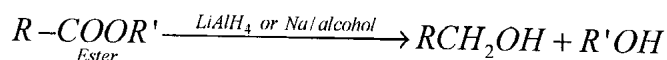
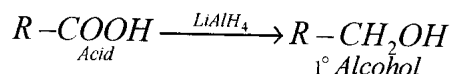
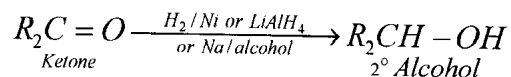
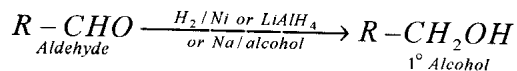
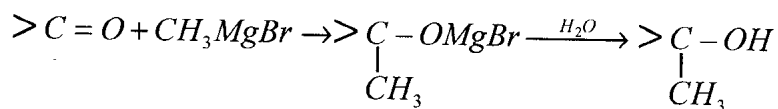
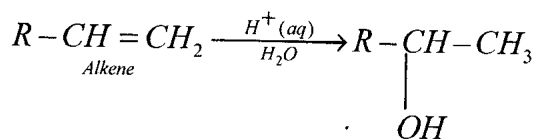
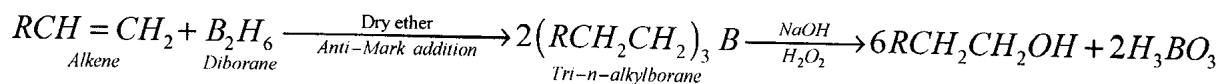
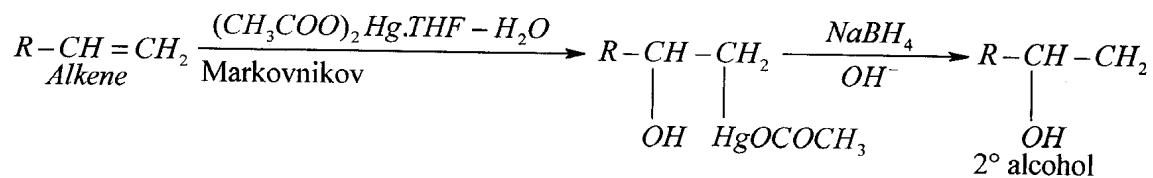


Alcohols, Phenols and Ethers**(b) By reduction of aldehydes, ketones, acids and esters :****(c) By action of Grignard reagent on aldehydes, ketones and esters**

Whereas formaldehyde gives  $1^\circ$  alcohols, aldehydes other than formaldehyde give  $2^\circ$  alcohols while ketones give  $3^\circ$  alcohols. Further, addition of two moles of Grignard reagent to formic ester gives  $2^\circ$  alcohols and to esters other than formic ester gives  $3^\circ$  alcohols.

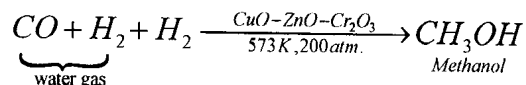
**(d) From alkenes (i) By hydration of alkenes :****HYDROBORATION - OXIDATION**

### (iii) Oxymercuration-demercuration



The reaction occurs by electrophilic addition of  $Hg(OCOCH_3)_2$  to double bond in accordance with Markovnikov's rule.

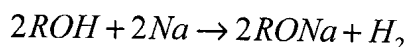
**(h) From water gas :** Methanol is industrially prepared by reduction of carbon monoxide or water gas



4. **Physical properties. (i) Boiling points.** Alcohols undergo intermolecular H-bonding and hence their boiling points are much higher than those of hydrocarbons of comparable molecular masses. Amongst isomeric alcohols, the boiling points decrease in the order  $1^\circ > 2^\circ > 3^\circ$ .

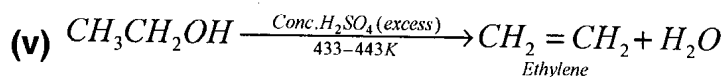
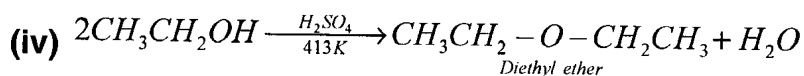
### 6. Chemical properties

**(a) Acidic nature.** Alcohols are weakly acidic even weaker than water. They react with alkali metals to form Alkoxides.

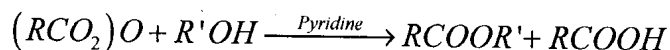


Amongst isomeric alcohols, acidity decreases in the order  $1^\circ > 2^\circ > 3^\circ$  and hence their reactivity towards Na also decreases in the same order.

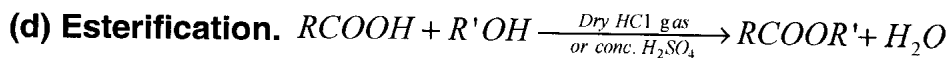
**(b) Action of  $H_2SO_4$  on ethyl alcohol at different temperatures.**



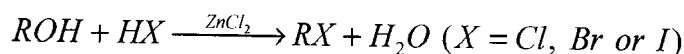
This reaction is called **dehydration**. The rate of dehydration of alcohols is  $3^\circ > 2^\circ > 1^\circ$ .



This reaction is called **acylation**. With acetyl chloride or acetic anhydride, it is called **acetylation**.



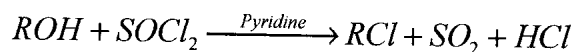
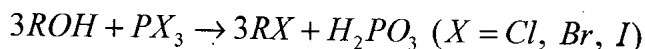
(e) Reaction with halogen acids.



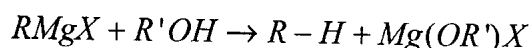
Order of reactivity of alcohols :  $3^\circ > 2^\circ > 1^\circ$

Order of reactivity of halogen acids :  $HI > HBr > HCl$ .

(f) Reaction with phosphorus halides and thionyl chloride



(h) Reaction with Grignard reagents. Alcohols ( $1^\circ$ ,  $2^\circ$  or  $3^\circ$ ) react with Grignard reagents to form corresponding alkanes in quantitative yields :

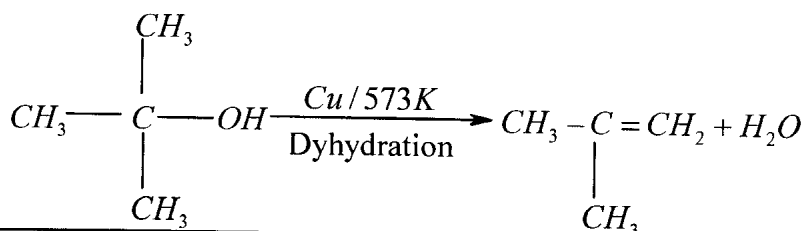
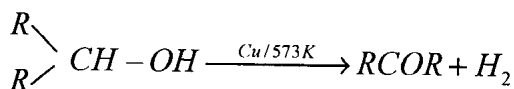
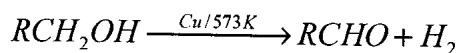


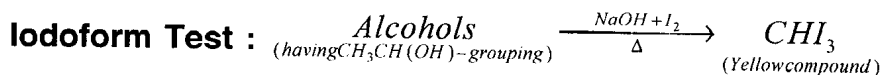
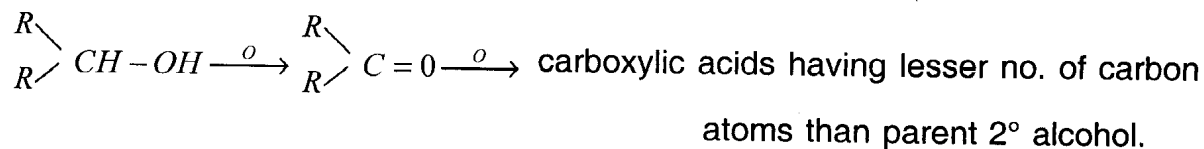
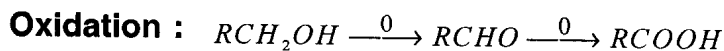
7. Distinction between  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols

(b) Lucas test. A mixture of conc.  $HCl$  + anhyd.  $ZnCl_2$  is called Lucas reagent.

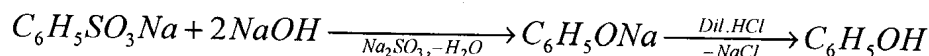
Primary alcohol	Secondary alcohol	Tertiary alcohol
$RCH_2-OH$ ↓ Lucas reagent ↓ No reaction and hence no white cloudiness or turbidity at room temperature	$R_2CH-OH$ ↓ Lucas reagent ↓ white cloudiness or turbidity appears in about 5 minutes	$R_3C-OH$ ↓ Lucas reagent ↓ white cloudiness or turbidity appears immediately

(c) Action of hot copper alcohols give aldehydes,  $2^\circ$  alcohols give ketones while  $3^\circ$  alcohols give alkenes.

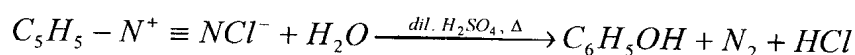




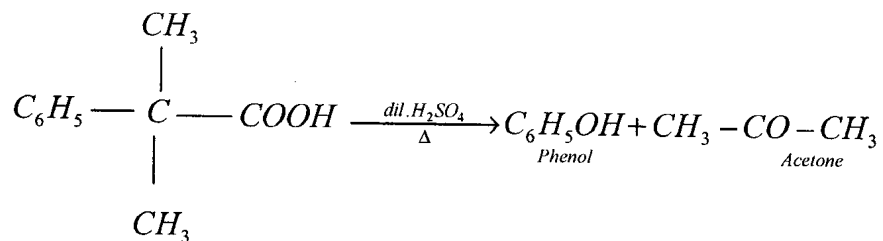
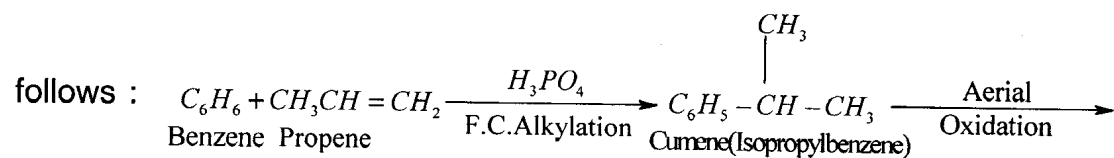
(a) By fusing sodium benzenesulphonate with NaOH



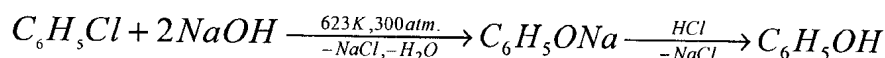
(b) By hydrolysis of benzenediazonium chloride



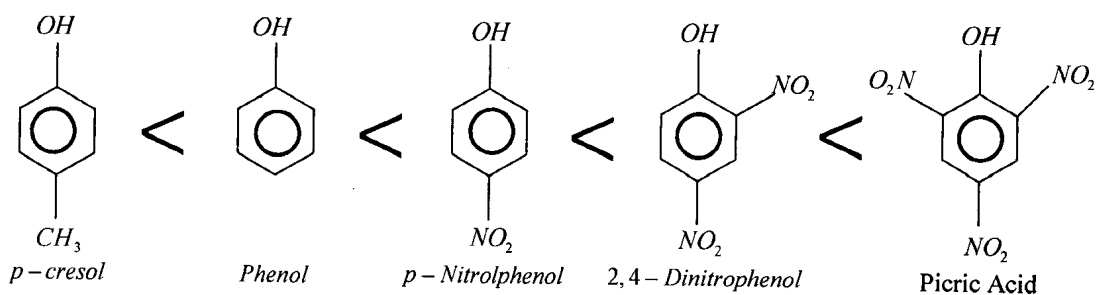
(ii) From cumene. These days phenol is manufactured from cumene as



(iii) From chlorobenzene—Dow's process

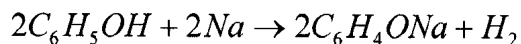
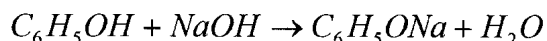


10. **Chemical properties : (a) Acidic nature.** Phenol is a stronger acid than alcohol since phenoxide ion is stabilized by resonance but alkoxide ions is not. Electron-withdrawing groups increase the acidity while electron donating groups decrease the acidity of phenols, i.e.,

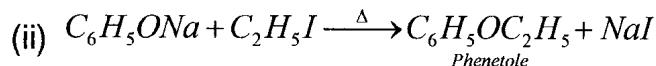
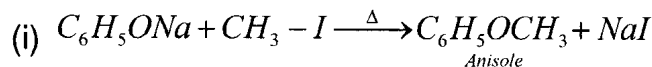


Phenol itself is, however, a weaker acid than carbonic acid ( $H_2CO_3$ ) and hence does not decompose  $NaHCO_3$  to evolve  $CO_2$ .

However, phenols dissolve in strong alkalis and evolve  $H_2$  when treated with alkali metals and other highly reactive metals like  $Al, Na$ , etc.

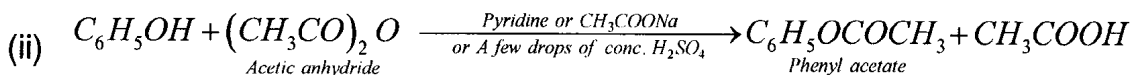
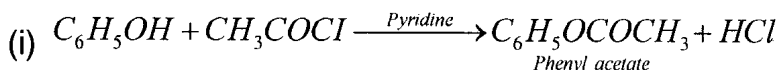


**(b) Alkylation :**



This reaction is called **Williamson's synthesis**.

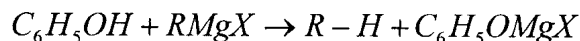
**(c) Acylation:**



This reaction is called Schotten-Baumann reaction.



**(f) Reaction with Grignard reagents:**



**(g) Action with halogen acids and phosphorus halides:** Unlike alcohols, phenols do not react with these reagents to form aryl halides since  $C - OH$  bond in phenol has partial double bond character due to resonance.

**(h) Reaction with  $FeCl_3$**  Phenols give violet colour with  $FeCl_3$ .

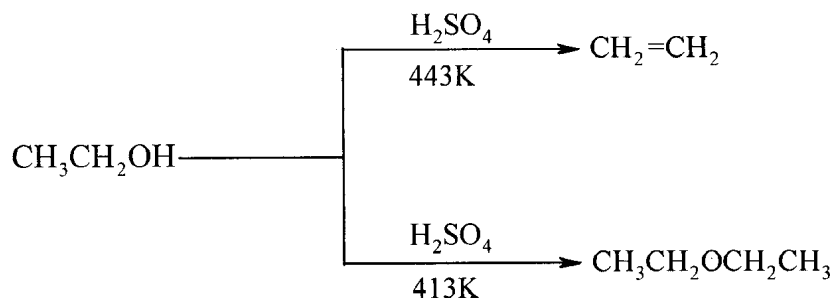
**(j) Electrophillicsubstitution reactions:** The  $-OH$  group in phenols is o, p-directing since due to resonance it increases the electron density at o- and p-positions. Some important reactions are :



# Ethers

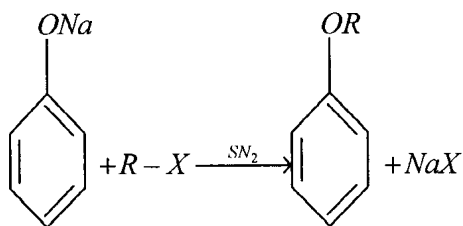
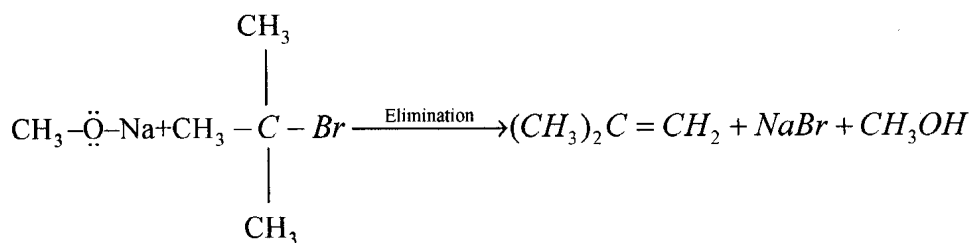
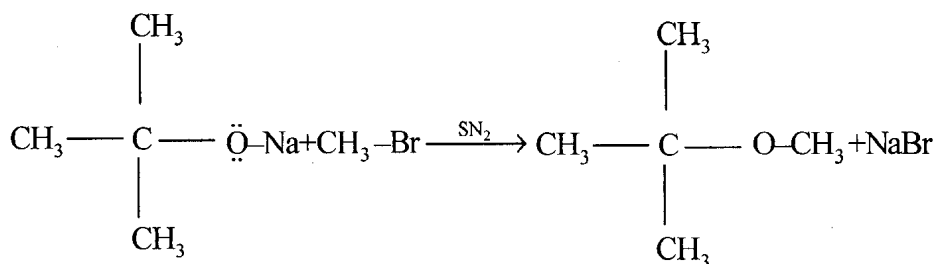
## Preparation of ethers :

1. By dehydration alcohols in presence of protic acids ( $H_2SO_4, H_3PO_4$ ).



For ethers primary alkyl group should be unhindered and temperature be kept low.

2. **Williamson's syntheses** :  $R-X + R'-O^-Na \xrightarrow{S_N2} R'-O-R + NaX$

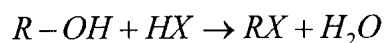
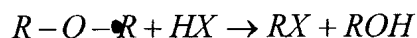


Ethers have small dipole moments. Weak polarity of ethers does not affect their b.p. which are comparable of alkanes of comparable molar masses.

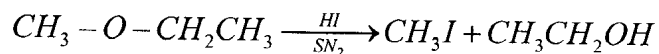
n-pentane	ethoxyethane	Butan-1-ol
b.p./K : 309.1	307.6	390

## Chemical properties

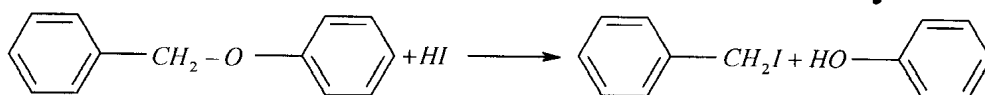
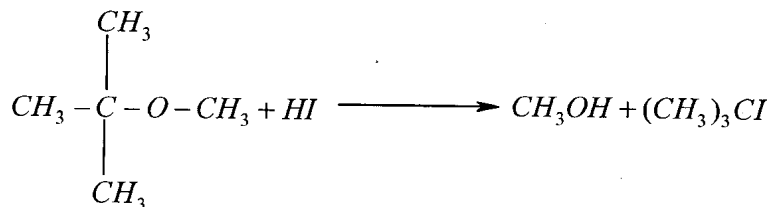
### (i) Reaction with HX :



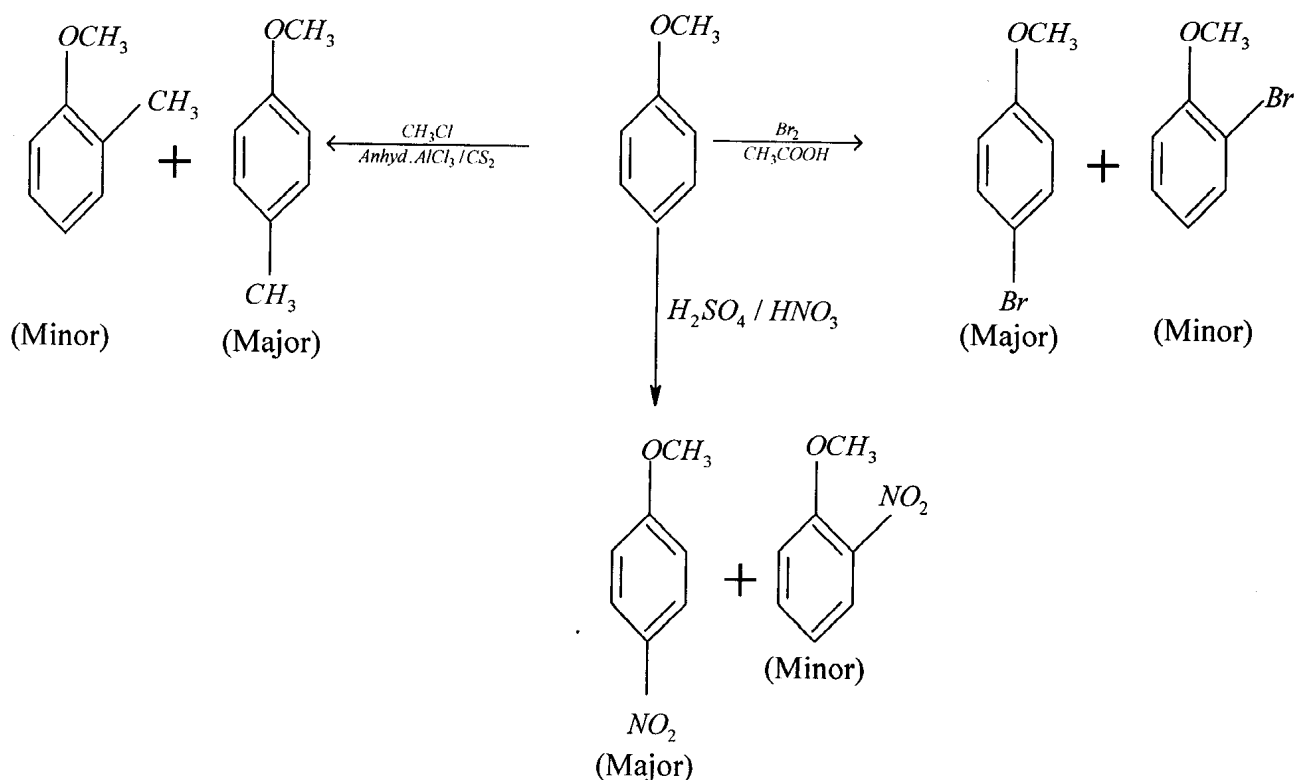
If both the alkyl groups are primary and/ or secondary, then the alkyl halide formed will have smaller alkyl group



However, when one of the alkyl group is tertiary, then halide formed is tertiary halide



### Electrophilic Substitution :



# MOCK TEST

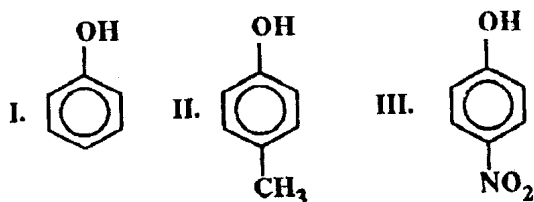
U N I T - 2 2

P a r t - I

1. The order of activity of the various o- and p-directors is

- (a)  $-O^- > -OH > -OCOCH_3 > -COCH_3$
- (b)  $-OH > -O^- > -OCOCH_3 > -COCH_3$
- (c)  $-OH > -O^- > -COCH_3 > -OCOCH_3$
- (d)  $-O^- > -COCH_3 > -OCOCH_3 > -OH$

2. The correct acidic order of the following is



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

3. n-Propyl alcohol and isopropyl alcohol can be chemically distinguished by which reagent?

- (a)  $PCl_5$
- (b) Reduction
- (c) Oxidation with potassium dichromate
- (d) Ozonolysis

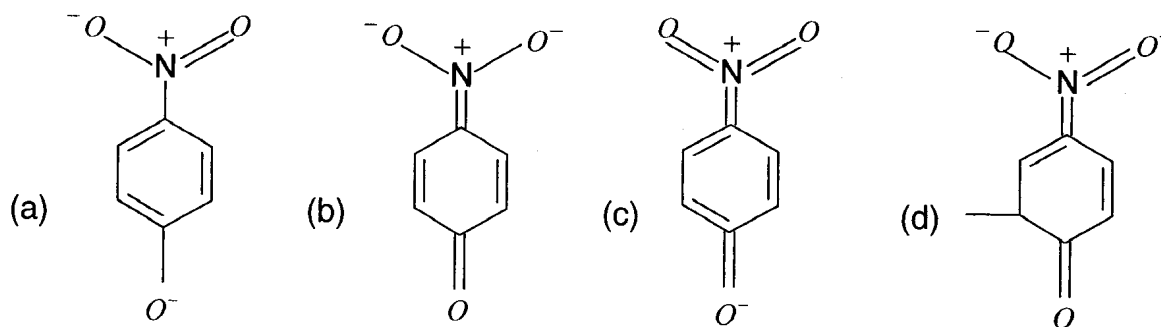
4. When phenol is treated with  $CHCl_3$  and  $NaOH$ , the product formed is

- (a) Benzaldehyde
- (b) Salicylaldehyde
- (c) Salicylic acid
- (d) Benzoic acid

5. Aspirin is an acetylation product of

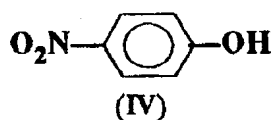
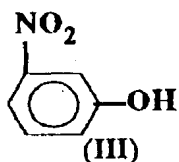
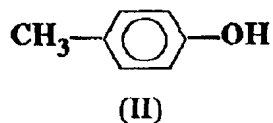
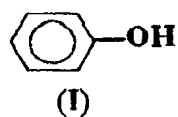
- (a) p-Dihydroxybenzene
- (b) o-Hydroxybenzoic acid
- (c) o-Dihydroxybenzene
- (d) m-Hydroxybenzoic acid

6. The most suitable method of separation of a mixture of ortho and para-nitrophenols mixed in the ratio of 1: 1 is  
 (a) Steam distillation (b) Crystallization  
 (c) Vapourization (d) Colour spectrum
7. Which of the following is the most suitable method for removing the traces of water from ethanol?  
 (a) Heating with Na metal (b) Passing dry HCl gas through it  
 (c) Distilling it (d) Reacting with Mg.
8. Which of the following is most acidic?  
 (a) Phenol (b) Benzyl alcohol  
 (c) m-Chlorophenol (d) Cyclohexanol
9. The most unlikely representation of resonance structures of p-nitrophenoxide ion is



10. The ionization constant of phenol is higher than that of ethanol because  
 (a) Phenoxide ion is a stronger base than ethoxide ion  
 (b) Phenoxide ion is stabilized through delocalization  
 (c) Phenoxide ion is less stable than ethoxide ion  
 (d) Phenoxide ion is bulkier than ethoxide ion.
11. Phenol can be distinguished from ethyl alcohol by all reagents except  
 (a) NaOH (b)  $FeCl_3$  (c)  $Br_2 / H_2O$  (d) Na

12. In the following compounds,



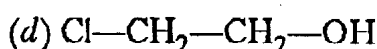
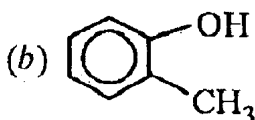
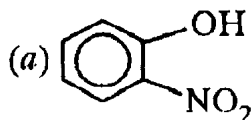




22. Propan-1-ol can be prepared from propene by

- (a)  $H_2O / H_2SO_4$
- (b)  $Hg(OAc)_2 / H_2O$  followed by  $NaBH_4$
- (c)  $B_2H_6$  followed by  $H_2O_2$
- (d)  $CH_3CO_2H / H_2SO_4$

23. Which of the following compounds is most acidic?

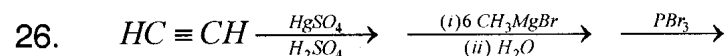


24. Acid-catalysed hydration of alkenes except ethene leads to the formation of

- (a) primary alcohol
- (b) secondary or tertiary alcohol
- (c) mixture of primary and secondary alcohols
- (d) mixture of secondary and tertiary alcohols

25. When phenylmagnesium bromide reacts with tertbutanol, which of the following is formed?

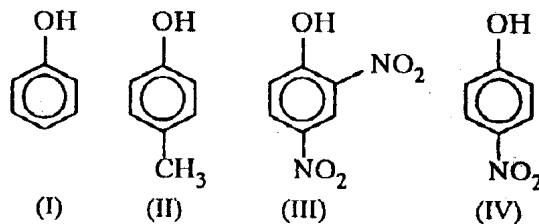
- (a) tert-Butyl methyl ether
- (b) Benzene
- (c) tert-Butylbenzene
- (d) Phenol



- (a)  $CH_3CHBrCH_3$
- (b)  $CH_3CH_2CH_2Br$
- (c)  $CH_2 = CH - Br$
- (d)  $BrCH = CH - CH_3$

27. Strength of acidity is in order

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



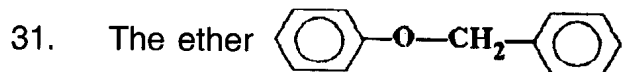
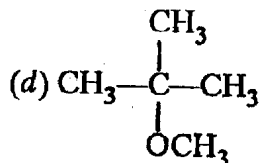
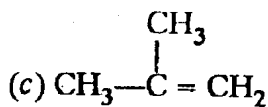
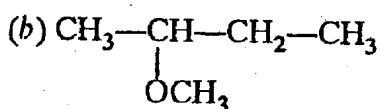
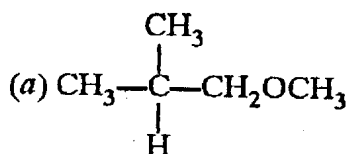
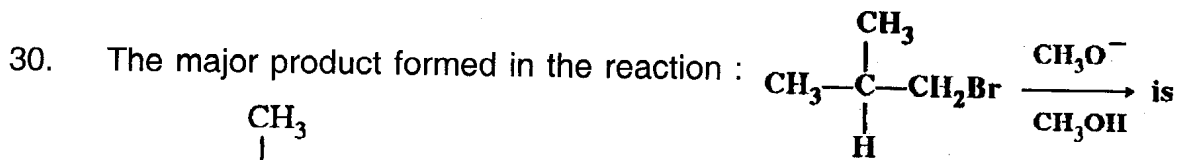
28. Which of the following cannot be made by using Williamson's synthesis?

- (a) Methoxybenzene
- (b) Benzylp-nitrophenyl ether

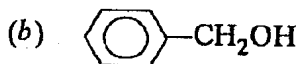
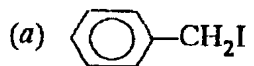
(c) tert-butyl methyl ether

(d) Di-tert-butyl ether.

29. 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



when treated with *HI* produces



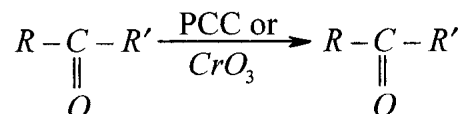
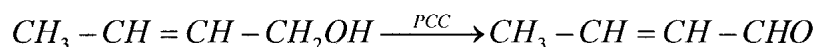
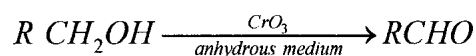
## Aldehydes, Ketones and Carboxylic Acids

**Structure of  $>C=O$  group :** The carbonyl Carbon is  $sp^2$  hybridised and forms three bonds. The bonds angles are approximately  $120^\circ$ . The carbon oxygen double bond is polarised due to higher electronegativity of oxygen than carbonyl carbon.

Carbonyl Carbon is an electrophilic centre and carbonyl oxygen, a nucleophilic centre.

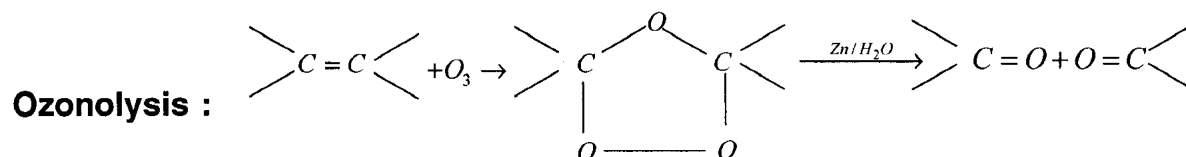
**Preparation of aldehydes/ Ketones :**

(a) **Oxidation of alcohol :**

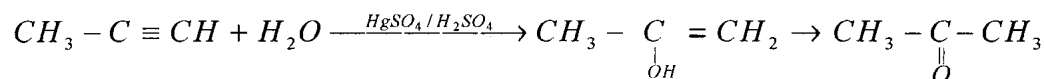


(b) **By dehydrogenation of  $1^\circ$  and  $2^\circ$  alcohols** with Cu or Ag at 573 K (please refer to oxidation of alcohol)

(c) **From hydrocarbons**



**Hydration of alkynes :**

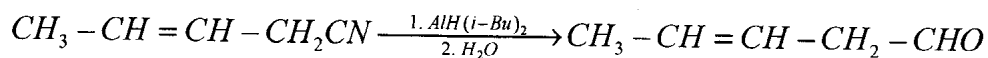


**Rosenmund reduction :**  $R/Ar-COCl + H_2 \xrightarrow{Pd-BaSO_4} R/Ar-CHO$

**Stephen Reaction :**  $RCN \xrightarrow{SnCl_2+HCl} RCH=NH \xrightarrow{H_3O^+} RCHO$

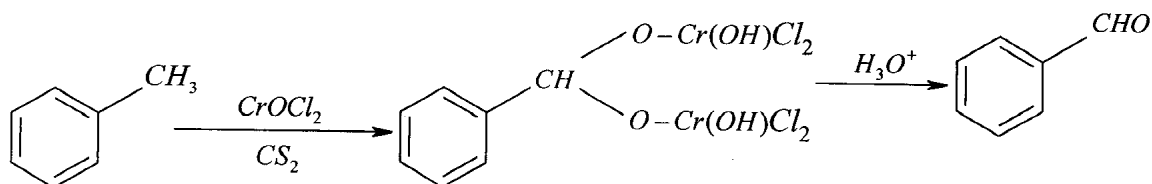
Nitriles are selectively reduced by diisobutylaluminium hydride (DIBAL-H) to

imines which give aldehydes on hydrolysis.

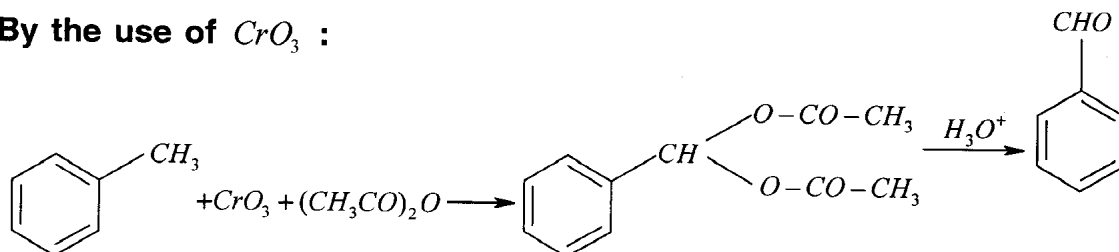


### From hydrocarbons :

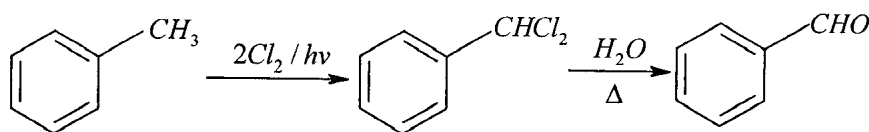
#### (a) Etard Reaction:



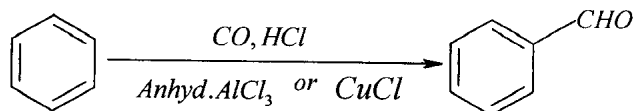
#### (b) By the use of $\text{CrO}_3$ :



#### (c) By side chain chlorination :

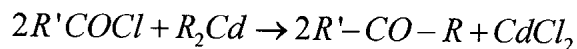


#### By Gatterman-Koch reaction:

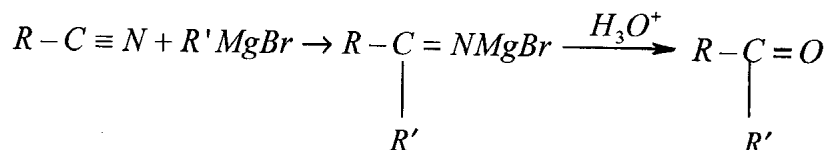


### Preparation of Ketones:

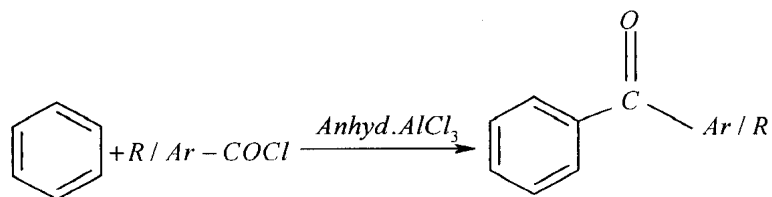
#### (i) From acid chloride using dialkyl cadmium



#### (ii) From nitriles :



(iii) **From benzene or substituted benzene :**



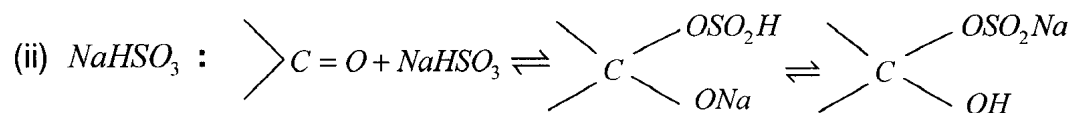
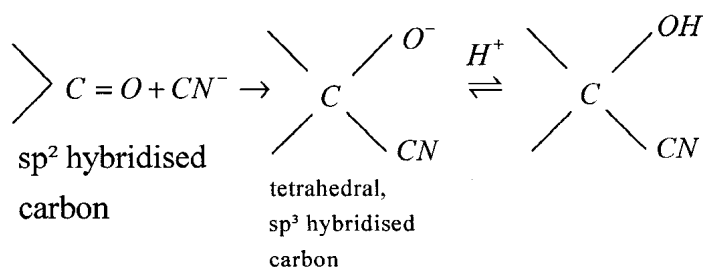
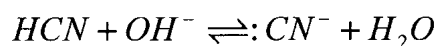
Comparison of boiling points of aldehydes, ketones, hydrocarbons, ethers and alcohols of comparable molar masses :

(a) propan-1-ol > acetone > propanal > methoxymethane > n-butane

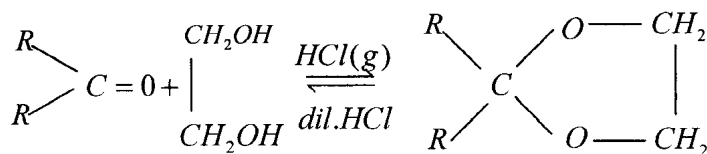
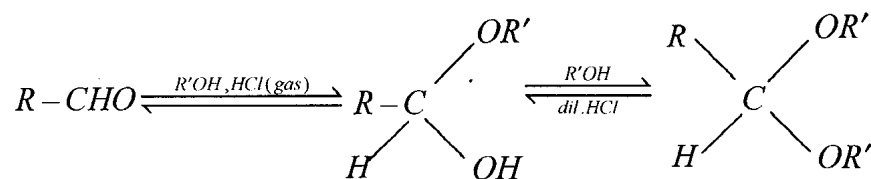
(b) Butan-1-ol > butanal > n-pentane > ethoxyethane

**Reactivity :-** Aldehydes are more reactive than ketones towards nucleophilic addition reactions. Sterically the presence of two relatively large alkyl groups in ketones hinders the approach of the nucleophile to the carbonyl carbon than in aldehydes having only one alkyl group. Further, two alkyl groups in ketones reduce the electrophilicity of carbonyl carbon.

**Reaction with (i) HCN Catalysed by base**

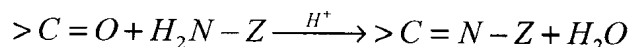


(iii) **alcohol :**

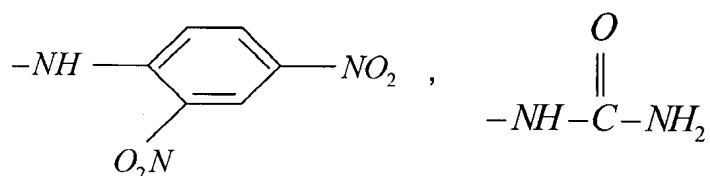


(iv) **Addition of ammonia and its derivatives :** This reaction is catalysed by acid but in highly acidic medium ammonia derivatives ( $\text{H}_2\text{N-Z}$ ) no longer act as

nucleophiles, therefore pH is carefully controlled



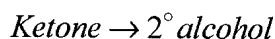
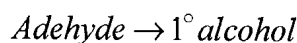
Where Z = alkyl, aryl, OH,  $NH_2$ ,  $NHC_6H_5$



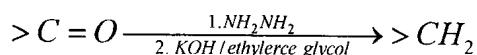
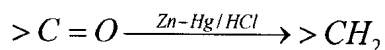
**Note :-** 2, 4 – DNP derivatives are yellow, orange, or red solids used for the characterisation of aldehydes and ketones.

### Reduction :

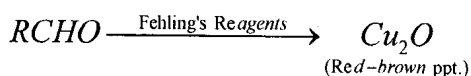
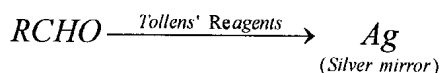
(i)  $NaBH_4$ ,  $LiAlH_4$  and  $H_2/Ni$  are used to reduce the carbonyl compounds to alcohols



(ii) **Clemmensen reduction :**  $Zn-Hg / conc.HCl$  reduces the aldehydes and ketones, which are sensitive to base, to hydrocarbons. Similarly aldehydes and ketones sensitive to acids, are reduced to hydrocarbons by  $NH_2NH_2$  followed by treatment with KOH dissolved in ethylene glycol

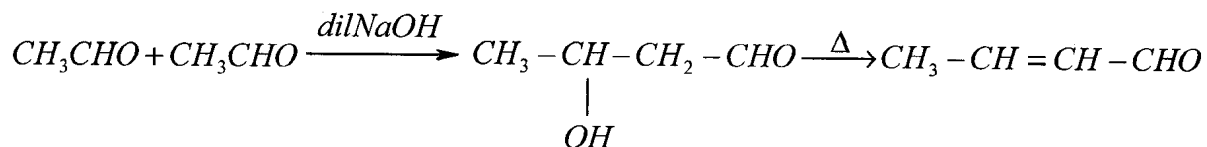


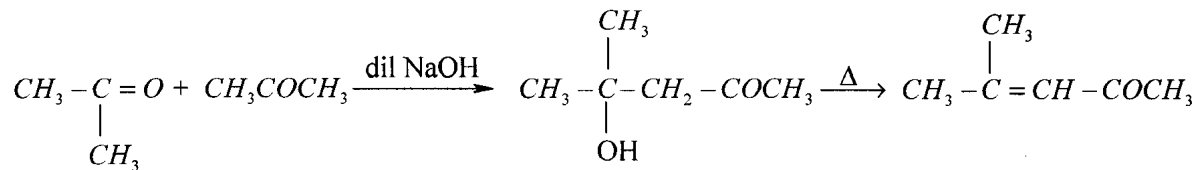
**Oxidation :** Even mild oxidising agents like Tollens' reagent and Fehling's reagent oxidise aldehydes only ketones do not respond to these tests.



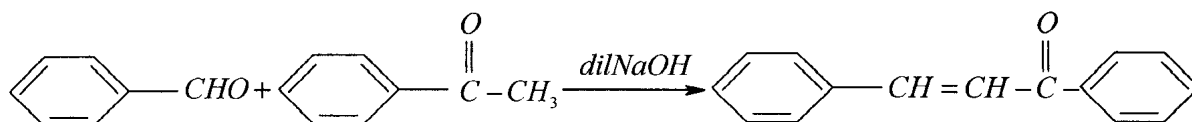
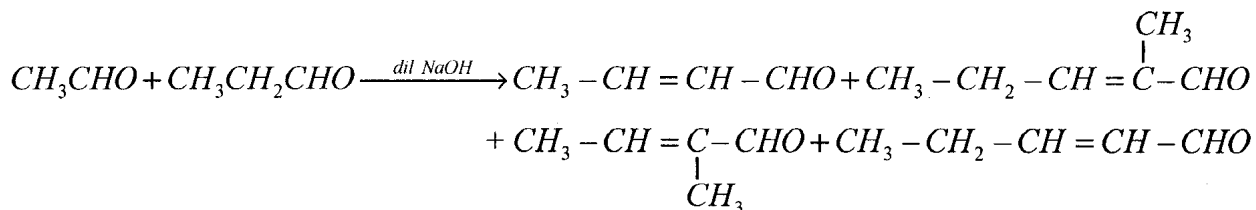
Methyl ketones and ethanol are oxidized by the mixture of  $I_2$  and  $NaOH$  to form yellow iodoform.

**Aldol condensation :** Aldehydes and ketones having at least one  $\alpha$ -hydrogen undergo a condensation reaction in presence of dilute alkali to form  $\beta$ -hydroxy aldehydes (aldol) or ketones (ketol).

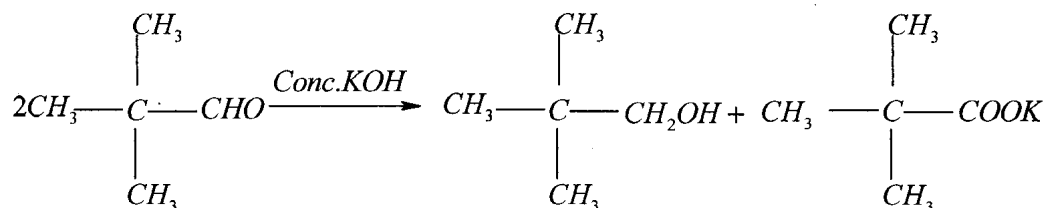
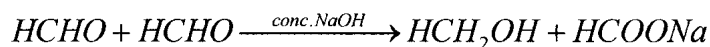




**Cross aldol condensation :**



**Connizzaro Reaction :** Aldehydes (and not ketones) which do not have an  $\alpha$ -hydrogen undergo oxidation and reduction (disproportionation) reaction on treatment with conc. alkali (50% NaOH)



# MOCK TEST

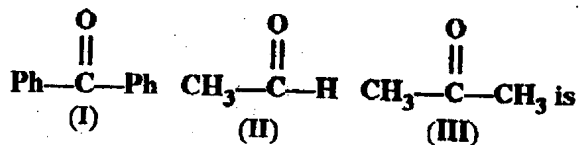
## UNIT – 22

### Part - II

1. The reagent used for separation of acetaldehyde and acetophenone is

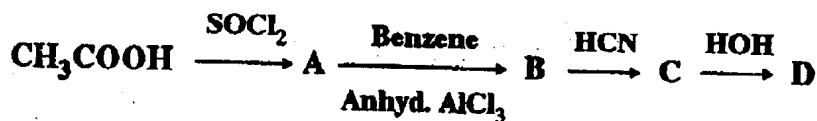
- (a)  $\text{NaHSO}_3$                       (b)  $\text{C}_6\text{H}_5\text{NHNH}_2$   
 (c)  $\text{NH}_2\text{OH}$                       (d)  $\text{NaOH} + \text{I}_2$

2. The correct order of reactivity of  $\text{PhMgBr}$  with

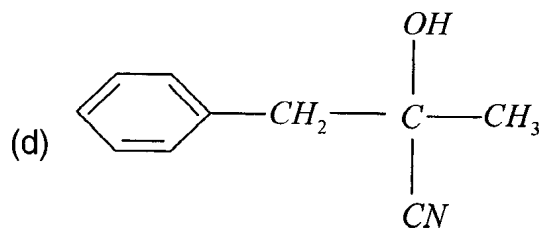
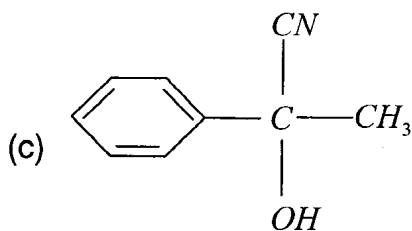
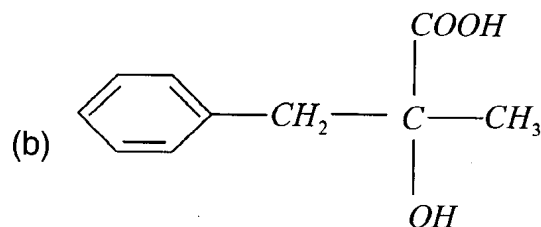
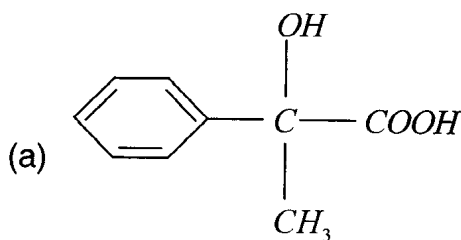


- (a)  $I > II > III$                       (b)  $III > II > I$   
 (c)  $II > III > I$                       (d)  $I > III > II$

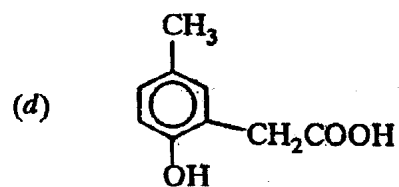
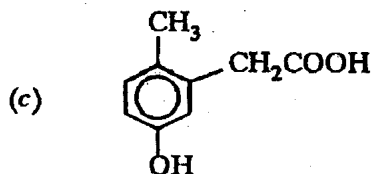
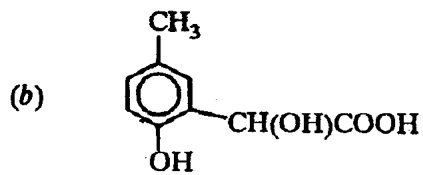
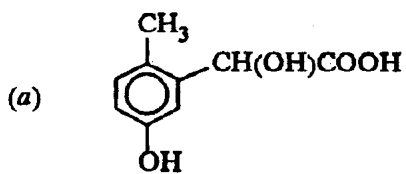
3. In a set of reactions, acetic acid yielded product D



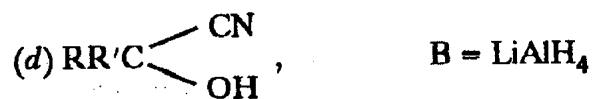
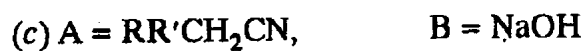
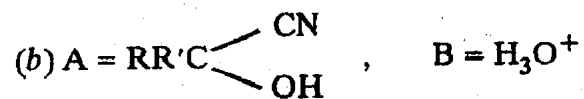
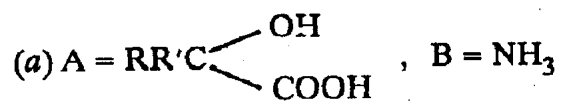
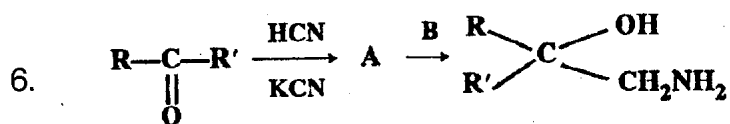
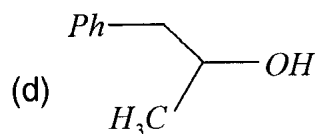
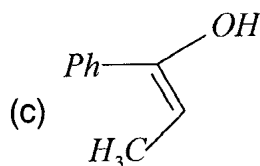
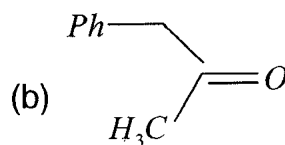
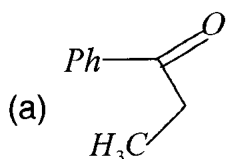
The structure of D would be



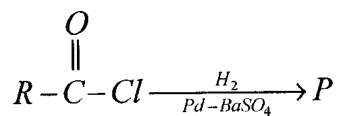
4. p-Cresol reacts with chloroform in alkaline medium to give the compound A which adds hydrogen cyanide to form the compound B. The latter on acidic hydrolysis gives chiral carboxylic acid. The structure of the carboxylic acid is



5.  $Ph-C \equiv C-CH_3 \xrightarrow{Hg^{2+}/H^+}$  A is



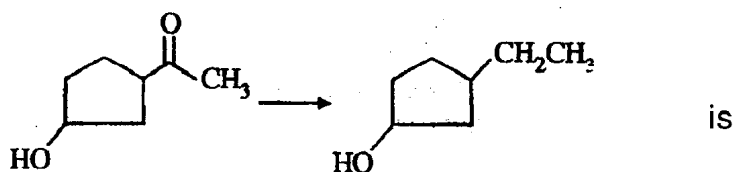
7. In the following reaction, product 'P' is



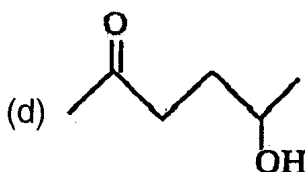
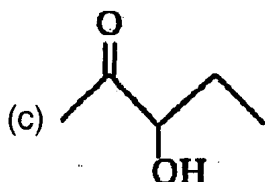
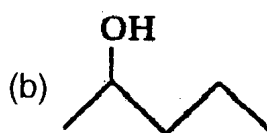
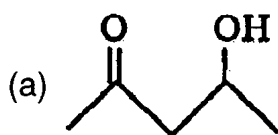
- (a)  $RCH_2OH$  (b)  $RCOOH$   
 (c)  $RCHO$  (d)  $RCH_3$

8. Ozonolysis of  $C_7H_{14}$  gave 2-methyl-3-pentanone. The alkene is  
 (a) 2-Ethyl-3-methyl but-1-ene  
 (b) 2-Methyl-3-ethyl but-3-ene  
 (c) 2, 5-Dimethyl-3, 4-diethylhex-3-ene  
 (d) 2-Methyl-3-ethyl but-1-ene

9. The appropriate reagent for the transformation



- (a)  $Zn(Hg), HCl$  (b)  $NH_2NH_2, OH^-$   
 (c)  $H_2 / Ni$  (d)  $NaBH_4$
10. Which of the following will be most readily dehydrated in acidic conditions?



11. Iodoform test is not given by  
 (a) Pentan-2-one (b) Pentan-3-one  
 (c) Ethanal (d) Ethanol

12. Aldol condensation will not take place in  
 (a)  $HCHO$  (b)  $CH_3CHO$   
 (c)  $CH_3COCH_3$  (d)  $CH_3CH_2CHO$

13. m-Chlorobenzaldehyde on reaction with conc.  $KOH$  at room temperature gives :  
 (a) Potassium m-chlorobenzoate and m-hydroxy-benzaldehyde

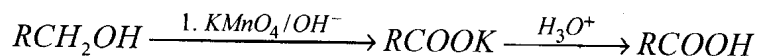
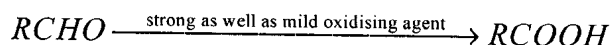
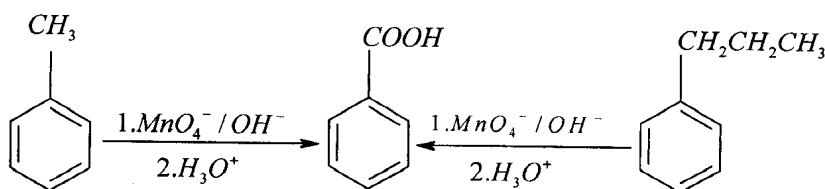
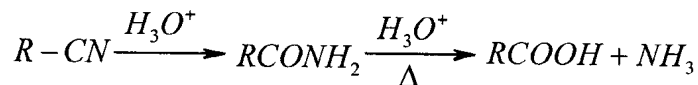
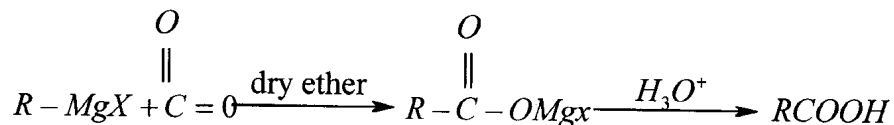
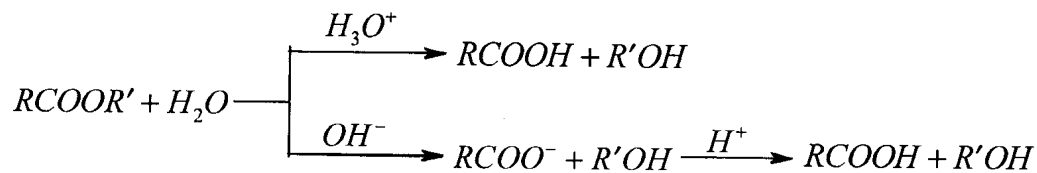
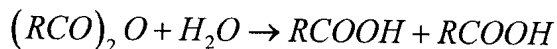
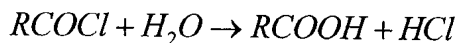
- (b) m-Hydroxybenzaldehyde and m-chlorobenzyl alcohol
- (c) m-Chlorobenzyl alcohol and m-hydroxybenzyl alcohol
- (d) Potassium m-chlorobenzoate and m-chlorobenzyl alcohol

14. An organic compound,  $C_3H_6O$  does not give a precipitate with 2, 4-dinitrophenylhydrazine reagent and does not react with metallic sodium. It could be

- (a)  $CH_3 - CH_2 - CHO$
- (b)  $CH_3 = CH - CH_2HO$
- (c)  $CH_3 - CO - CH_3$
- (d)  $CH_2 = CH - O - CH_3$

15. A compound  $A(C_5H_{10}Cl_2)$  on hydrolysis gives  $C_5H_{10}O$  which reacts with  $NH_2OH$ , forms iodoform but does not give Fehling test. A is :

- (a)  $CH_3 - \overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}} - CH_2 - CH_2 - CH_3$
- (b)  $CH_3CH_2 - \overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}} - CH_2CH_3$
- (c)  $CH_3CH_2CH_2CH_2 \overset{\overset{Cl}{|}}{C} H - Cl$
- (d)  $CH_3 - \overset{\overset{Cl}{|}}{C} H - \overset{\overset{Cl}{|}}{C} H - CH_2CH_3$

Carboxylic AcidsMethods of preparation :(i) **From primary alcohols and aldehydes :**Alcohols can also be oxidised by  $CrO_3$  in acidic media.(ii) **From alkylbenzene :** The alkyl group whatever is the length of side chain attached to benzene ring, is converted to COOH(iii) **From Nitriles and amides :**(iv) **From Grignard reagent :**(v) **By the hydrolysis of Acyl halides, Anhydrides, and Esters**

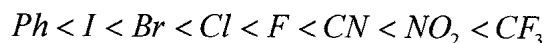
Carboxylic acids exist as dimers in aprotic solvents like benzene, ether, or chloroform. Order of b.p. : carboxylic acid > alcohols > aldehydes having comparable molar masses.

**Acidic nature :** More acidic than phenols because the conjugate base  $RCOO^-$

is more resonance stabilised than 

**Effect of substituents on the acidity of carboxylic acids :**

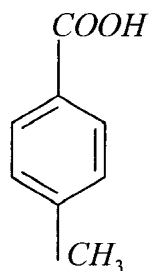
Electron withdrawing (EW) groups increase the acidity of the carboxylic acids by stabilising the conjugate bases through delocalisation of negative charge by inductive and/ or resonance effects. Conversely, electron donating (ED) groups decrease the acidity by destabilising the conjugate bases. The effect of following groups in increasing acidity order is :



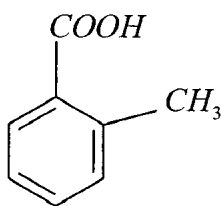
The presence of EW groups on benzene ring of aromatic carboxylic acid increases the acidity while ED groups decrease their acidity.

**The  $-OH$  and  $-OCH_3$  display both kinds of effects. From  $m$ -position these groups show electron withdrawing acid-strengthening effect but from  $p$ -position show electron donating acid- weakening resonance effect (which at this position outweighs inductive effect).**

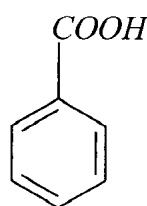
**Ortho effect :** Nearly all ortho substituents exert acid-strengthening effect whether they are electron withdrawing or electron releasing.



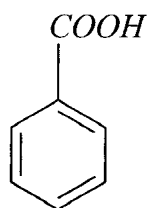
**Ka :**  $4.2 \times 10^{-5}$



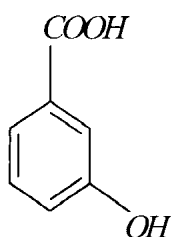
$12.4 \times 10^{-5}$



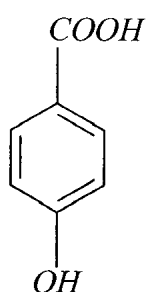
$6.3 \times 10^{-5}$



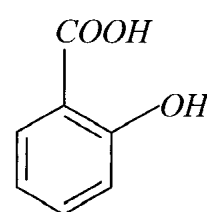
**Ka :**  $6.3 \times 10^{-5}$



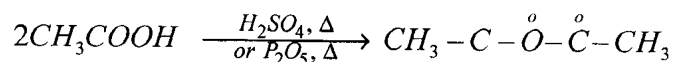
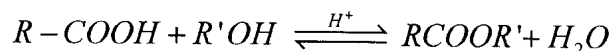
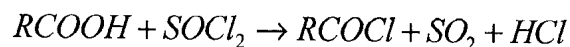
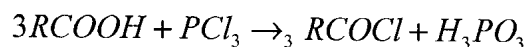
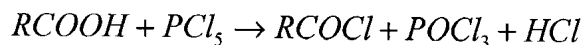
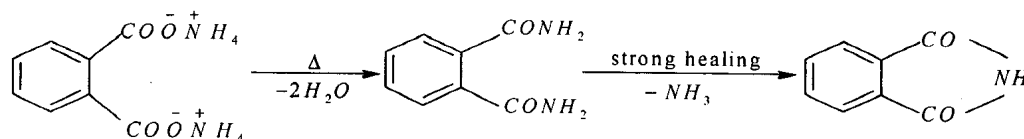
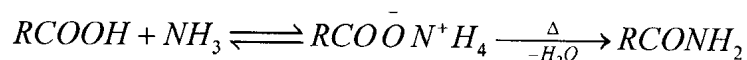
$8.3 \times 10^{-5}$



$2.6 \times 10^{-5}$



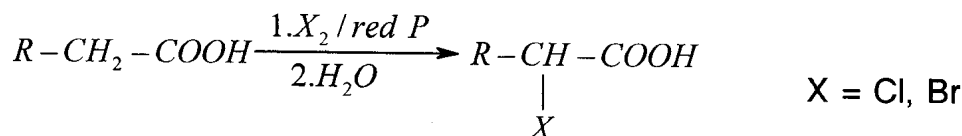
$105 \times 10^{-5}$

**Chemical properties : (1) Formation of anhydride :****(2) Formation of Ester :****(3) Reaction with  $\text{PCl}_5$ ,  $\text{PCl}_3$  and  $\text{SOCl}_2$  :****(4) Reaction with  $\text{NH}_3$  :**

**(5) Reduction :** Carboxylic acids are reduced by  $\text{LiAlH}_4$  to  $1^\circ$  alcohols or better by  $\text{B}_2\text{H}_6$ . Diborane ( $\text{B}_2\text{H}_6$ ) does not easily reduce functional groups as  $-\text{NO}_2$ , halo, ester, etc.  $\text{NaBH}_4$  does not reduce  $-\text{COOH}$  group.

**(6) Decarboxylation :** Please refer to the preparation of hydrocarbons (alkanes)

**Halogenation :** Carboxylic acids having at least an  $\alpha$ -hydrogen are halogenated at  $\alpha$ -position on treatment with  $\text{Cl}_2$  or  $\text{Br}_2$  in presence of red phosphorus to give  $\alpha$ -halocarboxylic acid. This reaction is known as Hell-vohlard-Zelinsky reaction.

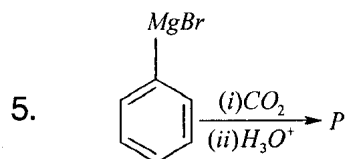


# MOCK TEST

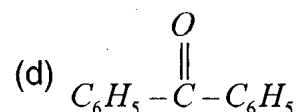
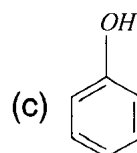
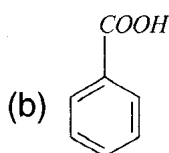
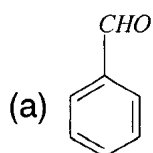
## UNIT – 22

### Part - III

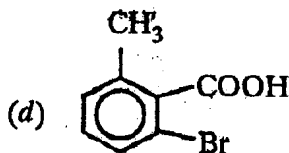
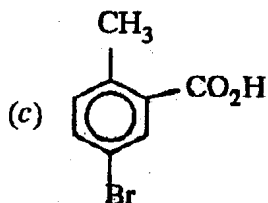
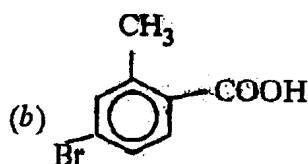
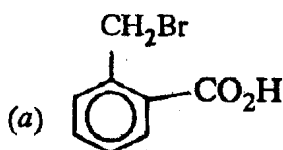
1.  $R-CH_2-CH_2OH$  can be converted into  $RCH_2CH_2COOH$ . The correct sequence of reagents is
- (a)  $PBr_3, KCN, H^+$                       (b)  $PBr_3, KCN, H_2$   
(c)  $KCN, H^+$                                 (d)  $HCN, PBr_3, H^+$
2. Which reaction is suitable for the preparation of  $\alpha$ -chloroacetic acid?
- (a) Hell-Volhard Zelinsky reaction  
(b) Nef reaction  
(c) Stephen's reaction  
(d) Perkin condensation
3. When propionic acid is treated with aqueous sodium bicarbonate,  $CO_2$  is liberated. The 'C' of  $CO_2$  comes from
- (a) methyl group                                (b) carboxylic acid group  
(c) methylene group                            (d) bicarbonate.
4. Carboxylic acids are more acidic than phenol and alcohol because of
- (a) intermolecular hydrogen bonding  
(b) formation of dimers  
(c) highly acidic hydrogen  
(d) greater resonance stabilization of their conjugate base.



In the above reaction, product 'P' is



6.  $CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} (A) \xrightarrow{\text{alc.KOH}} (B)$ . The compound (B) is  
 (a)  $CH_3CH_2COCl$  (b)  $CH_3CH_2CHO$   
 (c)  $CH_2=CHCOOH$  (d)  $ClCH_2CH_2COOH$
7. When  $CH_2=CH-COOH$  is reduced with  $LiAlH_4$ , the compound obtained will be  
 (a)  $CH_3-CH_2-CHO$  (b)  $CH_3-CH_2-COOH$   
 (c)  $CH_2=CH-CH_2OH$  (d)  $CH_3-CH_2-COOH$
8. In the  $HCOO^-$ , the two carbon-oxygen bonds are found to be of equal length. What is the reason for it?  
 (a) The anion is obtained by removal of a proton from the acid molecule  
 (b) Electronic orbitals of carbon atom are hybridised  
 (c) The  $C=O$  bond is weaker than  $C-O$  bond  
 (d) The anion  $HCOO^-$  has two resonating structures.
9. The OH group of an alcohol or the  $-COOH$  group of a carboxylic acid can be replaced by  $-Cl$  using.  
 (a) phosphorus pentachloride (b) hypochlorous acid  
 (c) chlorine (d) hydrochloric acid
10. O-Toluic acid on reaction with  $Br_2 + Fe$  gives



11. Consider the acidity of the carboxylic acids  
 (i)  $PhCOOH$  (ii)  $o-NO_2C_6H_4COOH$   
 (iii)  $p-NO_2C_6H_4COOH$  (iv)  $m-NO_2C_6H_4COOH$

Which of the following order is correct ?

(a) (i) > (ii) > (iii) > (iv)

(b) (ii) > (iv) > (iii) > (i)

(c) (ii) > (iv) > (i) > (iii)

(d) (ii) > (iii) > (iv) > (i)

12. Among the following acids, which has the lowest  $pK_a$  value?

(a)  $CH_3COOH$

(b)  $HCOOH$

(c)  $(CH_3)_2CHCOOH$

(d)  $CH_3CH_2COOH$

13. Butan-2-one can be converted to propanoic acid by which of the following?

(a)  $NaOH, NaI / H^+$

(b) Fehling solution

(c)  $NaOH, I_2 / H^+$

(d) Tollen's reagent

14. Which of the following acids has the smallest dissociation constant?

(a)  $CH_3CHFCOOH$

(b)  $FCH_2CH_2COOH$

(c)  $BrCH_2CH_2COOH$

(d)  $CH_3CHBrCOOH$

15. Among the following, the strongest acid is :

(a)  $CH_3COOH$

(b)  $CH_6H_5COOH$

(c)  $m-CH_3OC_6H_4COOH$

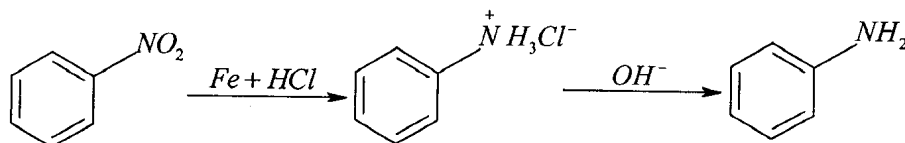
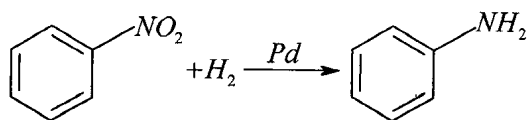
(d)  $p-CH_3OC_6H_4COOH$

Organic Compounds Containing NitrogenAmines

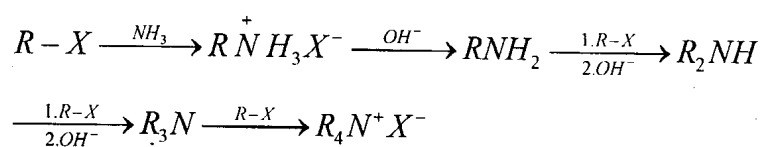
Amines are the derivatives of  $NH_3$ . They are classified as primary ( $RNH_2$ ), secondary ( $R_2NH$ ) and tertiary ( $R_3N$ ) amines. The H-atoms of ammonia can be replaced by alkyl and/ or aryl groups. Amines have pyramidal geometry having  $sp^3$  hybridised N atom with a lone pair of electrons.

Preparation of amines :

(i) **By the reduction of nitro compounds.** Reducing agent frequently used are  $H_2/Pt$ ,  $H_2/Pd$ ,  $Sn+HCl$  or  $Fe+HCl$ ,  $Na-Hg/C_2H_5OH$



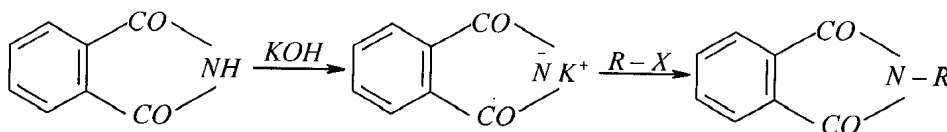
(ii) **Ammonolysis of alkyl halide :**

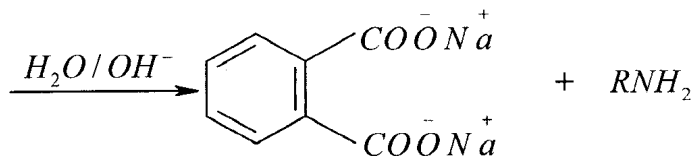


(iii) **Reduction of nitriles :**  $R-CN \xrightarrow{Na-Hg/C_2H_5OH} R-CH_2-NH_2$

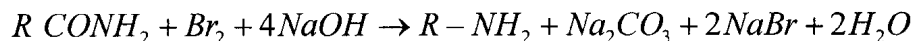
(iv) **Reduction of amides :**  $R-CONH_2 \xrightarrow[2.H_2O]{1.LiAlH_4} RCH_2NH_2$

(v) **Gabriel phthalimide synthesis:** Aromatic primary amine cannot be prepared by this method because aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.

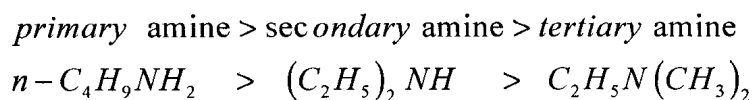




(vi) **Hoffmann bromamide degradation reaction** :- Migration of an alkyl or aryl group takes place from the carbonyl carbon of the amide to the nitrogen atom to form amine having one carbon atom less than the parent amide.



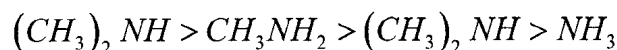
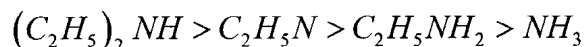
**Physical properties** :-  $1^\circ$  and  $2^\circ$  amines form intermolecular hydrogen bonds between the Nitrogen atom of one amine molecule and the hydrogen atom of the other molecule.  $3^\circ$  amines do not form intermolecular hydrogen bonds. The boiling points of isomeric amines vary as follows :



**Basic nature of amines** : Aliphatic amines are stronger bases than ammonia whereas aromatic amines are weaker bases than ammonia. This is because alkyl groups show electron donating inductive effect and the aryl group, electron withdrawing inductive effect.

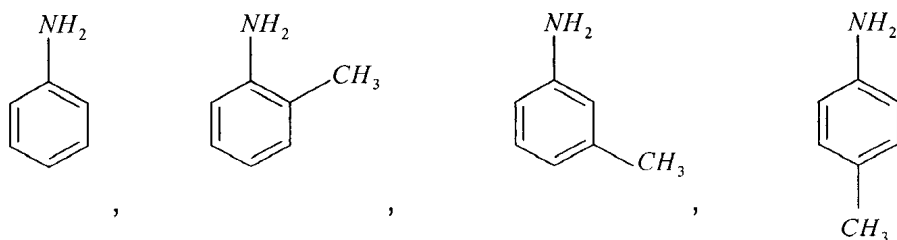
In aqueous phase, basic nature of amines depend not only on the electron availability of substituted ammonium cation by both electron donating inductive effect of alkyl group(s) and solvation of ammonium cations via hydrogen bonding.

The order of basic strength of methyl substituted amines and ethyl substituted amines in aqueous solution is as follows :-



**Basic nature of substituted arylamines** : In case of substituted anilene, electron donating groups like  $-\text{OCH}_3$ ,  $-\text{CH}_3$  increase basic strength whereas electron withdrawing groups like  $-\text{NO}_2$ ,  $\text{SO}_3^-$ ,  $-\text{COOH}$ ,  $-\text{X}$  decrease the basic strength.

**Ortho effect** : Even electron-releasing substituents weaken the basicity when they are **ortho** to the amino group and electron withdrawing do so to a much greater extent from the **ortho** position than from the meta or para position.



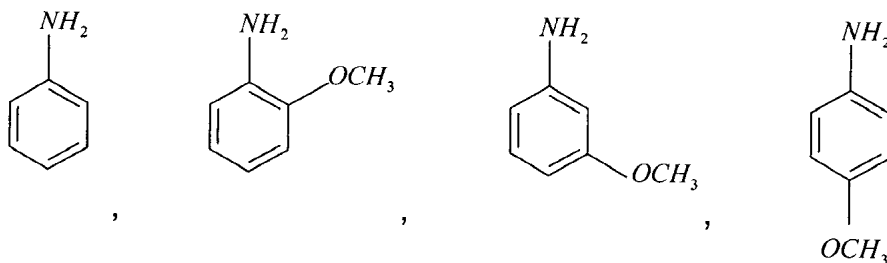
**Kb** :  $4.2 \times 10^{-10}$

$3 \times 10^{-10}$

$5 \times 10^{-10}$

$12 \times 10^{-10}$

The  $-OCH_3$  is electron-releasing by resonance effect when it is in para position to amino group and therefore it has base-strengthening effect but it decrease the basicity by electron-withdrawing inductive effect at meta position.



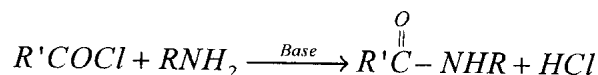
$$K_b : 4.2 \times 10^{-10}$$

$$3 \times 10^{-10}$$

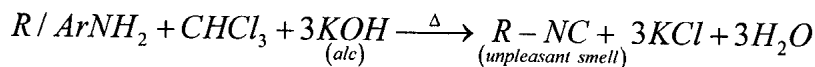
$$2 \times 10^{-10}$$

$$20 \times 10^{-10}$$

**Chemical properties :** Introduction of  $R-\overset{O}{\parallel}C-$ ,  $CH_3-\overset{O}{\parallel}C-$ ,  $C_6H_5-\overset{O}{\parallel}C-$  groups in amine molecule are respectively called acylation, acelylation and benzoylation. This reaction converts amines into substituted amides. Tertiary ammes do not undergo acylation/Acetylation/benzoylation.

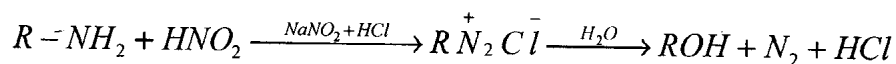


**Carbylamine reaction :**

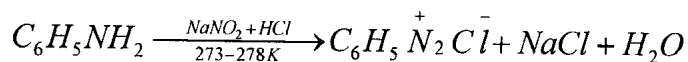


**Reaction with  $HNO_2$**

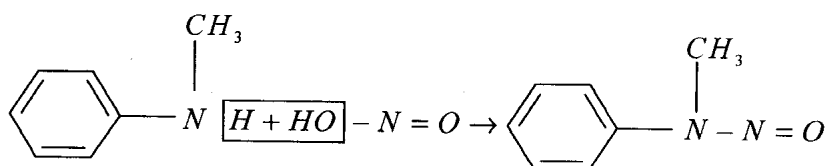
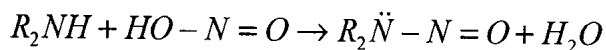
Primary aliphatic amines form alcohol and  $N_2(g)$  is liberated



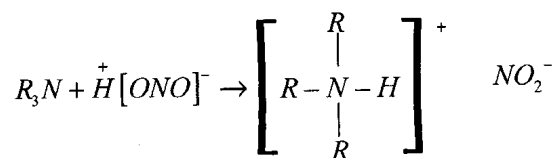
Aromatic primary amines form diazonium salts



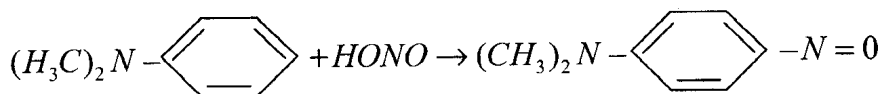
Secondary amines form yellow oily compounds insoluble in mineral acids



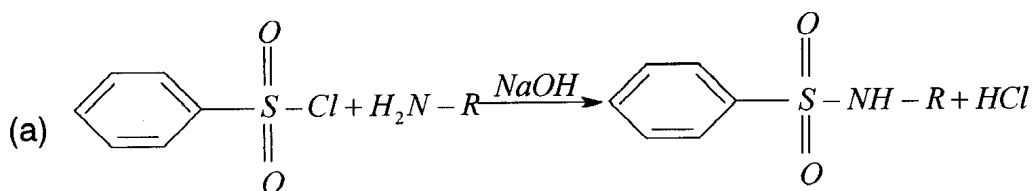
Tertiary aliphatic amines form nitrites



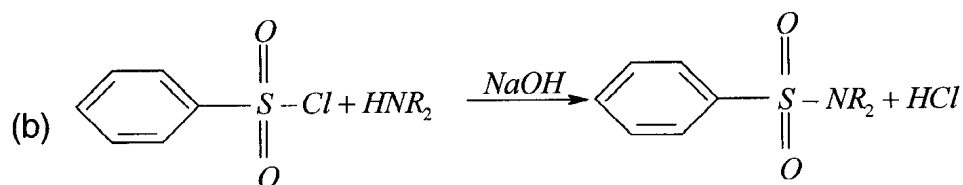
Tertiary aromatic amines undergo introduction of -NO (Nitroso group) in para position.



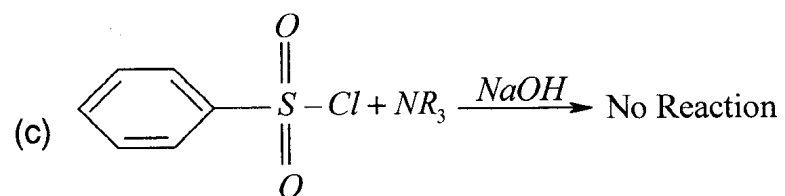
**Reaction with arylsulphonyl chloride (Hinsberg's reagent)**



N-alkyl benzenesulphonamide (soluble in alkali)

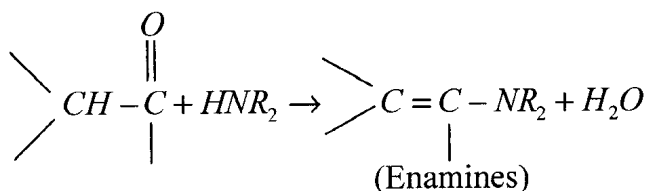
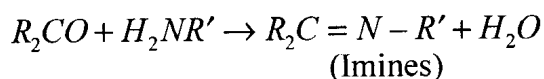


N, N- dialkyl benzene sulphonamide (insoluble in alkali)



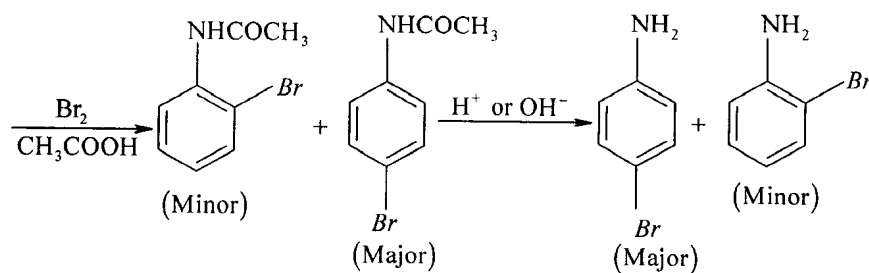
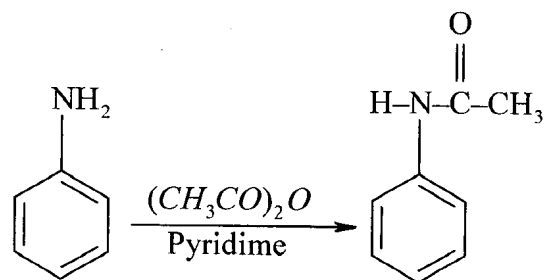
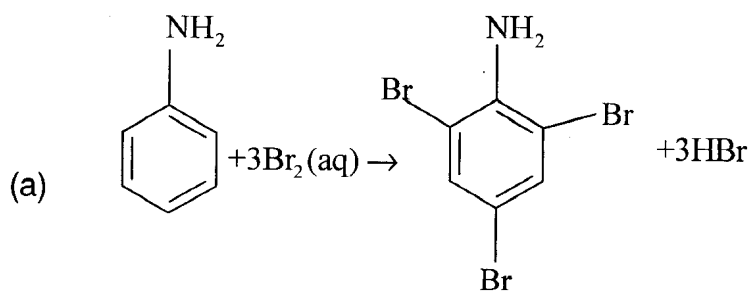
**Reaction of Amines Carbonyl compounds :-**

i° amines react with aldehydes and ketones to form **imines** (schiff bases). 2° amines form **enamines** with aldehydes / ketones that have alpha hydrogen atom(s).

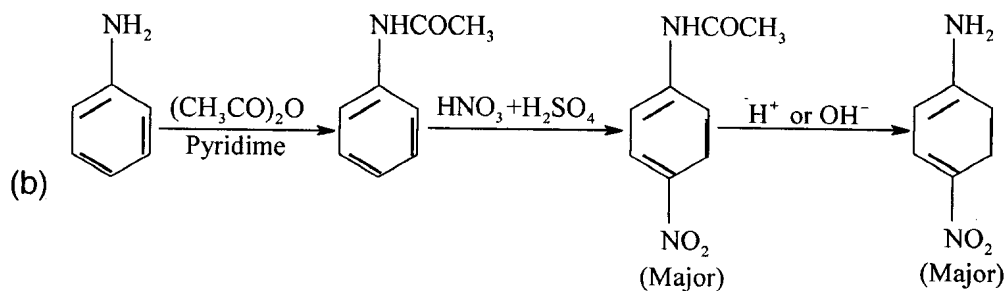
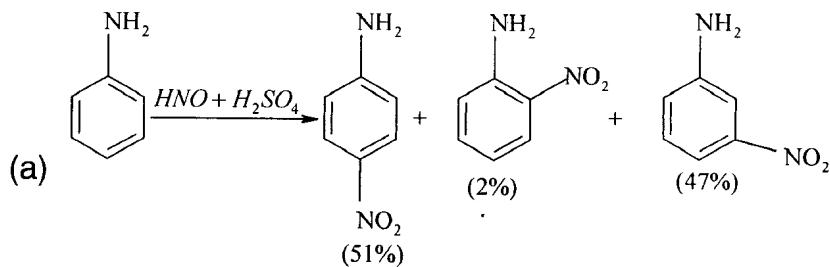


## Electrophilic substitution in aniline

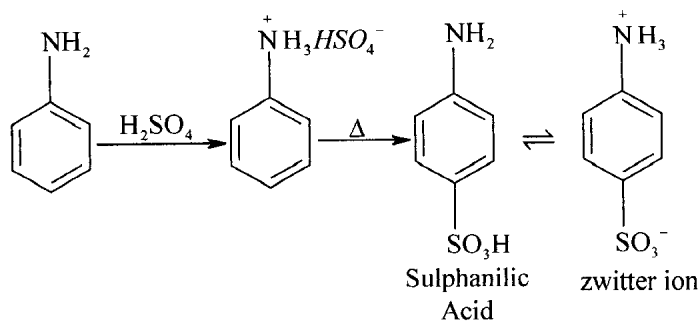
### Bromination



**Nitration :** Besides o – and p – derivative, significant amount of m – derivative is also formed. This because  $-NH_2$  group is protonated in strongly acidic medium to form  $-NH_3^+$  group which is a m-director.

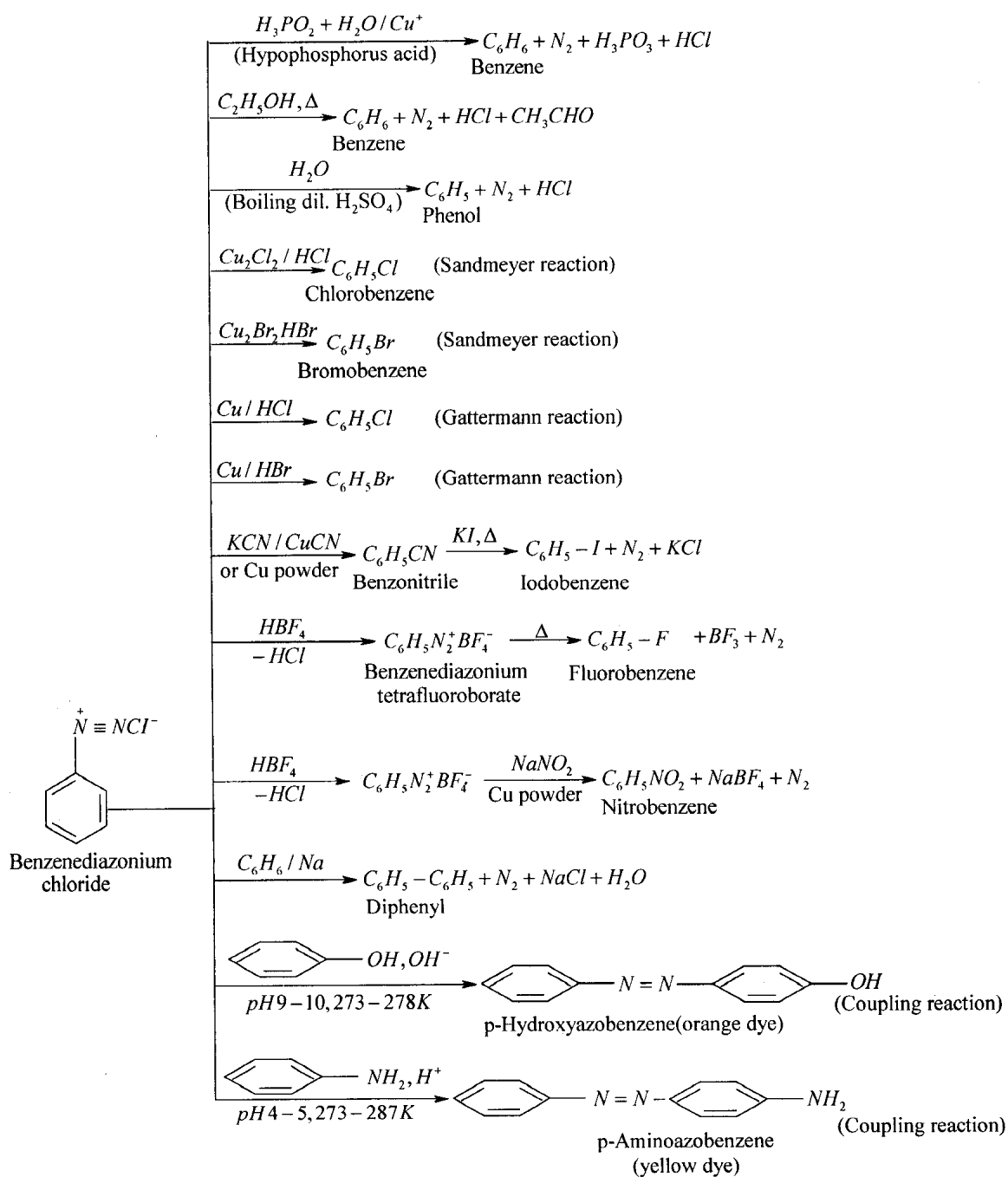


## Sulphonation :



Aniline do not undergo Friedel craft's reaction due to formation of salt with Lewis acid  $\text{AlCl}_3$ , used as catalyst due to which N atom of aniline aquires positive charge leading to deactivation of benzene ring.

## Reactions of Benzene Diazonium Chloride

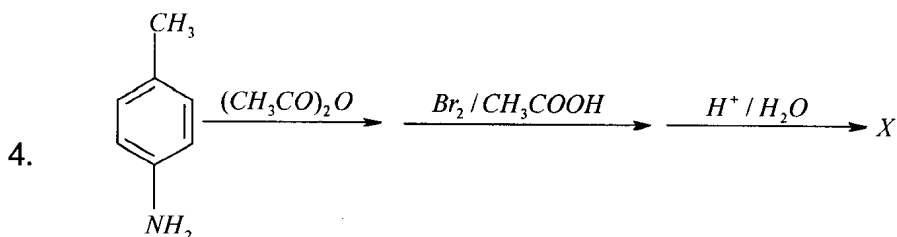


# ORGANIC COMPOUNDS CONTAINING NITROGEN

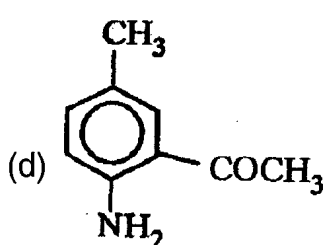
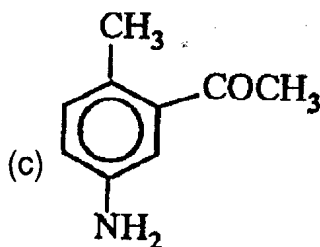
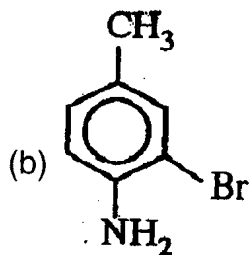
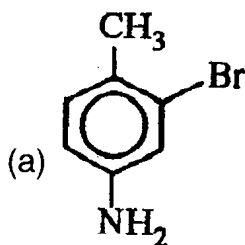
## MOCK TEST

### UNIT – 23

- The compound obtained by heating a mixture of a primary amine and chloroform with ethanolic potassium hydroxide (KOH) is :  
(a) an alkyl isocyanide                      (b) an alkyl halide  
(c) an amide                                      (d) an amide and nitro compound
- Reaction of nitrous acid with aliphatic primary amine in the cold gives  
(a) A diazonium salt                              (b) An alcohol  
(c) A nitrite                                        (d) A dye
- Which of the following reactions will not give a primary amine?  
(a)  $CH_3CONH_2 \xrightarrow{Br_2/KOH}$                       (b)  $CH_3CN \xrightarrow{LiAlH_4}$   
(c)  $CH_3NC \xrightarrow{LiAlH_4}$                               (d)  $CH_3CONH_2 \xrightarrow{LiAlH_4}$



What is X?



5. The correct order of increasing basic nature for the bases  $NH_3$ ,  $CH_3NH_2$  and  $(CH_3)_2NH$  is
- (a)  $CH_3NH_2 < (CH_3)_2NH < NH_3$   
 (b)  $CH_3NH_2 < NH_3 < (CH_3)_2NH$   
 (c)  $(CH_3)_2NH < NH_3 < CH_3NH_2$   
 (d)  $NH_3 < CH_3NH_2 < (CH_3)_2NH$
6. Among the following, weakest base is
- (a)  $C_6H_5CH_2NH_2$  (b)  $C_6H_5CH_2NHCH_3$   
 (c)  $O_2N-CH_2NH_2$  (d)  $CH_3NHCHO$
7. Carbylamine test is performed in alcoholic KOH by heating a mixture of :
- (a) Chloroform and silver powder  
 (b) Trihalogenated methane and a primary amine  
 (c) An alkyl halide and a primary amine  
 (d) An alkyl cyanide and a primary amine
8. Gabriel phthalimide reaction is used for the preparation of :
- (a) Primary aromatic amines (b) Secondary amines  
 (c) Aliphatic primary amines (d) Tertiary amines
9. Aniline first reacts with acetyl chloride producing compound 'A' which reacts with nitric acid/sulphuric acid mixture and produces compound 'B', which is hydrolysed to form compound 'C'. What is the identity of 'C'?
- (a) Acetanilide (b) p-Nitroacetanilide  
 (c) p-Nitroaniline (d) Aniline
10. Which of the following is the strongest base?
- (a)  $C_6H_5NH_2$  (b)  $C_6H_5NHCH_3$   
 (c)  $O-CH_3-C_6H_4NH_2$  (d)  $C_6H_5CH_2NH_2$
11. Amongst the following the most basic compound is
- (a) benzylamine (b) aniline  
 (c) acetanilide (d) p-nitroaniline

12.  $C_6H_5CONHCH_3$  can be converted into  $C_6H_5CH_2NHCH_3$  by
- (a)  $NaBH_4$  (b)  $H_2 - Pd/C$   
 (c)  $LiAlH_4$  (d)  $Zn - Hg / HCl$
13. What is the order of basicity of
- I. *p*-Methylaniline      II. *m*-Methylaniline  
 III. Aniline      IV. *o*-Methylaniline
- (a)  $I > II > III > IV$  (b)  $I > II > IV > III$   
 (c)  $IV > I > II > III$  (d)  $II > I > IV > III$
14. Among the following, the strongest base is
- (a)  $C_6H_5NH_2$  (b)  $p-NO_2-C_6H_4NH_2$   
 (c)  $m-NO_2-C_6H_4NH_2$  (d)  $C_6H_5CH_2NH_2$
15. Reaction of cyclohexanone with dimethylamine in the presence of catalytic amount of an acid forms a compound if water during the reaction is continuously removed. The compound formed is generally known as :
- (a) an enamine (b) a Schigg's base  
 (c) an amine (d) an imine

## Unit - 24

### Polymers

Polymers are defined as high molecular mass macromolecules which consist of repeating structural units derived from the corresponding monomers.

In presence of an organic peroxide initiator, the alkene, alkadienes and their derivatives undergo addition polymerisation or chain growth polymerisation through a free radical mechanism.

Polythene, polypropene, polystyrene, PVC, teflon (PTFE), Orlon, Buna-S, Buna-N, neoprene, etc., are formed by chain growth polymerisation.

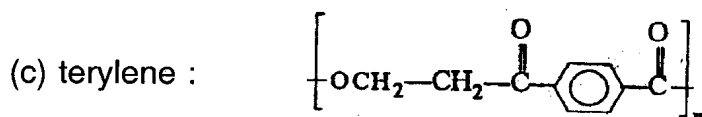
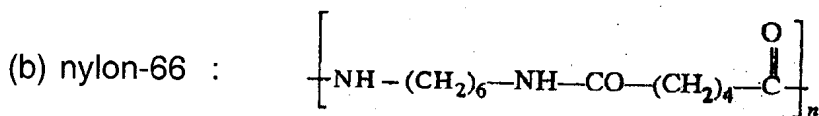
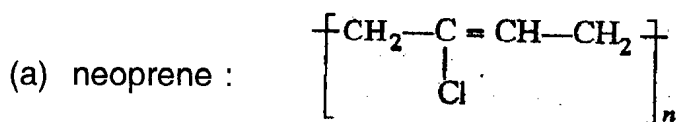
Condensation polymerisation or step growth polymerisation involves the reaction between bi-or poly functional monomers containing  $-NH_2$ ,  $-OH$  and  $-COOH$  groups. There may or may not be the elimination of simple molecules like  $H_2O$ ,  $CH_3OH$ , etc. Urea-formaldehyde resin formed from urea and formaldehyde, Glyptal formed from ethylene glycol and phthalic acid, Bakelite formed from phenol and HCHO. Nylon-66 formed from adipic acid and hexamethylenediamine, and Nylon-6 is a polymer of caprolactum. Both are polyamides. Terylene/ dacron is a polyester formed from ethylene glycol and terephthalic acid. These are the examples of step growth polymers.

Natural rubber is cis-1, 4-polyisoprene which is made tough by the process of vulcanisation with sulphur. Synthetic rubbers are homopolymers of 1, 3 - butadiene derivatives or copolymers of 1, 3 - butadiene or its derivatives with another unsaturated alkenes, e.g., neoprene, Buna - S, and Buna - N.

**Biodegradable polymers** : PHBV (copolymer of 3 - hydroxybutanoic acid and 3 - hydroxypentanoic acid), Nylon 2 - nylon 6 (a polyamide and copolymer of glycine ( $H_2N-CH_2-COOH$ ) and aminocaproic acid,  $H_2N(CH_2)_5COOH$  are biodegradable polymers .

**MOCK TEST  
POLYMERS  
UNIT – 24**

- $$\left[ -NH-(CH_2)_6-NH-CO-CH_2- \right]_n$$
 is a/an  
 (a) homopolymer (b) copolymer  
 (c) addition polymer (d) thermo-setting polymer
- Which of following is biodegradable polymer of polyamide class.  
 (a) dextran (b) nylon2-nylon 6  
 (c) Nylon - 66 (d) PHBV
- Which one of the following statements is not true  
 (a) Buna-S is a copolymer of butadiene and styrene  
 (b) Natural rubber is cis 1, 4 - polymer of isoprene  
 (c) In vulcanisation, the formation of sulphur bridges between different chains makes rubber harder and strong.  
 (d) Natural rubber has transconfiguration at every double bond.
- Which is used for the formation of nylon-66?  
 (a) Sulphur hexafluoride (b) adipic acid  
 (c) Sulphurous acid (d) Phthalic acid
- Soft drinks and baby feeding bottles are generally made up  
 (a) Polyster (b) Polyurethane  
 (c) Terelene (d) Polystyrene
- Which of the following is not correctly matched?





14. Which one of the following is a polyamide?  
(a) Teflon (b) Nylon-66  
(c) Terylene (d) Bakelite
15. Which one of the following is a fully flourinated polymer?  
(a) Neoprene (b) Teflon  
(c) Thiokol (d) PVC
16. Natural rubber is a polymer of  
(a) Butadiene (b) Ethyne  
(c) Styrene (d) Isoprene
17. Interparticle forces present in Nylon-66 are  
(a) Van der Waals  
(b) Hydrogen bonding  
(c) Dipole-dipole interactions  
(d) None of the above.
18. Terylene is a condensation polymer of ethylene glycol and  
(a) Benzoic acid (b) Phthalic acid  
(c) Salicylic acid (d) Terephthalic acid
19. Nylon-6 is made from  
(a) 1, 3-Butadiene (b) Chloroprene  
(c) Adipic acid (d) Caprolactam

## Biomolecules

1. **Carbohydrates** are optically active polyhydroxyaldehydes or ketones or molecules which give such units on hydrolysis.

**Monosaccharides** : Ribose, fructose, glucose, etc.

**Disaccharides** : Sucrose, maltose, lactose (milk sugar), etc.

**Polysaccharides** : starch (a polymer  $\alpha$ -D - glucose), Cellulose (a polymer of  $\beta$  - D - glucose), Glycogen (known as animal starch) etc. When body needs glucose, enzymes break the glycogen down to glucose. Glycogen is also found in yeast and fungi. Monosaccharides are held together by glycosidic linkages to form disaccharides or polysaccharides.

2. **Proteins are polymers** of about twenty  $\alpha$ -aminoacids which are linked by peptide bonds. Ten aminoacids are called essential aminoacids because they cannot be synthesised by our body, hence must be provided through diet. Proteins perform various structural and dynamic functions in the organisms.

Primary structure refers to sequence of aminoacids in the polypeptide chains.

Secondary and tertiary structures of proteins get disturbed on change of pH or temperature and they are not able to perform their functions. This is called denaturation of proteins. During denaturation  $2^\circ$  and  $3^\circ$  structures are destroyed but  $1^\circ$  structure remains intact. The coagulation of egg on boiling and curdling of milk (caused by formation of lactic acid by bacteria present in the milk) are the examples of denaturation.

Enzymes are biological catalyst which speed up reactions in the biosystems. They are highly specific, efficient and selective in their action and chemically all enzymes are proteins.

Vitamins are accessory food factors required in diet. They are classified as fat soluble (A, D, E, and K) and water soluble (B - group, and C. Vitamin H (Biotin) is neither water soluble nor fat soluble. Deficiency of vitamins lead to many diseases.

Nucleic acids are the polymers of nucleotides which, in turn, consist of a base, pentose sugar and phosphate moiety. There are two types of nucleic acids – DNA and RNA. DNA contains a five-carbon sugar molecule called  $\beta$ -D- 2-deoxyribose sugar whereas RNA contains  $\beta$ -D-ribose sugar. Both DNA and RNA contain adenine, guanine and cytosine. The fourth base is thymine in DNA and uracil in RNA. DNA is a double strand molecule whereas RNA is single strand

molecule. DNA is the chemical basis of heredity and have coded message for proteins to be synthesised in the cell. There are three types of RNA : m RNA, r RNA and t RNA which carry out the proteins synthesis in the cell-

**Pyrimidine bases:** Thymine, cytosine, and uracil

**Purine bases :** Adenine, guanine.

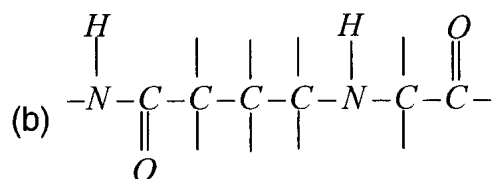
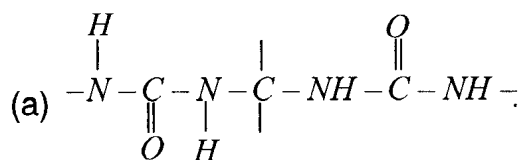
Adenine forms two hydrogen bonds with thymine and guanine forms three hydrogen bonds with cytosine in the double strand helix structure of DNA.

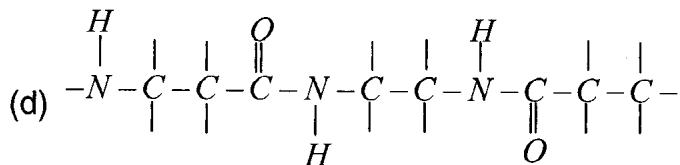
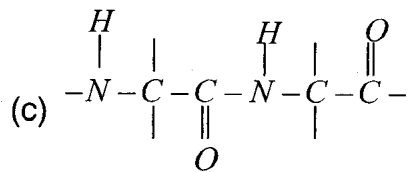
**NOTE :-** Refer to the table 14.3 NCERT Text Book, XII class, Part II, page 418 for some important vitamins, their sources and deficiency diseases.

# MOCK TEST BIOMOLECULES

## UNIT – 25

1. Which one of the following is not a protein?  
 (a) Wool (b) Nail  
 (c) Hair (d) DNA
  
2. Enzymes belong to which class of compounds?  
 (a) Polysaccharides  
 (b) Polypeptides  
 (c) Polynitro heterocyclic compounds  
 (d) Hydrocarbons
  
3. Glucose reacts with acetic anhydride to form :  
 (a) Monoacetate (b) Tetraacetate  
 (c) Pentaacetate (d) Hexaacetate
  
4. The hormone that helps in the conversion of glucose into glycogen is  
 (a) Cortisone (b) Bile acids  
 (c) Adrenaline (d) Insulin
  
5. The correct statement in respect of protein haemoglobin is that it  
 (a) functions as a catalyst for biological reactions  
 (b) maintains blood sugar level  
 (c) acts as an oxygen carrier in the blood  
 (d) forms antibodies and offers resistance to diseases
  
6. Which of the following structures represents the peptide chain?





7. The helical structure of protein is stabilized by  
 (a) dipeptide bonds (b) hydrogen bonds  
 (c) ether bonds (e) peptide bonds
8. Insulin production and its action in human body are responsible for the level of diabetes. This compound belongs to which of the following categories?  
 (a) a co-enzyme (b) a hormone  
 (c) an enzyme (d) an antibiotic
9.  $\alpha$  and  $\beta$ -Glucose differ in the orientation of  $-OH$  group around  
 (a)  $C_1$  (b)  $C_2$   
 (c)  $C_3$  (d)  $C_4$
10. The cell membranes are mainly composed of  
 (a) Phospholipids (b) Proteins  
 (c) Fats (d) Carbohydrates
11. In both DNA and RNA, heterocyclic base and phosphate ester linkages are at  
 (a)  $C_{5'}$  and  $C_{2'}$ , respectively of the sugar molecule  
 (b)  $C_{2'}$  and  $C_{5'}$ , respectively of the sugar molecule  
 (c)  $C_{1'}$  and  $C_{5'}$ , respectively of the sugar molecule  
 (d)  $C_{5'}$  and  $C_{1'}$ , respectively of the sugar molecule
12. In DNA, the complementary bases are :  
 (a) Uracil and adenine : cytosine and guanine  
 (b) Adenine and thymine : guanine and cytosine

- (c) Adenine and thymine : guanine and uracil  
(d) Adenine and guanine : thymine and cytosine
13. Vitamin A is called  
(a) Ascorbic acid (b) Retinol  
(c) Calciferol (d) Tocopherol
14. Which of the following is the sweetest sugar?  
(a) Sucrose (b) Glucose  
(c) Fructose (d) Maltose
15. The deficiency of vitamin-C causes  
(a) Scurvy (b) Rickets  
(c) Pyrrrohea (d) Pernicious anaemia
16.  $\alpha$ -D (+)-glucose and  $\beta$ -D (+)-glucose are  
(a) Enantiomers (b) Geometrical isomers  
(c) Epimers (d) Anomers
17. Which is the correct statement?  
(a) Starch is polymer of  $\alpha$ - glucose  
(b) Amylose is a component of cellulose  
(c) Proteins are composed of only one type of amino acids  
(d) In cyclic structure of furanose, there are four carbons and one oxygen atom.
18. The reason for double helical structure of DNA is operation of  
(a) electrostatic attractions (b) van der Waals forces  
(c) dipole-dipole interactions (d) hydrogen bonding
19. Chargaff's rule states that in an organism.  
(a) Amount of adenine (A) is equal to that of thymine (T) and the amount of guanine (G) is equal to that of cytosine (C)  
(b) Amount of adenine (A) is equal to that of guanine (G) and the amount of thymine (T) is equal to that of cytosine (C)  
(c) Amount of adenine (A) is equal to that of cytosine (C) and the amount of thymine (T) is equal to that of guanine (G)  
(d) Amounts of all bases are equal.

### Chemistry in Everyday Life

A **drug/ medicine** is a chemical used in diagnosis, prevention and treatment of diseases. Use of chemicals for therapeutic effects is called Chemotherapy. Drugs interact with target molecules such as carbohydrates, proteins, lipids and nucleic acids. Various drugs like analgesics, antibiotics, antiseptics, disinfectants, antacids antihyamines and tranquilizers are used for specific purposes.

**Antacids** are used to increase the pH to appropriate level in stomach. The commonly used antacids are sodium bicarbonate, metal hydroxides  $[Mg(OH)_2, Al(OH)_3]$ ,  $MgCO_3$ , and  $AlPO_4$ , etc.

**Antihistamines** like cimetidine (Tegamet), ranitidine (Zintacl) prevent the interaction of hytamine with receptors in the stomach, otherwise, hytamines stimulates the secretion of pepsin and hydrochloric acid in the stomach. These two above mentioned antihyamines are used in the treatment of hyperacidity.

**Tranquilizers** are a class of chemical compounds used for the treatment of stress and mental diseases. They are components of sleeping pills. If the level of noradrenaline, a neutrotransmitter, becomes low then the person suffers from depression which can be treated by anti depressant drugs. These drugs inhibit the enzymes which catalyse the degradation of norandrenaline. Iproniazid and phenelzine are used as antidepressant. Chlordiazepoxide and meprobamate are the mild tranquilizers used for relieving tension. Eqnamil is used in controlling depression and hypertension. Veronal, amytal, Nembutal, luminal and seconal used as tranquilizers are the derivatives of barbituric acid. These are hypnotic.

**Analgesics** are used to reduce or abolish pain.

**Non-narcotic analgesics** are aspirin and paracetamol.

These drugs show antipyretic action and prevent the platelet coagulation. Because of anti blood clotting action, aspirin finds use in the prevention of heart attacks.

**Narcotic analgesies** are morphine, heroin and codeine (which are addictive) are used to reduce pain and produce sleep in postoperative pain, cardiac pain and pains of terminal cancer and in child birth.

**Antibiotics** are substances produced wholly or partly by chemical synthesis which inhibit the growth or destroy microorganism by intervening in their metabolic processes. Penicillin G has narrow spectrum whereas ampicillin, amoxycillin, ofloxacin, vancomycin, tetracycline, erythromycin and chloramphenicol (used in the treatment of typhoid, meningitis

and pneumonia) are important broadspectrum antibiotics.

**Antiseptics and disinfectants** are the chemicals which either kill or prevent the growth of microorganism. Antiseptics are applied to living tissues. Examples are furacine, soframincine, dettol (mixture of chloroxylenol and terpineol), tincture of iodine (alcohol-water mixture of  $I_2$ ), iodoform, dilute boric acid solution. Disinfectants are applied to inanimate objects. 0.2 to 0.4 ppm solution of  $Cl_2$ , and  $SO_2$  in low concentrations are used as disinfectants.

Some substances can act as an antiseptics as well as disinfectants, e.g. 1% solution of phenol acts as disinfectant and 0.02% solution of phenol as antiseptic.

**Antifertility drugs** : progesterone derivative like norethindrone, estrogen derivative combined with progesterone derivative are used as antifertility drugs.

**Artificial sweetening agents** are aspartame, saccharin, sucrolose and altitame.

**Food preservatives** prevent spoilage of food due to microbial growth. Examples are table salt, sugar, vegetable oils and sodium benzoate.

**Soaps and detergents** : soaps are sodium salts of long chain fatty acids, e.g., stearic, oleic and palmitic acids. Soaps do not work in hard water because they form insoluble soaps which are useless as cleansing agent.

**Synthetic detergents are classified as :**

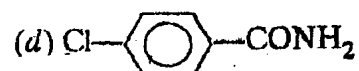
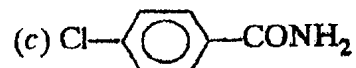
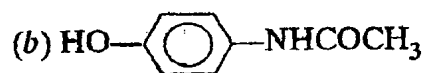
- (i) Anionic detergents which are sodium salts of sulphonated long chain alcohols or hydrocarbons. Anionic part of detergent is involved in the cleansing action. They are used for **household work and in toothpastes**.
- (ii) Cationic detergents which are the quaternary ammonium salts of amine with  $CH_3COO^-$ ,  $Cl^-$ , or  $Br^-$  as anions. Cetyltrimethylammonium bromide is used in hair **conditioners**. These detergents have **germicidal properties**.
- (iii) Non-ionic detergents do not contain any ion. Liquid dishwashing detergents are non-ionic type.

Detergents with straight chain of hydrocarbons are preferred over branched chain as the latter are non-biodegradable and consequently cause environmental pollution.

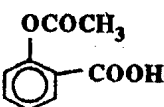
**MOCK TEST**  
**CHEMISTRY IN EVERYDAY LIFE**

**UNIT – 26**

1. Amoxillin is semi-synthetic modification of  
(a) Penicillin (b) Streptomycin  
(c) Tetracycline (d) Vat dye
2. 2-Acetoxybenzoic acid is called  
(a) Antiseptic (b) Aspirin  
(c) Antibiotic (d) Mordant dye
3. A broad spectrum antibiotic is  
(a) Paracetamol (b) Penicillin  
(c) Aspirin (d) Chloramphenicol
4. The correct structure of the drug paracetamol is



5. An ester used as medicine is  
(a) ethyl acetate (b) methyl acetate  
(c) methyl salicylate (d) ethyl benzoate

6. The compound  is used as

- (a) antiseptic (b) antibiotic  
(c) analgesic (d) pesticide

7. Which one of the following is not a surfactant?

