation of an ester (b) protonation of alcohol molecule
(c) formation of carbocation (d) elimination of water
13. An ether is more volatile than alcohol having the same molecular formula. This is due to
(a) intermolecular hydrogen bonding in alcohols
(b) dipolar character of ethers
(c) alcohols having resonance structures
(d) intermolecular hydrogen bonding in ethers
-

14. Glycerol is treated with excess of HI at room temperature and then with more HI at 423 K. The final product obtained is
 (a) Allyl iodide (b) Isopropyl iodide (c) Propene (d) Propane
15. Which of the following alcohols can be prepared by the action of Grignard reagent with aldehydes?
 (a) 1° & 2° alcohols (b) 2° & 3° alcohols
 (c) only 1° alcohols (d) only 2° alcohols

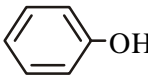
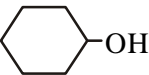
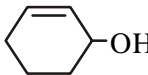

16. The major product of the following reaction $C_6H_5CH = CHCH_3 \xrightarrow[(ii) NaBH_4]{(i) Hg(OAc)_2, THF-H_2O}$ is



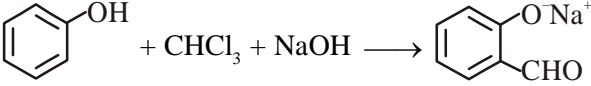
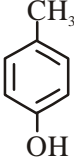
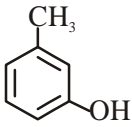
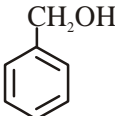
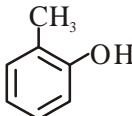
17. Claisen rearrangement of allyl phenyl ether gives a mixture of
 (a) *o*-, *m*- and *p*-Allylphenols (b) *o*- and *m*-Allylphenols
 (c) *m*- and *p*-Allylphenol (d) *o*- and *p*-Allylphenols
18. An organic compound with molecular formula, C_7H_8O dissolves in NaOH and gives a characteristic colour with $FeCl_3$. On treatment with bromine, it gives a tribromo derivative, $C_7H_5OBr_3$. The compound is
 (a) Benzyl alcohol (b) *o*-Cresol (c) *m*-Cresol (d) *p*-Cresol
19. A compound with molecular formula $C_4H_{10}O_3$ is converted by the action of acetyl chloride to a compound with molecular weight 190. The original compound has
 (a) One OH group (b) Two OH group (c) Three OH group (d) No OH group



This reaction is called

- (a) Reimer-Tiemann reaction (b) Lederer-Manasse reaction
 (c) Sandmeyer reaction (d) Kolbe's reaction
21. Dehydration of the following in increasing order is
 I.  II.  III.  IV. 
- (a) I < II < III < IV (b) II < III < IV < I (c) I < III < II < IV (d) I < IV < II = III

22. The final product B in the following reaction $CH_3CH_2CH = CH_2 \xrightarrow[(C_6H_5CO_2)_2]{NBS, h\nu} A \xrightarrow[CH_3OH]{CH_3SNa} B$ is
 (a) Methyl 1-methylallyl sulphide (b) Allyl methyl sulphide
 (c) *n*-Butyl methyl sulphide (d) Diallyl sulphide

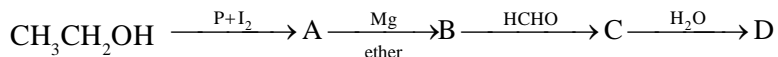
23. Identify X in the sequence: $\text{C}_3\text{H}_8\text{O} \xrightarrow[\text{H}_2\text{SO}_4]{\text{K}_2\text{Cr}_2\text{O}_7} \text{C}_3\text{H}_6\text{O} \xrightarrow[\text{warm}]{\text{I}_2 + \text{NaOH}} \text{CHI}_3$
 (a) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{OH}$ (b) $\text{CH}_3 - \text{CHOH} - \text{CH}_3$
 (c) $\text{CH}_3 - \text{O} - \text{CH}_2 - \text{CH}_3$ (d) $\text{CH}_3 - \text{CH}_2 - \text{CHO}$
24. Among the following the one that gives positive iodoform test upon reaction with I_2 and NaOH is
 (a) PhCHOHCH_3 (b) $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$
 (c) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{OH}$ (d) $\text{CH}_3 - \overset{\text{CH}_3}{\underset{|}{\text{C}}}\text{HCH}_2\text{OH}$
25. Increasing order of stability among the three main conformations (*i.e.* Eclipse, Anti, Gauche) of 2-fluoroethanol is
 (a) Anti, Gauche, Eclipse (b) Eclipse, Gauche, Anti
 (c) Gauche, Eclipse, Anti (d) Eclipse, Anti, Gauche
26. . The electrophile involved in the above reaction is
 (a) formyl cation ($\overset{\oplus}{\text{C}}\text{HO}$) (b) dichloromethyl cation ($\overset{\oplus}{\text{C}}\text{HCl}_2$)
 (c) dichlorocarbene ($:\text{CCl}_2$) (d) trichloromethyl anion ($\overset{\ominus}{\text{C}}\text{Cl}_3$)
27. The structure of the compound that gives a tribromo derivative on treatment with bromine water is
 (a)  (b)  (c)  (d) 
28. Which of the following hydrogen bonds is the strongest?
 (a) $\text{O} - \text{H} \dots \text{O}$ (b) $\text{O} - \text{H} \dots \text{F}$ (c) $\text{O} - \text{H} \dots \text{N}$ (d) $\text{F} - \text{H} \dots \text{F}$
29. In the following sequence of reactions,

$$\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{P} + \text{I}_2} \text{A} \xrightarrow[\text{ether}]{\text{Mg}} \text{B} \xrightarrow{\text{HCHO}} \text{C} \xrightarrow{\text{H}_2\text{O}} \text{D}$$

 the compound 'D' is
 (a) *n*-propyl alcohol (b) propanal (c) butanal (d) *n*-butyl alcohol
30. Among the following compounds, strongest acid is
 (a) $\text{HC} \equiv \text{CH}$ (b) C_6H_6 (c) C_2H_6 (d) CH_3OH
31. The reaction of CH_3MgBr with acetone and hydrolysis of the resulting product gives
 (a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 (c) $(\text{CH}_3)_2\text{CHOH}$ (d) $(\text{CH}_3)_3\text{COH}$

32. Identify X in the following sequence of reactions: $X \xrightarrow[\text{(ii) H}^+/\text{H}_2\text{O}]{\text{(i) CH}_3\text{MgX}} \text{C}_5\text{H}_{12}\text{O} \xrightarrow[573 \text{ K}]{\text{Cu}} \text{C}_5\text{H}_{10}$
- (a) $\text{CH}_3\text{COCH}_2\text{CH}_3$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
 (c) $(\text{CH}_3)_2\text{CHCHO}$ (d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

33. In the following sequence of reactions,

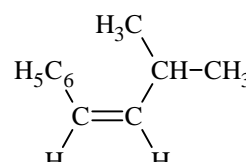
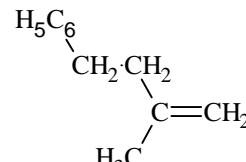
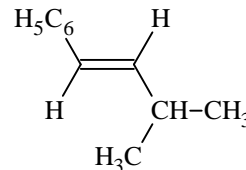
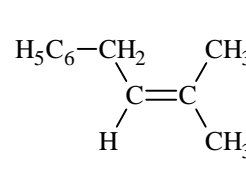


the compound 'D' is

- (a) *n*-propyl alcohol (b) propanal (c) butanal (d) *n*-butyl alcohol
34. Phenol, when it first reacts with concentrated sulphuric acid and then with concentrated nitric acid, gives
- (a) *o*-nitrophenol (b) *p*-nitrophenol
 (c) nitrobenzene (d) 2,4,6-trinitrobenzene
35. The major product obtained on interaction of phenol with sodium hydroxide and carbon dioxide is:
- (a) Salicylaldehyde (b) salicylic acid (c) phthalic acid (d) benzoic acid

36. The main product of the following reaction



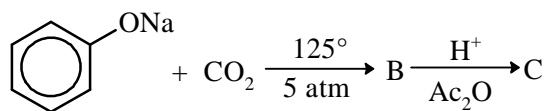
- (a) 
- (b) 
- (c) 
- (d) 

37. Phenol is heated with a solution of mixture of KBr and KBrO_3 . The major product obtained in the above reaction is:
- (a) 2-Bromophenol (b) 3-Bromophenol
 (c) 4-Bromophenol (d) 2,4,6-Tribromophenol
38. Which of the following reagents may be used to distinguish between phenol and benzoic acid?
- (a) Aqueous NaOH (b) Tollen's reagent (c) Molisch reagent (d) Neutral FeCl_3
39. Aspirin is known as:
- (a) Acetyl salicylic acid (b) Phenyl salicylate
 (c) Acetyl salicylate (d) Methyl salicylic acid

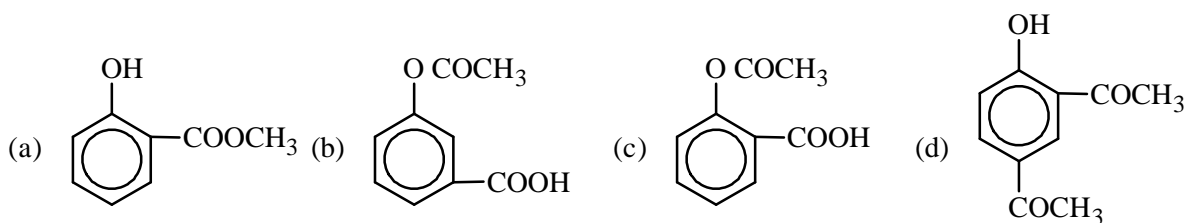
40. Ortho-Nitrophenol is less soluble in water than *p*- and *m*-Nitrophenols because

- (a) o-Nitrophenol is more volatile in steam than those of m - and p-isomers
- (b) o-Nitrophenol shows Intramolecular H-bonding
- (c) o-Nitrophenol shows Intermolecular H-bonding
- (d) Melting point of o-Nitrophenol is lower than those of m- and p-isomers

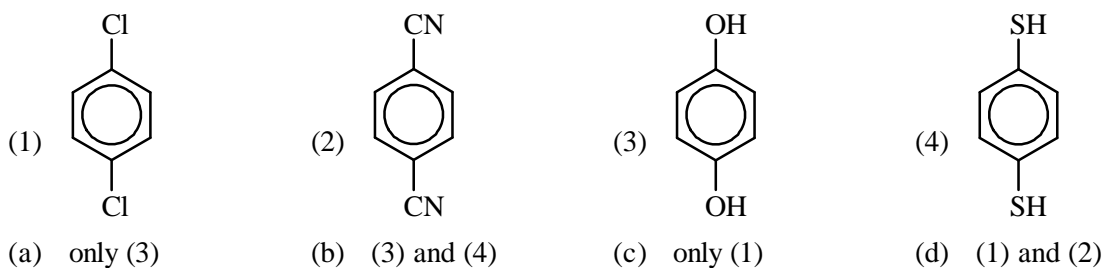
41. Sodium phenoxide when heated with CO_2 under pressure at 125°C yields a product which on acetylation produces C.



The major product C would be



42. For which of the following molecule significant $\mu \neq 0$?



SUBJECTIVE PROBLEMS

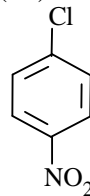
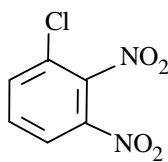
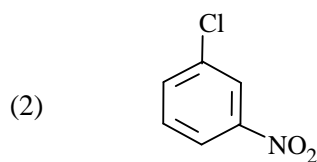
1. Arrange the following as mentioned.

(1) $C_6H_5CH_2CH_2Br$, $C_6H_5CH(Br)CH_3$ and $C_6H_5CH=CH-Br$ (Reactivity with $AgNO_3$)

(I)

(II)

(III)



(Reactivity with $NaOEt$)

(I)

(II)

(III)

(3) H_2O , OH^- , CH_3O^- and CH_3COO^- (Nucleophilicity rate of SN^2 reaction)

(I)

(II)

(III)

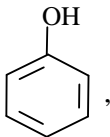
(IV)

(4) CH_3COO^- , $C_6H_5O^-$, $C_6H_5SO_3^-$ (Leaving group ability)

(I)

(II)

(III)

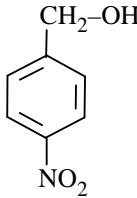
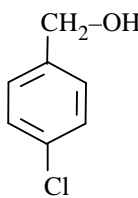
(5) , C_2H_5OH , $HCOOH$, CH_3COOH (Acidic strength)

(I)

(II)

(III)

(IV)

(6) $C_6H_5CH_2OH$, $(C_6H_5)_2CHOH$, $(C_6H_5)_3COH$, , 

(I)

(II)

(III)

(IV)

(V)

(Reactivity with HBr decreasing order)

(7) Phenol, o -Chlorophenol, m -Chlorophenol, p -Chlorophenol (Decreasing acidic character)

(I)

(II)

(III)

(IV)

(8) $CH_3CH_2CH_2CH_2-OH$, $CH_3CH(OH)CH_3$, $(CH_3)_2C(OH)C_2H_5$ (Decreasing order of reactivity for esterification)

(I)

(II)

(III)

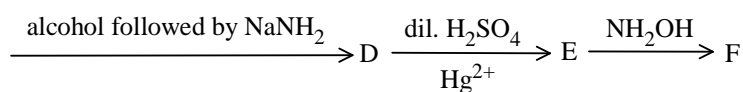
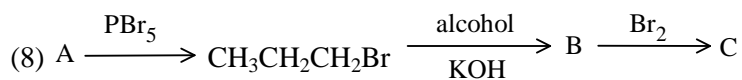
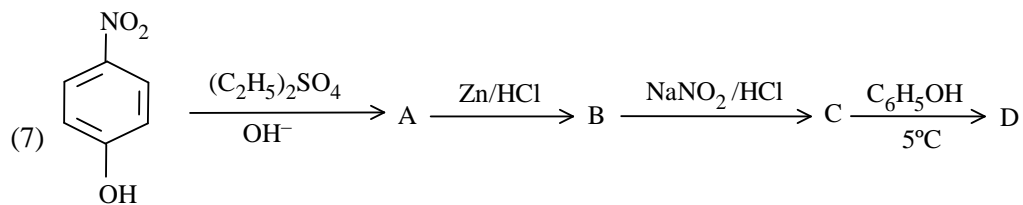
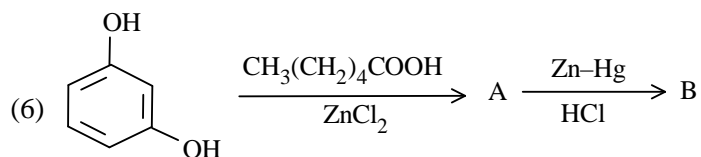
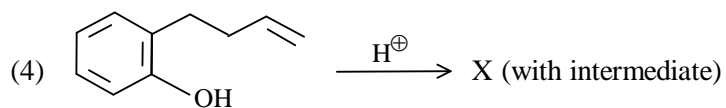
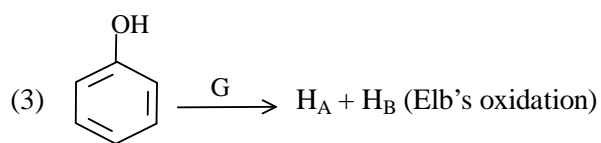
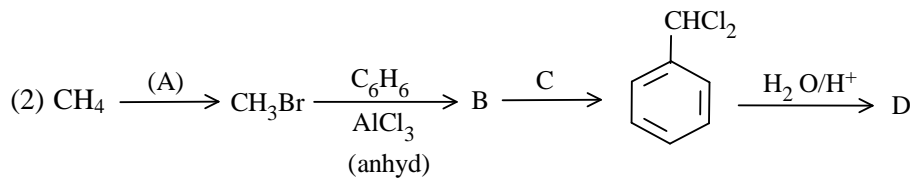
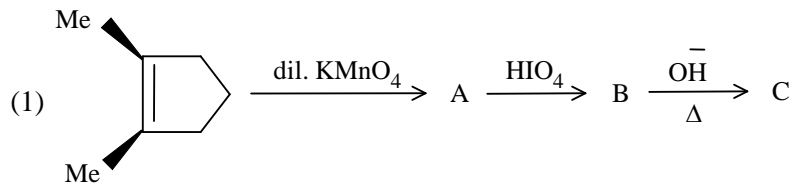
(9) $CH_3CH_2CH_2Cl + I^- \longrightarrow$ [Classify as SN^1 , SN^2 , E_1 or E_2]

(10) $(CH_3)_3CBr + CN^-(alc) \longrightarrow$ [Classify as SN^1 , SN^2 , E^1 , E^2]

(11) $CH_3CH(Br)CH_3 + OH^- \longrightarrow$ [Classify as SN^1 , SN^2 , E^1 or E^2]

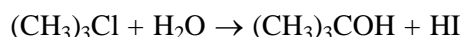
(12) t -Butyl chloride, sec -butyl chloride and CCl_4 with alc silver nitrate.

2. Identify the products A, B, C, D etc.



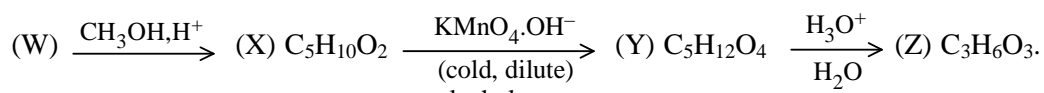
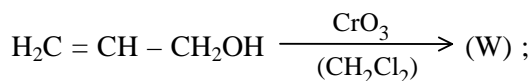
3. Explain the following giving reasons (equations wherever necessary)

- (1) Sodium metal can be used for drying diethyl ether and benzene but not ethanol.
- (2) The boiling point of the three alcohols lie in the order : n-Butyl alcohol > sec-Butyl alcohol > tert-Butyl alcohol.
- (3) No esterification takes place between ethyl alcohol and excess of sulphuric acid at 170°C.
- (4) Sodium chloride solution in water is added to decrease the solubility of organic compounds in water.
- (5) Acid catalysed dehydration of t-butanol is faster than that of n-butanol.
- (6) Alcohols cannot be used as solvent with Grignard reagents or with LiAlH₄.
- (7) Phenols are more acidic than alcohols.
- (8) Alkylation of PhO⁻ with an active alkyl halide such as CH₂ = CHCH₂Cl gives phenylallyl ether and also some o-allyl phenol.
- (9) Although phenoxide ion has more number of resonating structures than benzoate ion, benzoic acid is a stronger acid than phenol.
- (10) Although n-alcohol and acetic acid both have the same molecular mass (60), the former boils at a lower temperature (97°) than the latter (118°C).
- (11) Dry gaseous hydrohalic acids and not their aqueous solutions are used to prepare alkyl halides from alkenes.
- (12) Isobutene gas dissolves in 63% H₂SO₄ to form a deliquescent white solid. If the H₂SO₄ solution is diluted with water and heated, the organic compound obtained is a liquid boiling at 83°C.
- (13) tert-Butyl iodide undergoes following reactions.



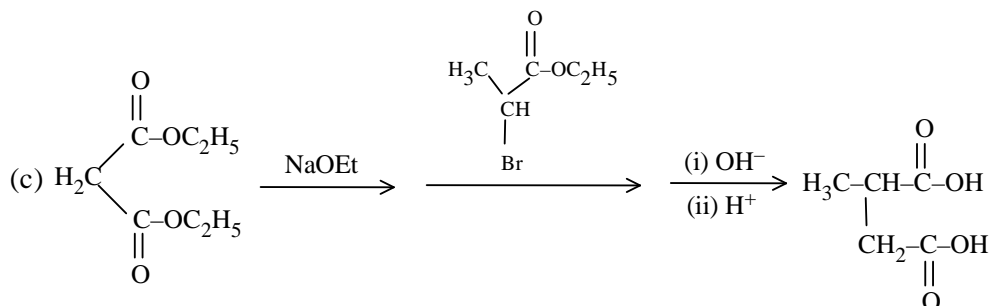
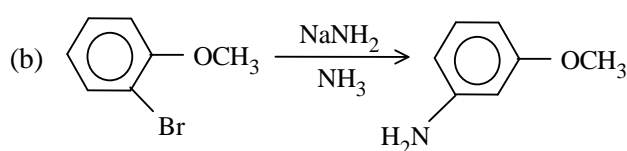
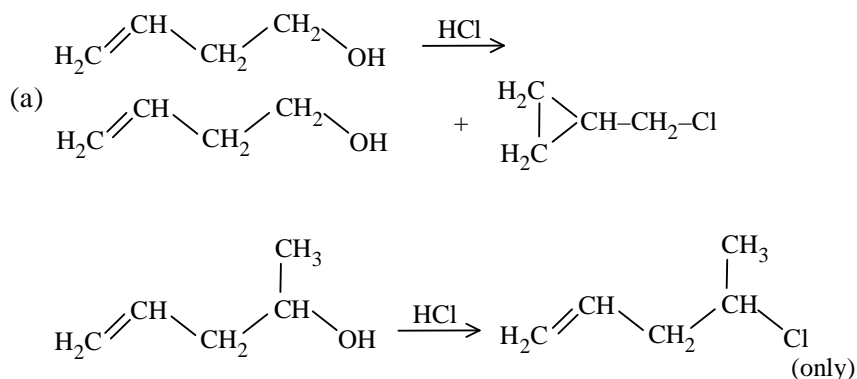
- (14) CH₃CH₂I undergoes loss of HI with strong base faster than CD₃CH₂I for loss of DI
 - (15) The carbocation is F₃C – C⁺ is destabilized while the carbocation Me₃C⁺ is stabilized.
 - (16) *p*-Dihalobenzenes have higher melting points and lower solubilities than that of their *o*- and *m*-isomers.
 - (17) Iodoform gives precipitate with silver nitrate on heating, while chloroform does not.
 - (18) Ethyl iodide becomes violet on standing in presence of light.
 - (19) When 2-Chloro-3-Methylbutane is treated with alcoholic potash, 2-Methyl-2-butene is the main product.
4. What happens when (Give equations also)
- (1) Ethylidene bromide is hydrolysed with aq. potassium hydroxide.
 - (2) Chloral is treated with aqueous sodium hydroxide.
 - (3) Chloroform is boiled with aqueous potassium hydroxide.
 - (4) Phenol is treated with carbon tetrachloride in presence of excess of alkali.
-

-
- (5) Propene is heated with chlorine at about 400°C under a pressure of 70 atmospheres.
 - (6) Silver acetate is treated with bromine.
 - (7) Carbon tetrachloride is treated with hydrogen fluoride in presence of antimony fluoride.
 - (8) 2-Butanol is treated with acidified potassium dichromate.
 - (9) Diethyl ether is heated with sulphuric acid under pressure.
 - (10) Excess of ethanol is heated with concentrated sulphuric acid at 140°C.
 - (11) Diethyl ether is heated with concentrated sulphuric acid.
 - (12) Diethyl ether is treated with concentrated sulphuric acid at 0°C.
 - (13) Phenol is treated with excess of bromine water.
5. Tert. butyl iodide forms tert. butyl alcohol with water but with OH⁻ yields Isobutylene. Explain.
 6. Why S_N¹ reaction proceeds faster in methanol than in C₆H₆ ?
 7. Why does aqueous sodium bicarbonate solution dissolve carboxylic acids but not phenols though they are also acidic ?
 8. What is the function of ZnCl₂ in Lucas reagent employed in the reaction of alcohols ?
 9. Dehydration of alcohols to alkenes is always carried out in the presence of conc. H₂SO₄ and not with conc. HCl or HNO₃.
 10. Give structures of (W), (X), (Y) and (Z) in the following reactions :

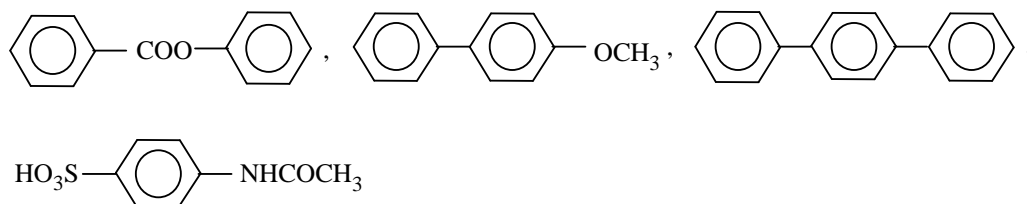


11. An organic compound (A), C₉H₁₂O was subjected to a series of tests in the laboratory. It was found that this compound :
 - (i) Rotates the plane polarised light.
 - (ii) Evolves hydrogen gas with sodium.
 - (iii) Reacts with I₂ and NaOH to produce a pale yellow solid compound.
 - (iv) Does not react with Br₂/CCl₄.
 - (v) Reacts with hot KMnO₄ to form compound (B), C₇H₆O₂ which can also be synthesized by the reaction of benzene and carbonyl chloride followed by hydrolysis.
 - (vi) Loses optical activity as a result of formation of compound (C) on being heated with HI and P.
 - (vii) Reacts with Lucas reagent in about 5 minutes.
 Give structures of A to C with proper reasoning and draw Fischer projection for (A). Give reactions for the steps wherever possible.
-

12. Compound (A), C_4H_8O , on catalytic hydrogenation gave (B) $C_4H_{10}O$. Compound (A) decolourised Br_2 in CCl_4 and cold aqueous $KMnO_4$ solution. On refluxing, (B) with HBr , compound (C) is formed. (C), on treatment with Mg in dry ether followed by hydrolysis, gave a hydrocarbon gas weighing 1.5 g per 1.12 litres at S.T.P. Give structure of (A).
13. Explain briefly the formation of products giving the structure of the intermediates.

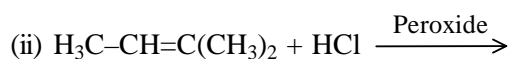
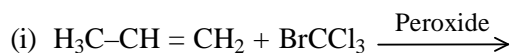


14. (a) An organic compound C_8H_{18} on monochlorination gives a single monochloride. Write the structure of the hydrocarbon.
- (b) Write the structures of possible major monosubstituted products formed when Br^+ attacks the following molecules.

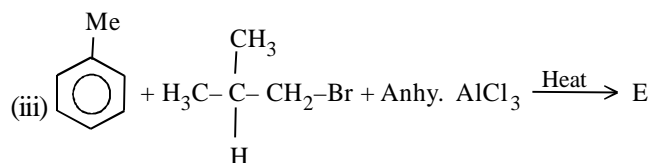
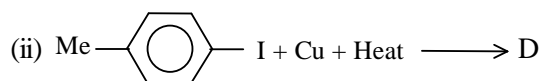
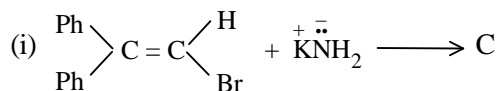
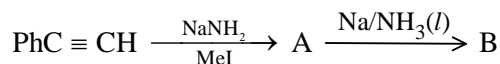


15. Cyclobutyl bromide on treatment with magnesium in dry ether forms an organometallic compound A. The organometallic reacts with ethanal to give an alcohol B after mild acidification. Prolonged treatment of alcohol B with an equivalent amount of HBr gives 1-Bromo-1-Methylcyclopentane (C). Write the structures of A, B and explain how C is obtained from B.

16. Write the products in the following reactions



17. Write down the structures for A, B, C, D and F.



18. Dehydrobromination of compounds (A) and (B) yield the same alkene (C). Alkene (C) can regenerate (A) and (B) by addition of HBr in the presence and absence of peroxide respectively. Hydrolysis of (A) and (B) give isomeric products (D) and (E) respectively. 1, 1-Diphenylethane is obtained on the reaction of (C) with benzene in the presence of H^+ . Give structures of (A) to (E) with reasons.

19. Compound A, $\text{C}_8\text{H}_8\text{O}$ can be oxidised with KMnO_4 to B having molecular formula $\text{C}_8\text{H}_6\text{O}_4$. Compound B is dicarboxylic acid, but does not form anhydride on heating. B when treated with bromine in presence of iron, gives only one monoderivative C, $\text{C}_8\text{H}_5\text{BrO}_4$. Give the structural formula of A, B and C.

ANSWERS

Objectives

- | | | | | |
|-----------|-------------|---------------|-------------|-------------|
| 1. (a) | 2. (b) | 3. (b) | 4. (b) | 5. (d) |
| 6. (d) | 7. (d) | 8. (c) | 9. (b) | 10. (a) |
| 11. (a) | 12. (c) | 13. (a) | 14. (c) | 15. (b) |
| 16. (b) | 17. (d) | 18. (b) | 19. (a) | 20. (b) |
| 21. (c) | 22. (c) | 23. (c) | 24. (c) | 25. (d) |
| 26. (c) | 27. (d) | 28. (a) | 29. (c) | 30. (a) |
| 31. (a) | 32. (d) | 33. (a) | 34. (d) | 35. (b) |
| 36. (a,c) | 37. (a,c) | 38. (a,b) | 39. (a,b,c) | 40. (a,c,d) |
| 41. (a,c) | 42. (a,b,d) | 43. (a,b,c,d) | 44. (a,d) | 45. (a,b,c) |

Miscellaneous Assignment

- | | | | | |
|--|--|---------|---------|---------|
| 1. (b) | 2. (b) | 3. (a) | 4. (a) | 5. (b) |
| 6. (c) | 7. (b) | 8. (b) | 9. (a) | 10. (d) |
| 11. A-(p),(r); B-(p),(s); C-(p),(r); D-(q),(r) | 12. A-(q); B-(r),(s); C-(p),(r),(s); D-(p) | | | |
| 13. (3) | 14. (5) | 15. (6) | 16. (4) | 17. (5) |
| 18. (6) | 19. (3) | 20. (5) | 21. (4) | 22. (4) |

Previous Year Questions

IIT-JEE/JEE-ADVANCE QUESTIONS

- | | | | | |
|---------|---------|-----------|--------|-----------|
| 1. (b) | 2. (a) | 3. (a) | 4. (c) | 5. (c) |
| 6. (c) | 7. (b) | 8. (c, d) | 9. (d) | 10. (a,c) |
| 11. (b) | 12. (c) | | | |

DCE QUESTIONS

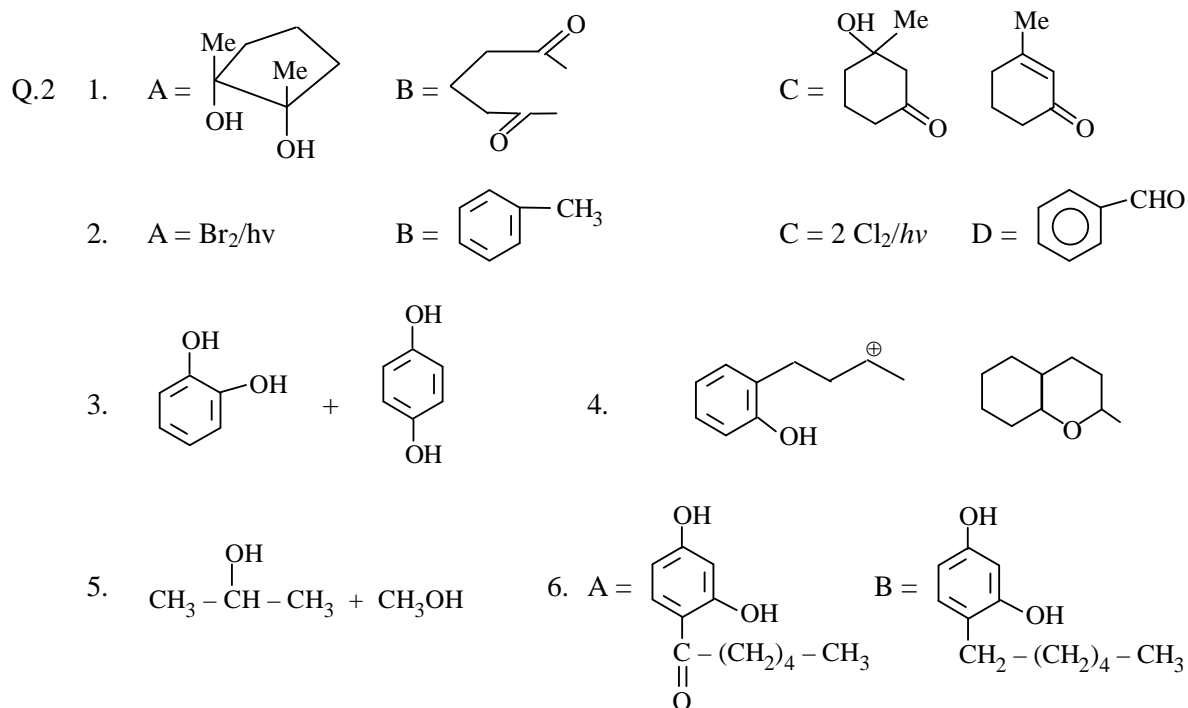
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|---------|---------|---------|---------|---------|
| 1. (a) | 2. (d) | 3. (b) | 4. (d) | 5. (c) |
| 6. (d) | 7. (c) | 8. (c) | 9. (a) | 10. (c) |
| 11. (a) | 12. (b) | 13. (d) | 14. (d) | 15. (d) |
| 16. (a) | 17. (d) | 18. (b) | 19. (b) | 20. (d) |
| 21. (a) | 22. (c) | 23. (b) | | |
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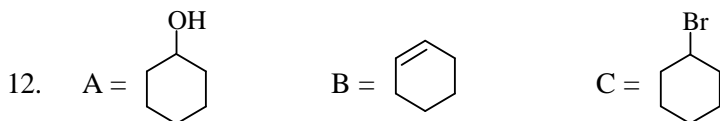
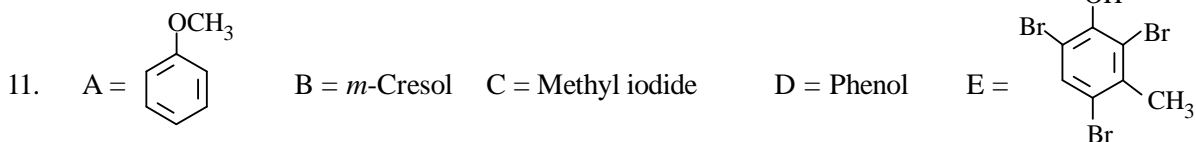
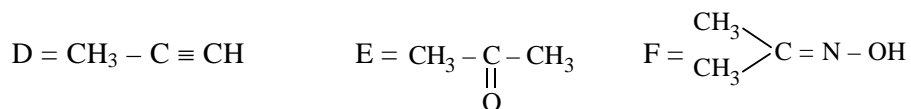
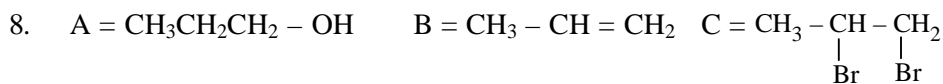
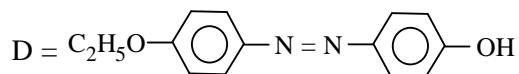
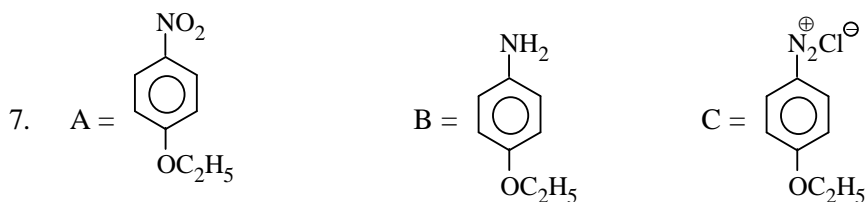
-MAINS QUESTIONS

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (b) | 2. (d) | 3. (a) | 4. (a) | 5. (b) |
| 6. (c) | 7. (a) | 8. (a) | 9. (b) | 10. (d) |
| 11. (b) | 12. (b) | 13. (a) | 14. (b) | 15. (a) |
| 16. (c) | 17. (d) | 18. (c) | 19. (b) | 20. (b) |
| 21. (a) | 22. (a) | 23. (b) | 24. (a) | 25. (d) |
| 26. (c) | 27. (b) | 28. (d) | 29. (a) | 30. (d) |
| 31. (d) | 32. (a) | 33. (a) | 34. (a) | 35. (b) |
| 36. (c) | 37. (d) | 38. (d) | 39. (a) | 40. (b) |
| 41. (c) | 42. (2) | | | |

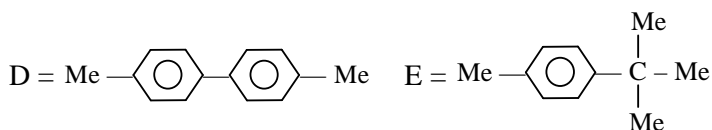
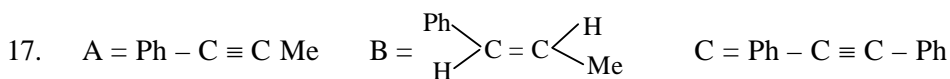
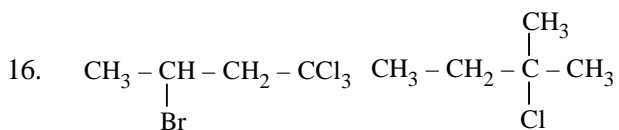
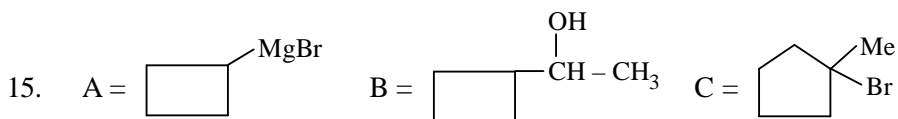
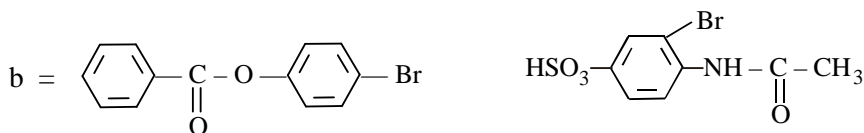
Subjective Problems

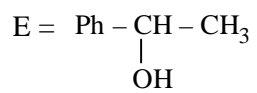
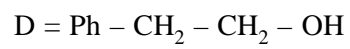
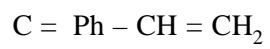
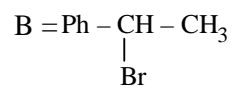
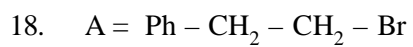
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- | | | |
|----------------------|----------------------|-----------------------------------|
| 1. II > I > III | 2. II > III > I | 3. III > II > IV > I |
| 4. III > I > II | 5. III > IV > I > II | 6. III > II > I > V > IV |
| 7. II > III > IV > I | 8. I > II > III | 9. SN-2 |
| 10. E ¹ | 11. E ¹ | 12. (t- > S- > CCl ₄) |





14. a = 2, 2, 3, 3-Tetramethylbutane





19.

