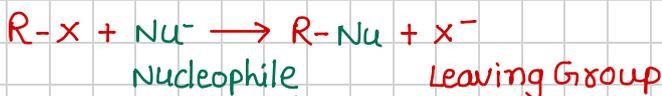


Chemistry - II

By Dharmendra Gaur



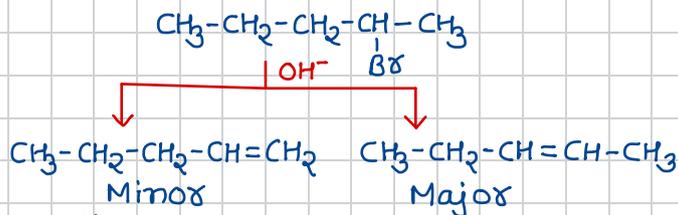
DRGP Institute



Reagent	Nucleophile	
NaOH/KOH	OH ⁻	→ Alcohol
NaOR'	R'O ⁻	→ Ether
NaI	I ⁻	→ RI
KCN	CN ⁻	→ Nitrile
AgCN	CN:	→ Isonitrile
KNO ₂	ONO ⁻	→ Nitrite
AgNO ₂	NO ₂ ⁻	→ Nitroalkane
LiAlH ₄	H ⁻	→ Hydrocarbon
R'M ⁺	R' ⁻	→ Alkane

Cyanide & Nitrites have 2 nucleophile centres are called Ambident Nu⁻.

B. Elimination Reaction

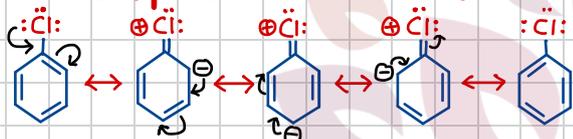


Zaitsev/Saytzeff Rule-

In dehydrohalogenation reaction the preferred product is alkene which has the greater number of alkyl groups attached to the doubly bonded C atoms.

Chemical Reaction of Haloarene

A. Nucleophilic Substitution

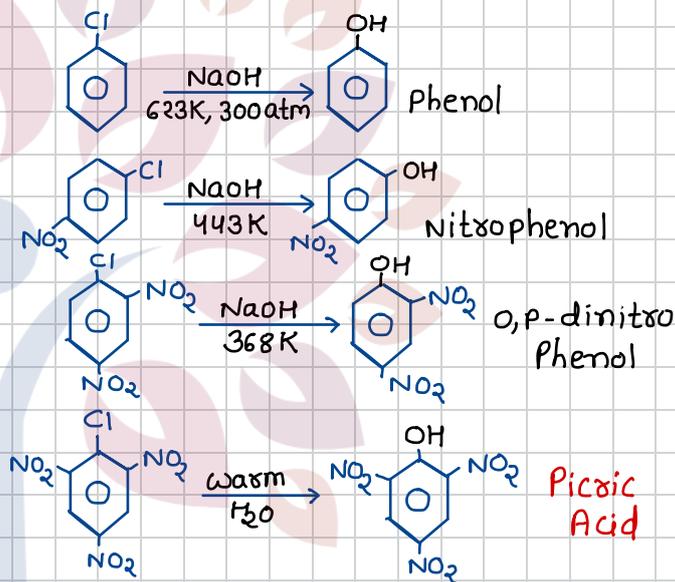
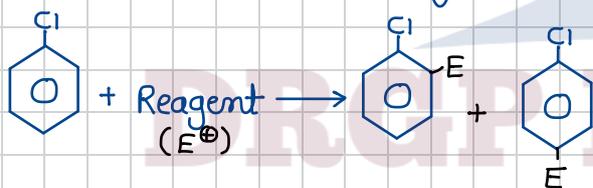


Aryl halide less reactive than Alkyl halide

1. C-Cl bond acq. partial double bond.
2. More E-N of C due to sp² hybridization. C-Cl bond is more strong.
3. Instability of phenyl cation
4. Nu⁻ get repulsion e⁻ rich arenes.

B. Electrophilic Substitution

Resonating structure shows that Cl is ortho and meta directing and ESR occurs at o & p position.



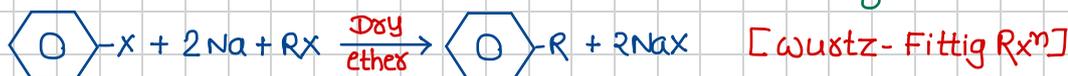
Reagent

1. Cl₂ (Anhyd. FeCl₃)
2. HNO₃ (conc. H₂SO₄)
3. conc. H₂SO₄
4. CH₃Cl (Anhyd. AlCl₃)

E⁺
Cl⁺
NO₂⁺
SO₃H⁺
CH₃⁺
CH₃-C(=O)⁺

} Friedel Crafts Reaction

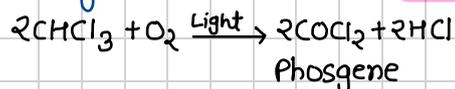
B. Reaction With Metal



Polyhalogen Compound

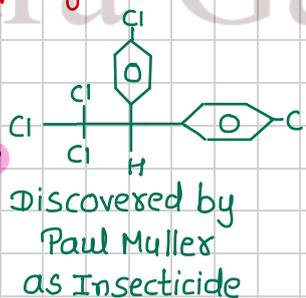
CH₂Cl₂, CHCl₃, CHI₃, CCl₄, DDT

Chloroform
Should kept in dark airtight container



p,p'-Dichlorodiphenyl trichloroethane

Iodoform-Release I₂ and act as Antiseptic.



Freemans

Chloroform Carbon

Freem-XYZ

X = no. of C-1

Y = no. of H+1

Z = no. of F

CCl₂F₂ - Freem-12

Formed by Swarts R_xⁿ of CCl₄.

Board-2021

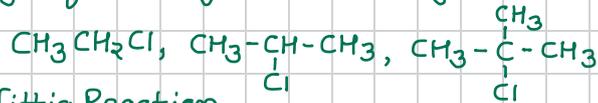
1. Hybridized state of carbon atom bonded to halogen atom in chlorobenzene.

- A. sp^3 B. sp^2 C. sp D. sp^3d^2

Ans - sp^2 hybridized.

2. (a) Write structural formula of allyl chloride

(b) Arrange following in increasing order of reactivity towards S_N1 Rx^n



(c) Write Fittig Reaction.

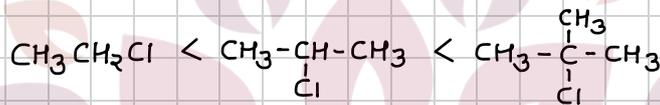
Answer - (a) Allyl chloride - $CH_2=CH-CH_2X$ or 

(b) Reactivity order of S_N1 Reaction -

- In S_N1 mechanism - Reaction proceeds in 2 steps.

- In first step carbocation is formed.

Reactivity depends on stability of carbocation.



(c) Fittig Rx^n -



3. (a) Write structural formula of Benzyl chloride.

(b) Arrange following according to S_N1 Reaction.



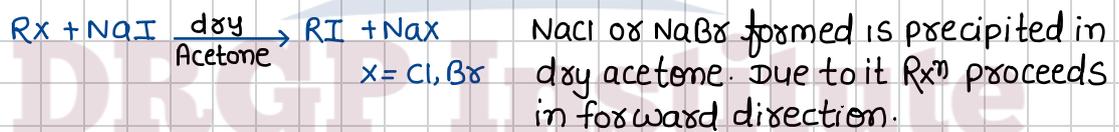
(c) Explain Finkelstein Reaction.

Answer - (a) Benzyl chloride - $C_6H_5CH_2Cl$ or 

(b) $C_6H_5Cl < CH_3CH_2Cl < C_6H_5CH_2Cl$

(According to stability of carbocation)

(c)



Board-2022

4. The compound having highest carbon-halogen (C-X) bond length is -

- A. CH_3F B. CH_3Cl C. CH_3Br D. CH_3I

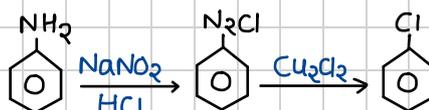
Answer - CH_3I

5. Compound [A] is obtained on reacting aniline with $(NaNO_2 + HCl)$ at 273-278K.

Compound [B] is obtained on mixing Cu_2Cl_2 in [A]. Write names of [A] & [B] and equations of chemical reactions involved.

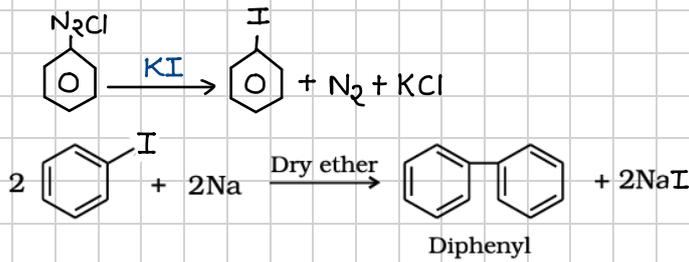
Answer - Compound [A] - Benzene diazonium chloride

Compound [B] - Chlorobenzene.



6. Compound [A] is obtained on mixing benzene diazonium chloride with KI solution. Compound [B] is obtained on reacting sodium with [A] in presence of dry ether write names of [A] and [B] and equations of chemical Rxⁿ.

Answer -



Compound [A] - Iodobenzene
Compound [B] - Diphenyl

Board-2023

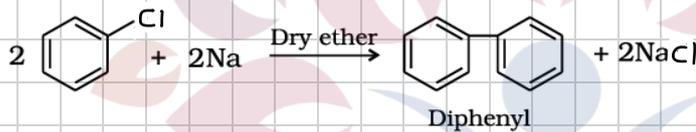
7. The name of CF_2Cl_2 in freon method is -

a. Freon-112 b. Freon-12 c. Freon-122 d. Freon-11

Answer - Freon-12

8. Write chemical equation to prepare diphenyl from chlorobenzene.

Answer -



9. Explain Swarts reaction by one example.

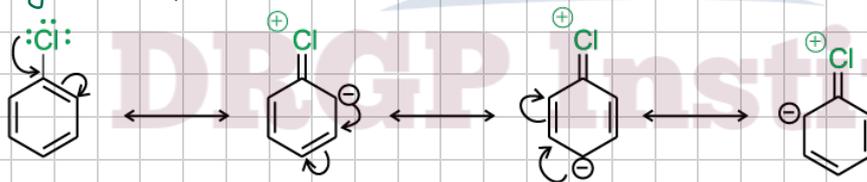
Answer - It is one of the methods of halogen exchange. It is used to prepare RF.



Board-2024

10. Despite being an electron withdrawing group why Cl-group is ortho and para directing in ESR? Give reason.

Answer -



Due to resonance structure, the e^- density increases more at o & p. So, it is o & p directing.

in ESR. Inductive effective (electron withdrawing) decide Reactivity. But Resonance effect decide orientation.

11. Explain - (i) B.P of isomeric haloalkanes decrease with increase in branching.
(ii) The M.P of p-isomer is higher than those o & m-isomer dichlorobenzenes.
(iii) The racemic mixture of an optically active compound is always optically inactive.

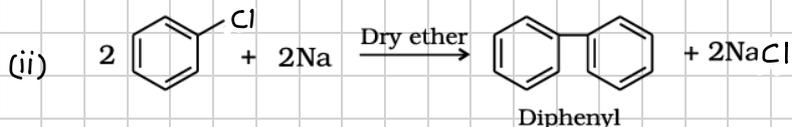
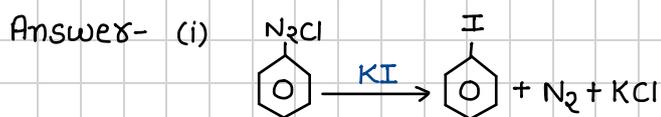
Answer - (i) The B.P depends on intermolecular attraction. As branching increase intermolecular attraction decrease. So, B.P decreases.

(ii) Due to symmetry of p-isomer fits in crystal lattice better than o & m. It allows better intermolecular attraction and cause of higher M.P.

(iii) The racemic mixture is mixture of equal % of d & l isomer of optical active compound. It is optically inactive as rotation of PPL by one enantiomer

is canceled out by other one.

12. Convert following (single step Rxⁿ) - (i) B.D.C to iodobenzene
(ii) chlorobenzene to diphenyl
(iii) Chloroethane to ethene.



Board-2024 (Supp)

13. Thionyl chloride among the following - A. SOCl_2 B. SO_2Cl_2 C. SO_2Cl D. SOCl_3

Answer - SOCl_2

14. The hybrid state of carbon attached to halogen in vinylic halide is -

Answer - sp^2 hybridization

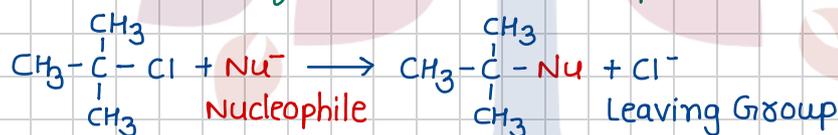
15. IUPAC name of isobutyl chloride - $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{Cl}$

Answer - 1-chloro-2-methylpropane

16. Write chemical equation of Fittig Reaction.

17. Write the mechanism of unimolecular nucleophilic substitution Reaction.

Answer -

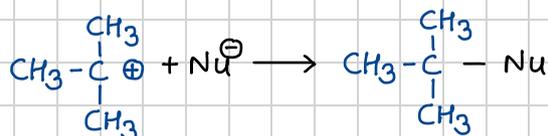


Mechanism-

Step-1 Formation of carbocation (slow)



Step-2 Attacking of Nu^- (fast)



→ Shows Racemisation.

$$\text{Rate} = k [(\text{CH}_3)_3\text{CCl}]$$

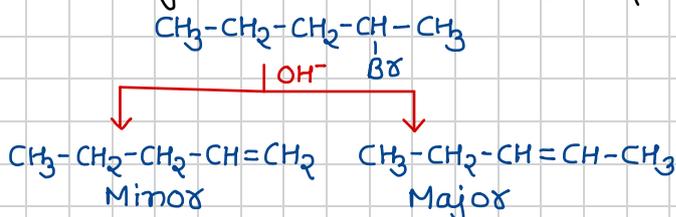
$$\text{Order} = 1$$

Factor Affecting -

1. Stability of C^\oplus
 $3^\circ\text{RX} > 2^\circ\text{RX} > 1^\circ\text{RX} > \text{CH}_3\text{X}$
2. Type of Rx
 $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$
3. Polar protic solvent favours this type.

18. Explain the β -elimination reaction by taking 2-bromopentane as eg.

⇒ β -elimination is a chemical reaction in which a small molecule like H_2O , HX is removed from two adjacent carbon atoms (α & β carbons). Due to it alkene is formed.



Board-2025

19. Thionyl chloride is - SOCl_2

20. The hybridised state of carbon atom attached to halogen atom in benzylic halide

Answer - sp^3 Hybridization.

21. Write chemical eqⁿ of Fittig Rxⁿ.

22. Define the following terms - (a) optical activity (b) chirality

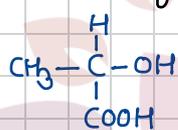
Answer - (a) Optical Activity - It is the property of a substance to rotate the plane of PPL. If a compound rotates the light, it is optically active. There are two types of optical active compounds -

(i) dextro-rotation - Rotates PPL clockwise.

(ii) levo-rotation - Rotates PPL anticlockwise.

(b) Chirality - Chirality is the property of a molecule that makes it non superimposable on its mirror image. A molecule is chiral if - it has chiral carbon (Asymmetric carbon). A

carbon having 4 different groups is called chiral carbon. Compound having chirality is optical active compound.



23. Explain the mechanism of unimolecular $\text{SN}_1 \text{Rx}^n$.

Board-2025 (Supp.)

24. In structure of o-chlorotoluene  the group at 'x' -

Answer - CH_3 .

25. Write molecular formula of Freon-12.

Answer - CF_2Cl_2 .

26. Write chemical eqⁿ to prepare iodobenzene from benzene diazonium chloride.

Answer - $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{KI} \longrightarrow \text{C}_6\text{H}_5\text{I} + \text{N}_2 + \text{KCl}$

27. (i) Write chemical formula and IUPAC name of chloroform.

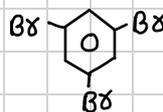
(ii) Explain SN_1 Reaction.

(iii) Draw structure of sym-tribromobenzene.

Answer - (i) CHCl_3 [Trichloromethane].

(ii) $\text{SN}_1 \text{Rx}^n$

(iii) 1,3,5-tribromobenzene



28. (i) Write chemical formula and IUPAC name of Iodoform.

(ii) Explain bimolecular $\text{SN}_2 \text{Rx}^n$ by an example.

(iii) Write structural formula of benzylchloride.

Answer - (i) CHI_3 [Triiodomethane]

(ii) $\text{SN}_2 \text{Rx}^n$ - Single step $\text{SN}_2 \text{Rx}^n$

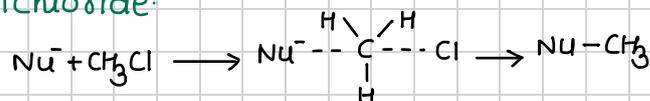
- Second order Rx^n

Rate $\propto [\text{CH}_3\text{Cl}][\text{Nu}^-]$

- Nu^- must be stronger

- Polar aprotic solvent support it.

- Reactivity - $\text{RI} > \text{RBr} > \text{RCI} > \text{RF}$



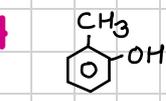
Transition state

$3^\circ \text{RX} < 2^\circ \text{RX} < 1^\circ \text{RX} < \text{CH}_3\text{X}$

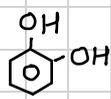
{ Steric hindrance \downarrow
Reactivity }

\rightarrow Shows Walden inversion.

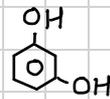
C. Phenol - ArOH



o-cresol
2-Methylphenol



catechol
Benzene-1,2-diol



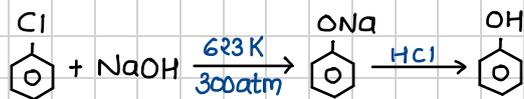
Resorcinol



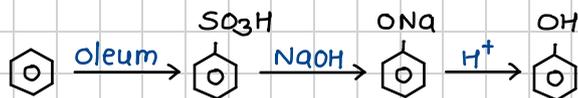
Hydroquinone
or Quinol

Preparation

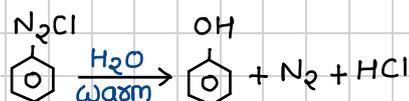
1. From haloarene



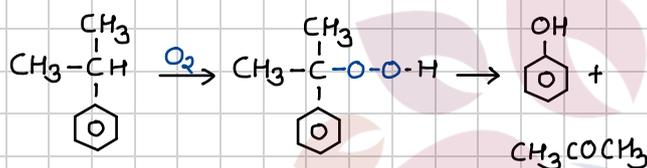
2. From Benzene Sulphonic Acid



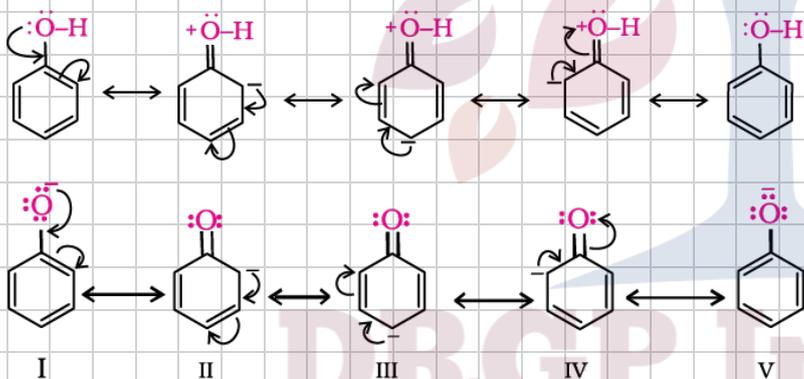
3. From Benzene diazonium Salt



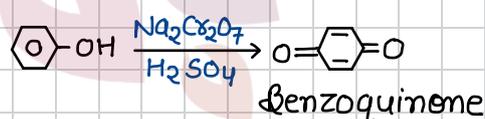
4. From cumene



Resonance



8. Oxidation



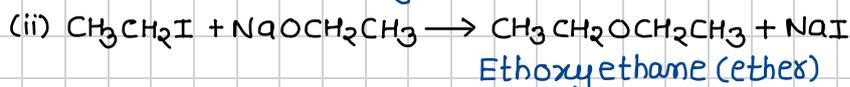
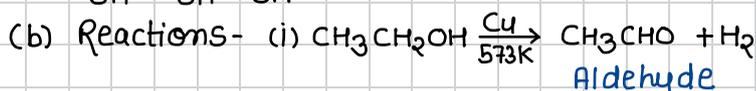
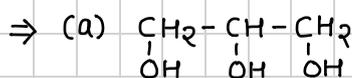
Due to Resonance phenoxide ion more stable than Alkoxide ion and it is the reason of -
"Phenol is more Acidic than Alcohol".

Board-2021

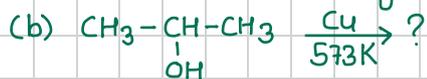
1. Write IUPAC Name of diethyl ether.



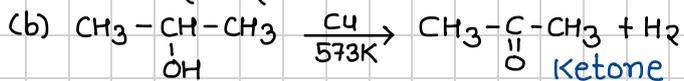
2. (a) Write structural formula of Glycerol



3. (a) write structural formula of ethylene Glycol.



⇒ (a) $\text{HO}-\text{CH}_2-\text{CH}_2-\text{OH}$

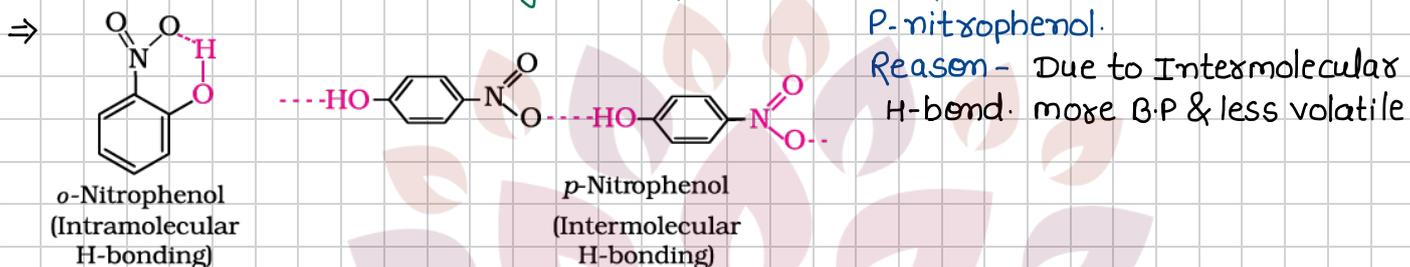


Board-2022

4. The correct ascending order of boiling points of CH_3OCH_3 , $\text{CH}_3\text{CH}_2\text{OH}$ & $\text{CH}_3\text{CH}_2\text{CH}_3$.

⇒ $\text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{OCH}_3 < \text{CH}_3\text{CH}_2\text{OH}$

5. _____ is less volatile among o-nitrophenol & p-nitrophenol.

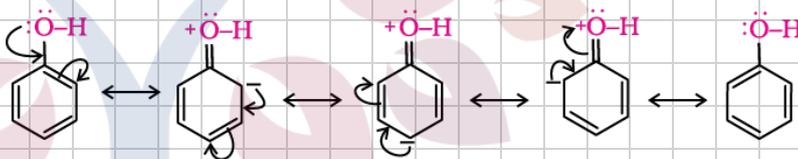


6. (i) C-O bond length present in phenol is less than methanol.

(ii) C-O-C bond angle present in ether is more than tetrahedral angle.

(iii) Boiling point of isomeric alcohol is lowered on increasing in branching.

⇒ (i) Phenol shows resonance due to it, C-O bond acquires partial double bond. Due to it bond length is less than CH_3OH .



(ii) Due to repulsive interaction b/w two bulky alkyl group C-O-C bond angle in ether is more than tetrahedral angle.

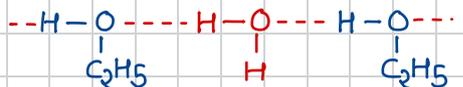
(iii) B.P depends on van der Waals interaction. As branching increase van der Waals interaction decrease and B.P decrease.

7. (i) Boiling point of ethanol is more than methoxy methane. why?

(ii) Ethanol easily dissolved in water. why?

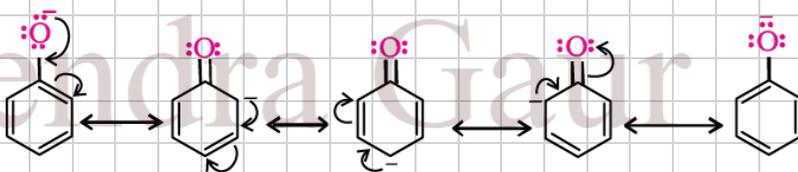
(iii) Phenol is more acidic than alcohol. why?

⇒ (i) B.P of $\text{C}_2\text{H}_5\text{OH} > \text{CH}_3\text{OCH}_3$. Ethanol shows intermolecular H-bond. So, B.P is higher.

(ii)  Ethanol form H-bond with water. Due to it, ethanol is soluble in water.

(iii) Acidic strength -

Phenol form stable $\text{C}_6\text{H}_5\text{O}^-$ intermediate compare to RO^- intermediate formed by Alcohol.



→ Phenoxide ion - stabilise by Resonance, RO^- - Destabilise by +I of R.

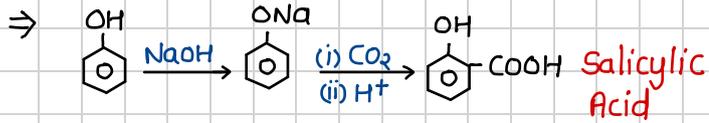
Board-2023

8. In reaction of formation of Phenol from cumene the by product is-

⇒ Acetone.

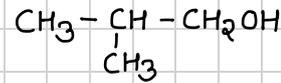
9. In Williamson Synthesis the _____ reacts with RONA & give dialkylether.
⇒ Alkyl halide

10. Write chemical equation to prepare salicylic acid from phenol.



11. Write IUPAC Name of Isobutyl alcohol.

⇒ 2-Methylpropan-1-ol

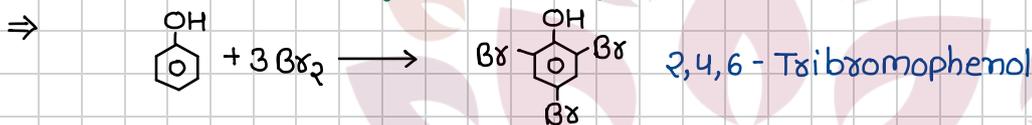


Board-2024

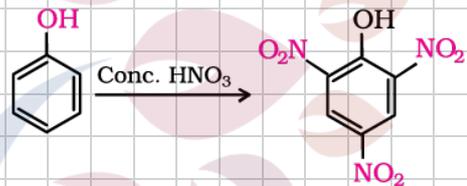
12. In Benzylic alcohols -OH group is bonded with _____ hybridised carbon.

⇒ sp^3 Hybrid.

13. Write the name of chemical of white precipitate when phenol + Br_2 water.

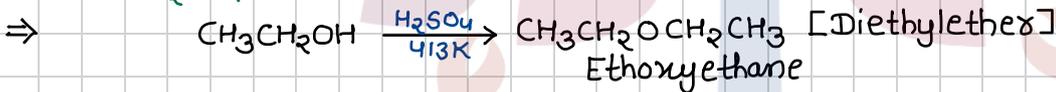


14. Write the IUPAC Name and chemical formula of A.



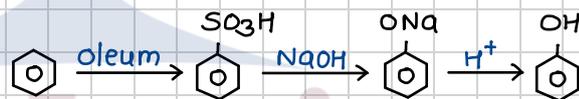
2,4,6-Trinitrophenol
(Picric acid)

15. Compound X is formed by heating ethanol with conc. H_2SO_4 and 413K. Write IUPAC Name and rxn .



16.  $\xrightarrow{\text{oleum}}$ [A] $\xrightarrow[\text{(ii) H}^+]{\text{(i) NaOH}}$ [B]

⇒ (i) Benzene Sulphonic Acid (ii) Phenol



Board-2024 (Supp.)

17. Unsymmetric ether is - (a) $\text{CH}_3 - \text{O} - \text{CH}_3$ (b) $\text{C}_2\text{H}_5 - \text{O} - \text{C}_2\text{H}_5$
⇒ $\text{CH}_3 - \text{O} - \text{C}_2\text{H}_5$ (c) $\text{CH}_3 - \text{O} - \text{C}_2\text{H}_5$ (d) $\text{C}_6\text{H}_5\text{OH}$

18. Trihydric alcohol is - (a) n-Propyl alcohol (b) iso-Propyl alcohol
⇒ Glycerol (c) Ethylene Glycol (d) Glycerol

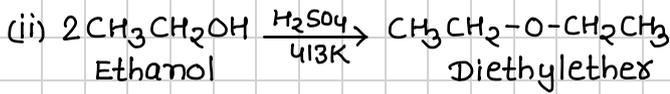
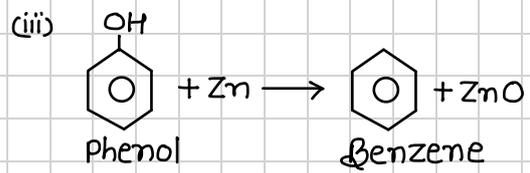
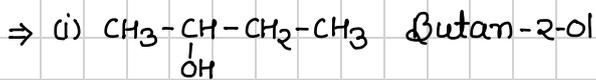
19. When phenol reacts with bromine water, the product is _____

⇒

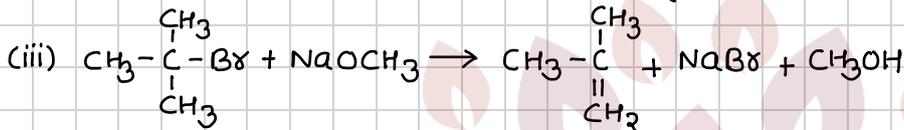
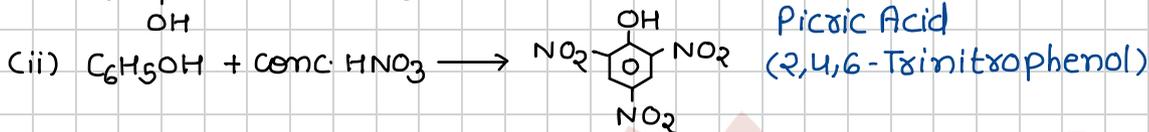
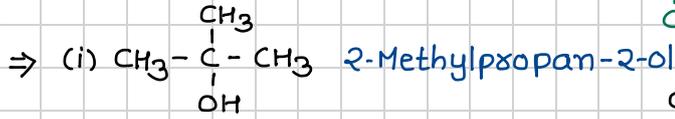
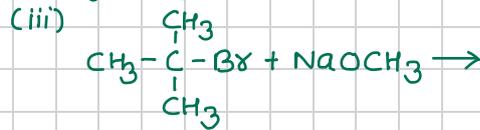
20. Draw Resonating structure of Phenoxide ion.

21. (i) Draw structural formula of sec-Butyl alcohol.





22. (i) Draw structure of Tertiary butyl alcohol.



Note - For Williamson ether synthesis -
 $\text{CH}_3\text{Br} + \text{NaOC}(\text{CH}_3)_3$

Board-2025

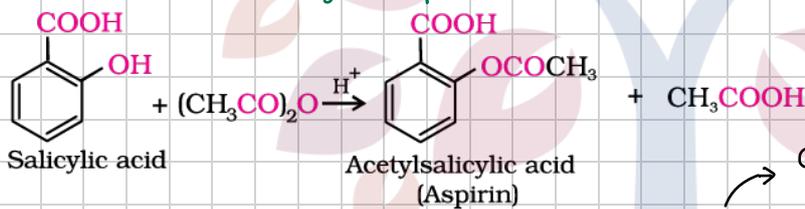
23. Asymmetrical ether - $\text{C}_6\text{H}_5-\text{O}-\text{CH}_3$



25. The B.P of Methanol is ____ K. 337K.

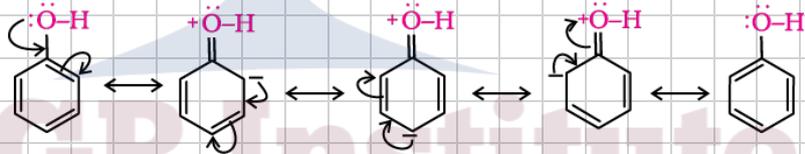
26. When phenol is reacted with conc. HNO_3 , the product is ____ . Picric Acid.

27. Write the name of compound obtained from acetylation of salicylic acid.



28. Write structural formula of (a) Isopropyl alcohol (b) sec-Butyl alcohol.

29. Draw Resonating structure of Phenol.



Board-2025 (Supp.)

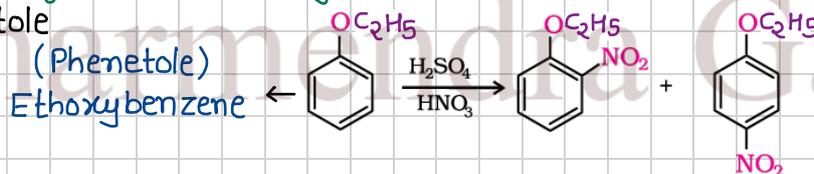
30. Hybridization of -OH bonded carbon in allylic alcohol is - sp^3 Hybrid

31. Number of -OH group in glycerol is - Three

32. In nitration of phenetole we get traces of 2-Nitrophenetole with ____ .

⇒ 4-Nitrophenetole

(Phenetole)
Ethoxybenzene



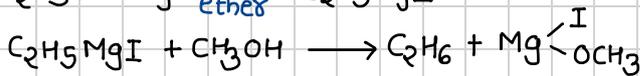
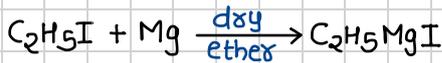
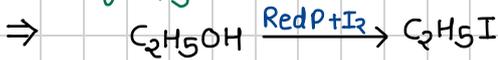
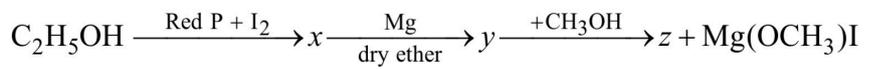
33. IUPAC Name of Anisole

⇒ Methoxybenzene

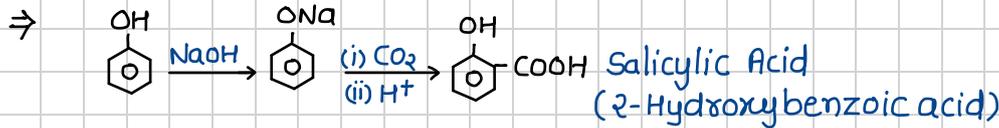
34. Write chemical eqⁿ for reaction of Phenol with bromine water.

⇒ 2,4,6-Tribromophenol. (Ques-13).

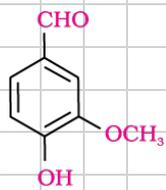
35. Write chemical names of x, y & z.



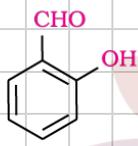
36. Write short note on Kolbe Reaction.



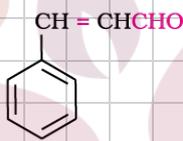
Chapter 8: Aldehyde Ketone Carboxylic Acid



Vanillin
(Vanilla Bean)

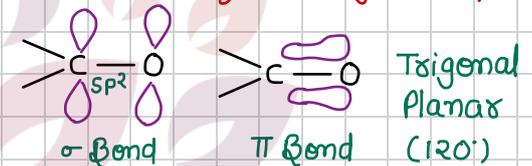


Salicylaldehyde
(Meadow Sweet)



Cinnamaldehyde
(Cinnamon)

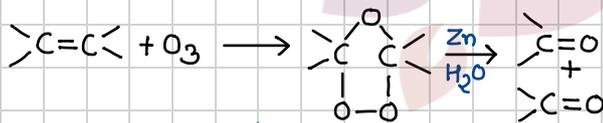
Structure of Carbonyl Group



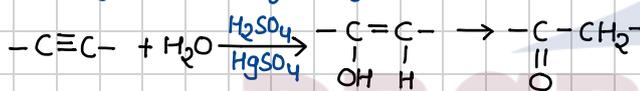
Preparation Reaction

A. For Both Aldehyde & Ketone

1. By oxidation of Alcohol
2. By dehydrogenation of Alcohol
3. By ozonolysis of alkene

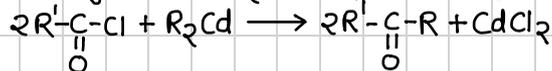
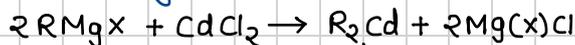


4. Hydration of Alkyne

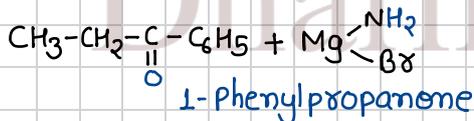
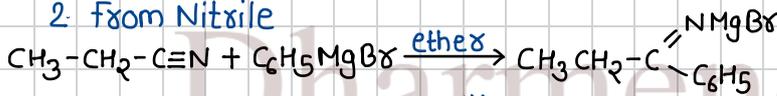


B. only Ketone -

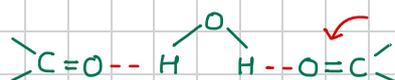
1. From Acyl chloride



2. From Nitrile

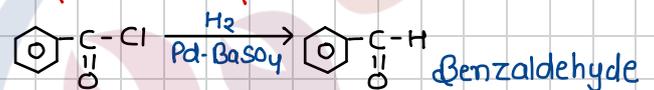


3. From Benzene



C. only Aldehyde

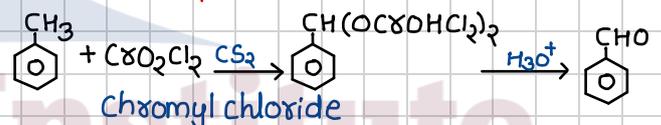
1. Rosenmund Reduction



2. Stephen Reaction



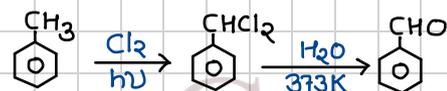
3. Etard Reaction



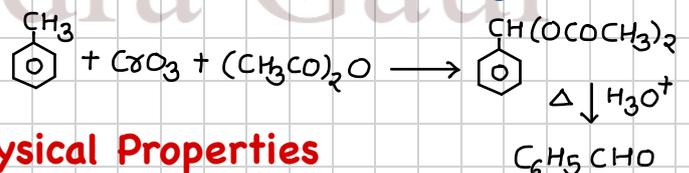
4. Gatterman Koch Reaction



5. Side chain chlorination & Hydrolysis



6. Toluene + Chromic oxide



Physical Properties

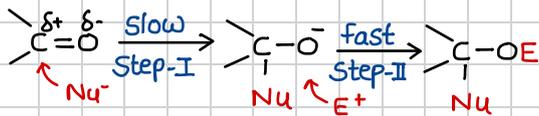
1. Lower member soluble
- Can form H-bond with water
2. Lower member - Pungent
- Higher Member - Have odour

3. B-P order - Alcohol > Aldehyde/Ketone > Ether > Alkane

Chemical Properties

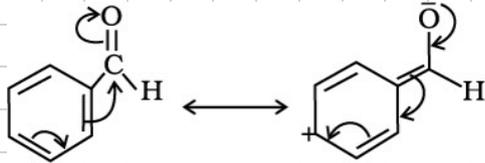
1. Nucleophilic Addition R_x^n

A. Mechanism -



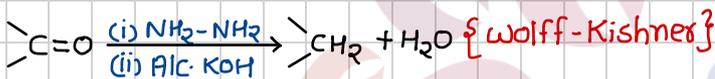
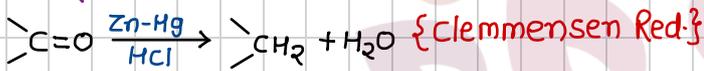
B. Reactivity - (i) steric effect ↓
(ii) +I effect ↓ (ii) Resonance ↓

for NAR



oxygen of -C=O and increase electrophilicity of compound.

2. Reduction -



3. Oxidation - Aldehyde show oxidise by weak oxidising agent -

(i) Tollen's test - form Silver mirror
freshly prepared Ammonical AgNO_3

(ii) Fehling's test - form Red-brown ppt
Fehling solution A + Fehling solution B
(Aq. CuSO_4) (Alk. Na-K tartarate)
Rochelle salt

4. Haloform Reaction - oxidation of Methyl Ketone/Aldehyde.



Uses: 1. Formalin (40% solution of HCHO) - To preserve Biological specimen.
2. Phenol + formaldehyde - To prepare Bakelite

Carboxylic Acid

Succinic Acid
Glutaric Acid
Di-oic Acid - **OMSGA** → Adipic Acid
Oxalic Acid → Malonic Acid

Resonance - Reason C=O less electrophilic than Carbonyl Compound.

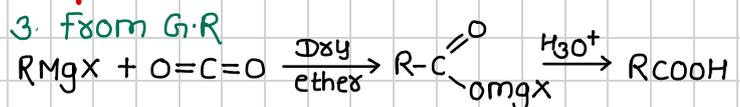
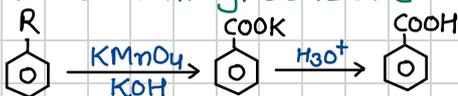


Preparation Methods

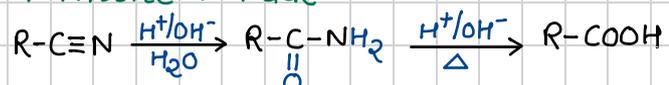
1. From 1° ROH & Aldehydes

- By KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, or Jones Reagent - CrO_3 in Acid.

2. From Alkyl benzene

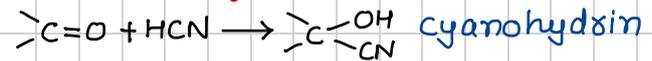


4. Nitrite & Amide



C. Example of NAR -

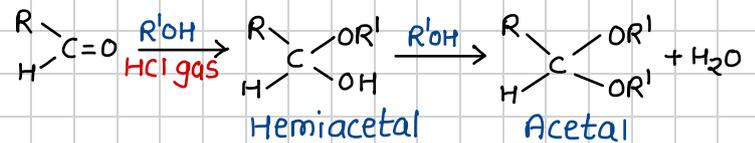
1. Addition of HCN



2. Addition of NaHSO_3

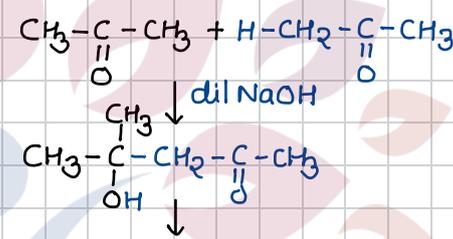


3. Addition of Alcohol



* Dry HCl protonates Ethylene glycol ketal

5. Aldol Condensation -



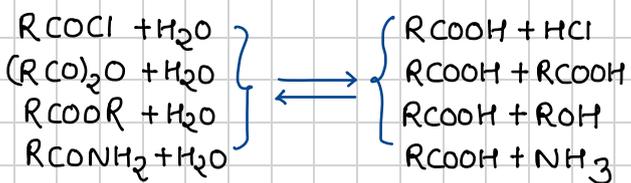
only Given by which have α -H.
→ HCHO & $\text{C}_6\text{H}_5\text{CHO}$
Not Gives Reaction.

4-Methylpent-3-en-2-one [Mesityl oxide]

6. Cannizzaro Reaction -



7. ESR - Carbonyl group is a Meta directing Group. Eg- By Nitration form m-nitrobenzaldehyde



Physical Properties

1. High B.P - form Intermolecular H-bond
2. Soluble in water - form H-bond with H₂O
3. Exist as dimer in vapour phase or in Aprotic solvent.

Chemical Properties

1. $2\text{RCOOH} + 2\text{Na} \rightarrow 2\text{RCOONa} + \text{H}_2$
2. $\text{RCOOH} + \text{NaOH} \rightarrow \text{RCOONa} + \text{H}_2\text{O}$
3. $\text{RCOOH} + \text{NaHCO}_3 \rightarrow \text{RCOONa} + \text{H}_2\text{O} + \text{CO}_2$
4. $2\text{RCOOH} \xrightarrow{\text{P}_2\text{O}_5} (\text{RCO})_2\text{O} + \text{H}_2\text{O}$
5. $\text{RCOOH} + \text{PCl}_5 \rightarrow \text{RCOCl} + \text{POCl}_3 + \text{HCl}$
6. $3\text{RCOOH} + \text{PCl}_3 \rightarrow 3\text{RCOCl} + \text{H}_3\text{PO}_3$
7. $\text{RCOOH} + \text{SOCl}_2 \rightarrow \text{RCOCl} + \text{SO}_2 + \text{HCl}$

8. Hell-Volhard-Zelinsky Reaction



α-Halocarboxylic Acid

9. Decarboxylation [By sodalime]



10. ESR - -COOH is meta directing.

"No Friedel-Craft Rxn"

↳ catalyst AlCl₃ gets bonded with carboxyl group.

Uses: Hexanedioic Acid (Adipic Acid)

Used for nylon-6,6 formation.

→ Ethanoic Acid - As vinegar } Food
Sodium Benzoate } Preservative

Board-2013

1. An organic compound having molecular formula C₃H₆O gives orange red precipitate with 2,4-dinitrophenyl hydrazine, but doesn't reduce Tollen Reagent. Give IUPAC & structural formula.



So, C₃H₆O - Either Aldehyde or Ketone but not reacts with Tollen Reagent - $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$ Propanone.

2. Write IUPAC Name of - (i) Formaldehyde - HCHO Methanal
(ii) Acetone - CH₃COCH₃ Propanone
(iii) Malonic Acid - HOOC-CH₂-COOH Propanedioic acid
(iv) Succinic Acid - HOOC-(CH₂)₂-COOH Butanedioic acid

3. (i) How carboxylate ion get stabilised by Resonance? Explain by structure.
(ii) Carboxylic acid is more acidic than phenol. Explain.

⇒ (i) Resonance in carboxylate ion -



(ii) Carboxylic Acid

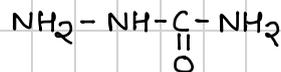
Phenol

↓
form carboxylate ion as C.B
[More stable]

↓
form Phenoxide ion as C.B
[Less stable]

- Reason -
1. Carboxylate ion shows Equivalent Resonance and phenoxide ion shows non equivalent Resonance.
 2. Effective delocalisation over two oxygen in carboxylate ion and less effective over one oxygen and one carbon.
 3. -ve charge less stable on C as in phenoxide ion. Where as in carboxylate ion -ve charge stable on more EN O.

Board-2021



4. write chemical formula of Semicarbazide.

5. why formaldehyde is more reactive than acetaldehyde towards NAR?

⇒ $\text{HCHO} > \text{CH}_3\text{CHO} \rightarrow +I$ of CH_3 and more steric hindrance \downarrow NAR Reactivity.

6. why formaldehyde can't prepare by Rosenmund Reduction?

⇒ for preparation of HCHO , HCOCl should be used but it is very unstable.

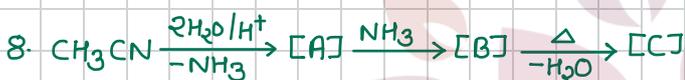
Board-2022

7. Explain Tollen's test used for distinguishing propanal & propanone.

⇒ Freshly prepared Ammonical Silver nitrate is known as Tollen's Reagent. It is mild oxidising agent and only oxidise Aldehyde or propanal.

(i) Tollen Reagent + Propanal - form silver mirror.

(ii) Tollen Reagent + Propanone - No Rxn



⇒

9. (a) write IUPAC Name of dicarboxylic acid used in formation of Nylon-6,6

(b) Acetic acid is weak acid as compared to formic acid.

(c) Boiling point of carboxylic acid is more than Aldehyde.

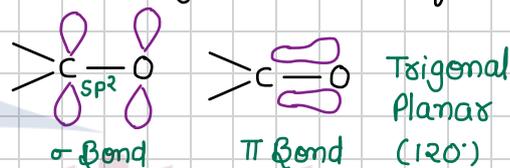
(d) Orbital diagram of carbonyl group.

⇒ (a) $\text{COOH}-(\text{CH}_2)_4-\text{COOH}$ Hexanedioic Acid

(b) **Acidic strength \propto stability of intermediate anion $\propto -I \propto 1/+I$**

Due to +I effect of CH_3 , CH_3COOH is less acidic than HCOOH .

(c) B.P depends on Intermolecular interaction. Carboxylic acid can form H-bond but Aldehyde can't form intermolecular H-bond. Due to H-bond carboxylic acid has more B.P.



(d) **Orbital diagram -**

10. (a) write the name of ester used as food preservative.

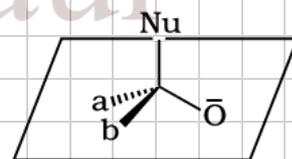
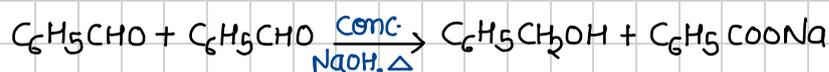
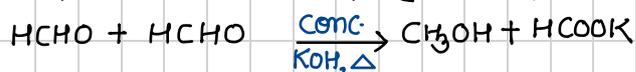
(b) Explain (i) Rosenmund Reduction (ii) Cannizzaro Reaction.

(c) Draw tetrahedral intermediate formed by nucleophilic attack on carbonyl carbon in NAR.

⇒ (a) Sodium benzoate.

(b) **Rosenmund Reduction** - Acid chloride $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl} \xrightarrow[\text{BaSO}_4]{\text{Pd}} \text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} + \text{HCl}$
partially reduce into Aldehyde.

Cannizzaro Reaction - Aldehyde which doesn't have $\alpha\text{-H}$ shows self-oxidation and reduction.



Tetrahedral intermediate

Board-2023

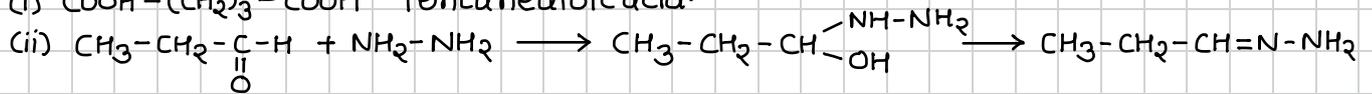
11. The aqueous solution of _____ is called Fehling Solution A.

⇒ Aq. CuSO_4 .

22. The B.P of Aldehydes and Ketones are higher than hydrocarbon & ethers. why.
⇒ It is due to dipole-dipole interaction in Aldehydes and Ketones.

23. (i) write IUPAC name of Glutamic acid.
(ii) write chemical eqⁿ of rxⁿ b/w propanal & hydrazine.
(iii) write short note on Cannizzaro Rxⁿ.

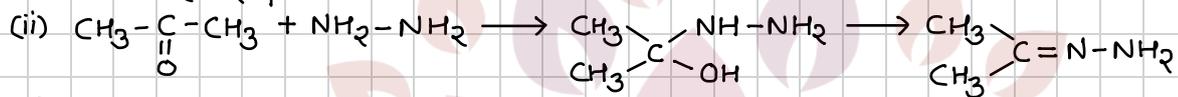
⇒ (i) $\text{COOH}-(\text{CH}_2)_3-\text{COOH}$ Pentanedioic acid.



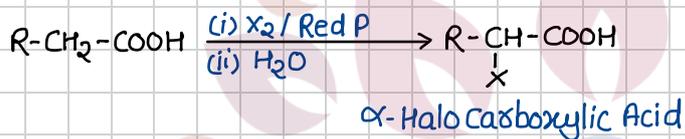
(iii) Cannizzaro Rxⁿ ✓

24. (i) write IUPAC Name of Adipic acid.
(ii) write chemical eqⁿ of propanone & hydrazine.
(iii) write short note on Hell-volhard Zelinsky Rxⁿ.

⇒ (i) $\text{COOH}-(\text{CH}_2)_4-\text{COOH}$ Hexanedioic acid.



(iii)



Board-2025

25. which of the following aldehydes undergo Cannizzaro Reaction -
⇒ Carbonyl Compound with no α-Hydrogen - $\text{C}_6\text{H}_5\text{CHO}$

26. Strongest acid among following -
 FCH_2COOH , ClCH_2COOH , BrCH_2COOH , CH_3COOH
⇒ FCH_2COOH

27. (i) write the name of aldehyde used in the preparation of bakelite.
(ii) write IUPAC name of Glutamic acid.
(iii) Explain Rosenmund reduction.

⇒ (i) HCHO Methanal. (ii) Pentanedioic acid. (iii) ✓

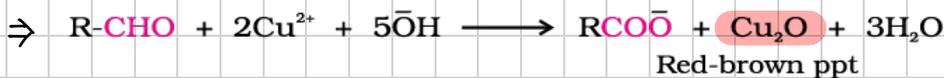
28. (i) write the name of carboxylic acid used as vinegar in food industry.
(ii) write IUPAC name of Adipic acid.
(iii) Explain Hell-volhard Zelinsky Reaction.

⇒ (i) CH_3COOH - Ethanoic Acid (ii) Hexanedioic acid (iii) ✓

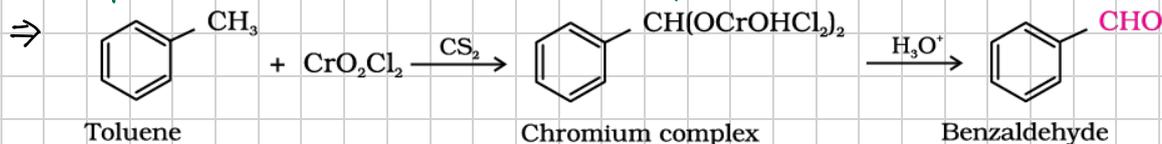
Board-2025 (Supp.)

29. Compound having max. value of pKa is -
 CF_3COOH , CCl_3COOH , CHCl_2COOH , CH_3COOH
⇒ $\text{CH}_3\text{COOH} < \text{CHCl}_2\text{COOH} < \text{CCl}_3\text{COOH} < \text{CF}_3\text{COOH}$
—— Acidic strength ↑ Ka ↑ pKa ↓ ——>

30. On heating ethanal with fehling reagent, red brown ppt of compound _____ is obtained.



31. Explain Etard reaction with example.



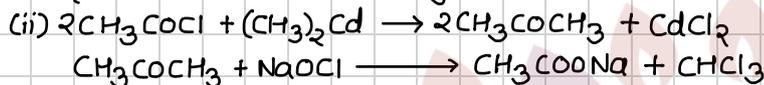
32. (i) write IUPAC name of phthalic acid.



(iii) Draw Resonating structure of carboxylic group.

\Rightarrow (i) Benzene-1,2-dicarboxylic acid

(iii) Resonance -

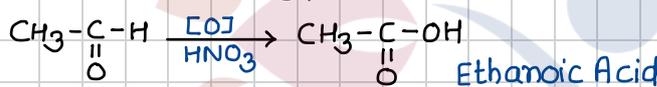
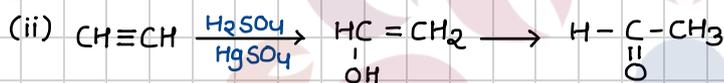


33. (i) write IUPAC name of adipic acid.

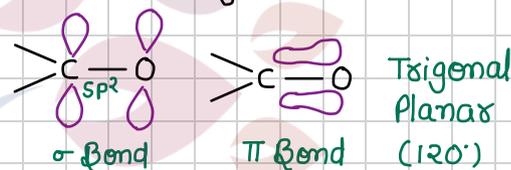


(iii) Draw orbital diagram of carbonyl group.

\Rightarrow (i) Hexanedioic Acid



(iii) Orbital Diagram



Chapter 9: Amine

Novocain - Used as an Anaesthetic in dentistry.

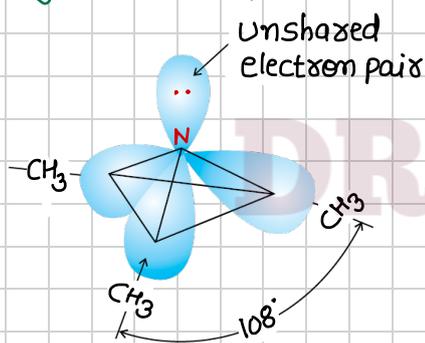
Benadryl - Antihistaminic drug (text: Amino group).

Quaternary ammonium salt - surfactants.

Adrenaline and Ephedrine - contain secondary Amino group.

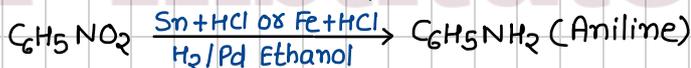
A. Pyramidal shape of Amine -

B. Type of Amine -

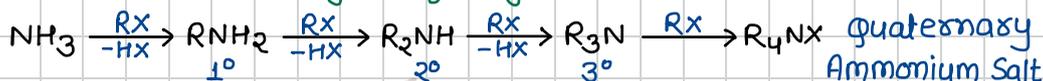


Preparation of Amine

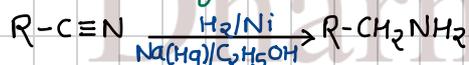
1. Reduction of Nitro compounds



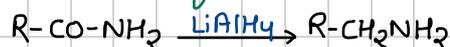
2. Ammonolysis of Alkyl halides



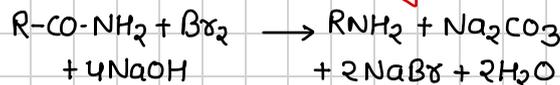
3. Reduction of nitriles -



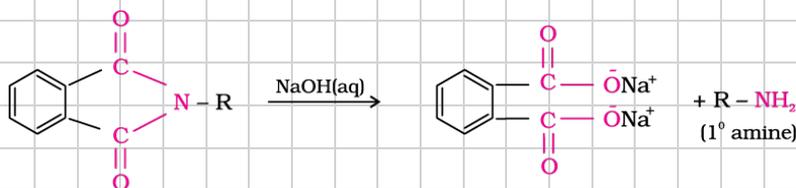
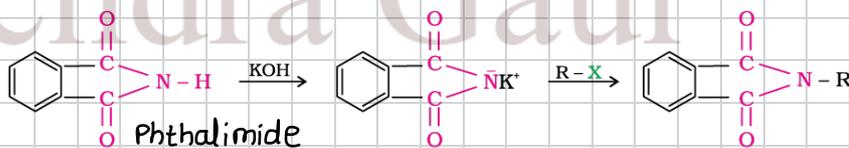
4. Reduction of Amides -



5. Hoffmann bromide degradation



6. Gabriel phthalimides synthesis



9. Give Reason that trimethyl amine is less basic than methyl amine.

⇒ $(\text{CH}_3)_3\text{N} < \text{CH}_3\text{NH}_2$: Due to three bulky group in $(\text{CH}_3)_3\text{N}$, more steric hindrance occur. It decrease electron donation nature. So, decrease basicity.

Board-2024

10. Hybridization state of N in trimethylamine is - sp^3 Hybridization

11. The compound showing highest basic strength -

A. $(\text{C}_2\text{H}_5)_3\text{N}$ B. $(\text{C}_2\text{H}_5)_2\text{NH}$ C. $\text{C}_2\text{H}_5\text{NH}_2$ D. NH_3 $2^\circ > 3^\circ > 1^\circ > \text{NH}_3$

12. 2° Amine in following -

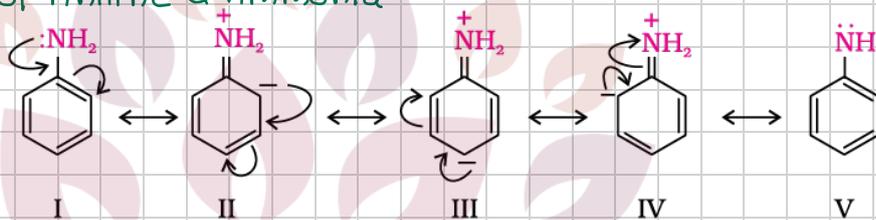
A. Propane-2-amine B. Pentane-3-amine
C. N-Methylethanamine D. N,N-Dimethylmethanamine

13. write isocyanide test for primary amine.

14. Compare basic strength of Aniline & Ammonia.

⇒ Aniline $< \text{NH}_3$

Due to Resonance
I.P. in aniline is less
available for donation.
So, Aniline is less basic.



Board-2024 (Supp.)

15. The shape of trimethylamine is -

⇒ Pyramidal in shape.

16. Tertiary amine is -

(a) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-NH}_2$ (b) $(\text{CH}_3)_3\text{N}$ (c) $\text{CH}_3\text{-CH}_2\text{-NH-CH}_3$ (d) $\text{CH}_3\text{-}\overset{\text{NH}_2}{\text{C}}\text{-CH}_3$

⇒ $(\text{CH}_3)_3\text{N}$

17. write chemical formula of p-aminoazobenzene.

⇒ $\text{C}_6\text{H}_5\text{-N=N-C}_6\text{H}_4\text{-NH}_2$

18. write chemical formula of A & B.



⇒ [A] - $\text{C}_6\text{H}_5\text{NH}_2$ [B] - $\text{C}_6\text{H}_5\text{N}_2\text{Cl}$

19. Explain with Reason -

(i) Alkylamine are more basic than Ammonia.

(ii) Aromatic amine are less basic than Ammonia.

⇒ (i) Due to +I effect of 'R' alkylamine is more basic than NH_3 .

(ii) Due to Resonance Aromatic Amine is less basic than NH_3 .

Board-2025

20. IUPAC name of $\text{CH}_3\text{-NH-CH}_2\text{-CH}_3$ is -

⇒ N-Methylethanamine

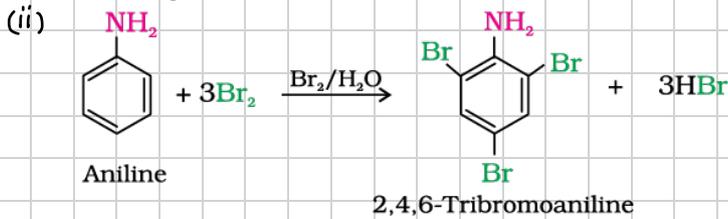
21. Arrange the following compounds in increasing order of their basic strength in aq. solution - NH_3 , $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$

⇒ $(\text{C}_2\text{H}_5)_2\text{NH} > (\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$

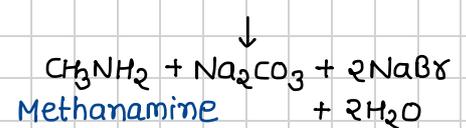
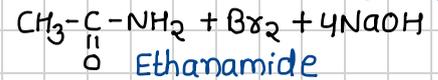
22. (i) Benzenediazonium chloride to phenol.

(ii) Aniline to 2,4,6-tribromoaniline.

(iii) Ethanamide to Methanamine.



(iii) Ethanamide to CH₃NH₂



23. (i) Benzenediazonium chloride to cyanobenzene

(ii) Aniline to benzenediazonium chloride

(iii) Nitrosomethane to methanamine



Board-2025 (Supp.)

24. Most basic compound in aq. solution is-

✓ A. (CH₃)₂NH B. CH₃NH₂ C. (CH₃)₃N D. NH₃

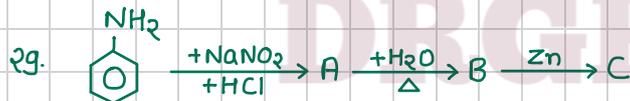
25. Main product of Carbylamine reaction is - CH₃NC

26. Formula of Hinsberg's Reagent is - C₆H₅SO₂Cl

27. Write chemical eqⁿ to prepare iodobenzene from B.D.C.

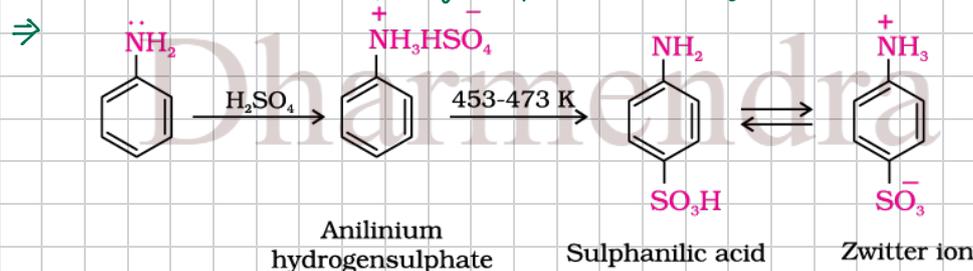


28. Write the name of yellow dye obtained by rxⁿ b/w Aniline & C₆H₅N₂Cl.



⇒ A. C₆H₅N₂Cl B. C₆H₅OH C. C₆H₆

30. Write chemical eqⁿ of sulphonation of Aniline.



Note- Aniline does not show **Friedel-Crafts Rxⁿ**. It is due to salt formation by Rxⁿ b/w -
(i) Aniline - Lewis base
(ii) AlCl₃ - Lewis acid

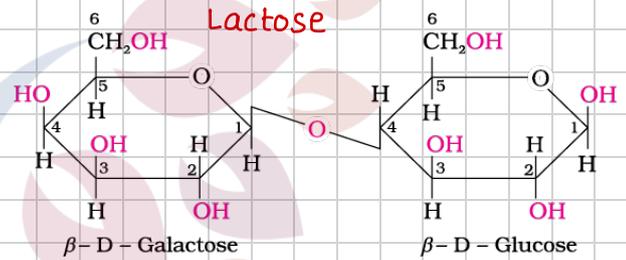
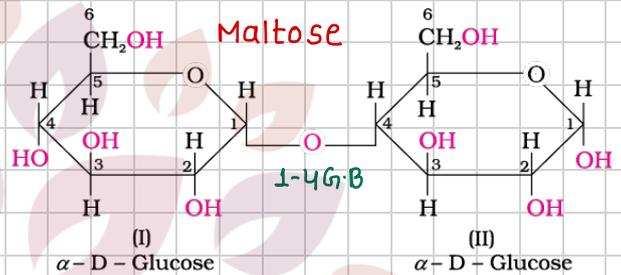
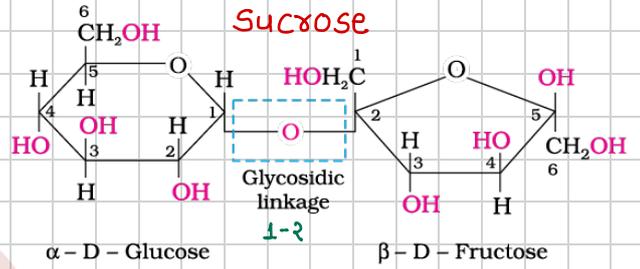
Chapter 10: Biomolecules

→ General formula - $C_x(H_2O)_y$
 → Generally have H & O in 2:1.

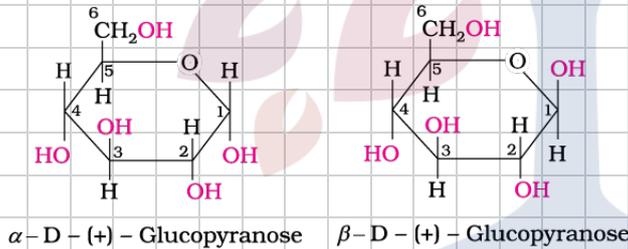
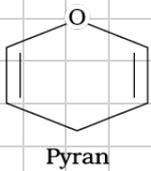
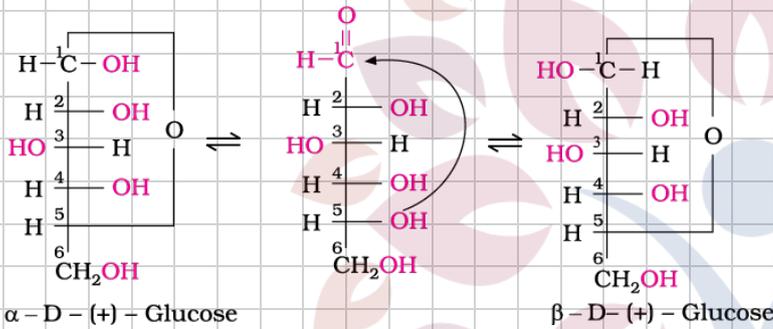
- (i) Rhamnose - $C_6H_{12}O_5$ is carbohydrate but H & O \neq 2:1.
- (ii) Acetic Acid - CH_3COOH is not carbohydrate but H & O = 2:1.

Carbohydrates - Carbohydrates may be defined as optically active poly hydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis.

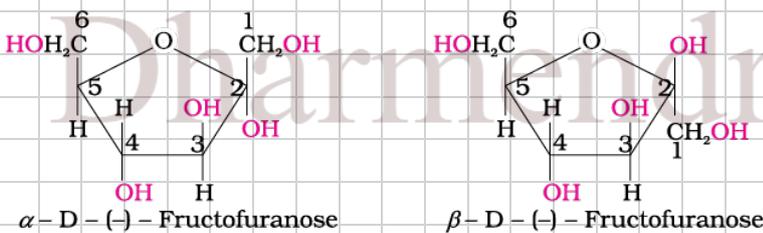
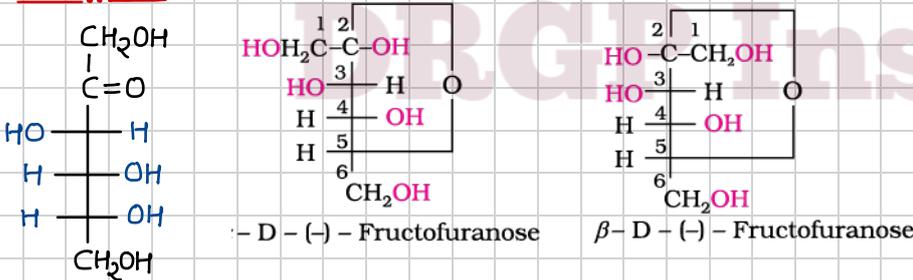
- Sugar** [1. Monosaccharides - Can't Hydrolysed]
 A. Aldohexose - Glucose
 B. Ketohexose - Fructose
- Non Sugar** [2. Oligosaccharides - 2 to 10 unit]
 A. Lactose - Glucose + Galactose
 B. Maltose - Glucose + Glucose
 C. Sucrose - Glucose + Fructose
- [3. Polysaccharides - Many subunit] **N.R.**



Glucose -



fructose-



- Starch**
- **Amylose**
 - 15-20%
 - C_1-C_4 G.B
 - water soluble
 - unbranched
 - **Amylopectin**
 - 80-85%
 - C_1-C_4, C_1-C_6 G.B
 - water insoluble
 - branched
- { Polymer of α -D(+)-Glucose }

Cellulose - Polymer of β -D Glucose (1-4 G.B). Most abundant organic compound in plant Kingdom.

Glycogen - Animal starch

Vitamin

- 1. water soluble - B, C
- 2. fat soluble - A, D, E, K

1. Vitamin A - xerophthalmia
 Night blindness

2. Vitamin B₁ - Beri-beri

3. Vitamin B₂ - cheilosis

4. Vitamin B₆ - Convulsion

5. Vitamin B₁₂ - Pernicious anaemia

6. Vitamin C - Scurvy

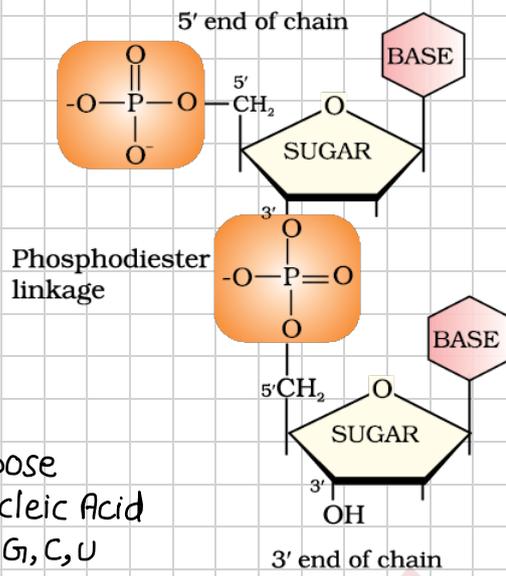
7. Vitamin D - Rickets

8. Vitamin E - Fragile RBC, Muscular weakness

9. Vitamin K - Blood clotting time \uparrow

Nucleic Acids

1. Nitrogen Base
 - A. Purin - A, G
 - B. Pyrimidin - C, T, U
2. Pentose Sugar
 - A. Ribose - RNA
 - B. deoxyRibose - DNA
3. Phosphate Group



Steps -

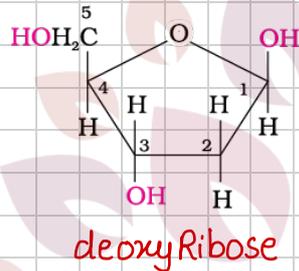
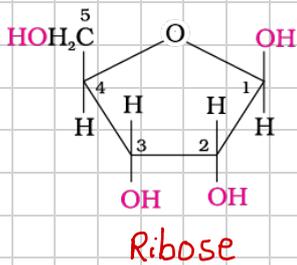
1. Nucleoside formation - Nitrogen Base + Sugar {^NGlycosidic Bond}
2. Nucleotide formation - Nucleoside + PO_4^{3-} {Phosphoester Bond}
3. Polynucleotide formation b/w nucleotides {Phosphodiester Bond}

Type - DNA

1. deoxyribose Nucleic Acid
2. A, G, C, T
3. deoxyribose

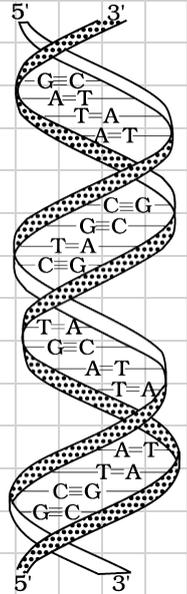
RNA

1. Ribose Nucleic Acid
2. A, G, C, U
3. Ribose



Double Helix (Watson-Crick Model)

1. Two nucleic acid chains held together by H-bond.
2. Two strands are antiparallel to each other 5'-3' 3'-5'



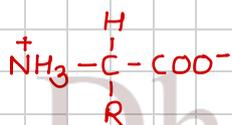
Type of RNA

m-RNA, r-RNA, t-RNA

Hormones

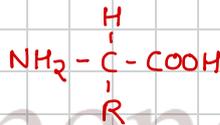
Hormones	Gland	Nature	Function
1. Insulin	- Pancreas	- Polypeptide	- Glucose to Glycogen
2. Glucagon	- Pancreas	- Polypeptide	- Glycogen to Glucose
3. Thyroxine	- Thyroid	- Iodinated Tyrosine	- Control metabolic rate Iodine deficiency - Goitre
4. Corticoids	- Ad. cortex	- Steroids	- Deficiency - Addison disease.
(i) Mineralocorticoids			(i) Control water and salt metabolism
(ii) Glucocorticoids			(ii) Control carbohydrate metabolism
5. Testosterone	- Testis	- Steroids	- Secondary sexual character
Estradiol	- Ovary		- Se. sex. character, Menstrual cycle.
Progesterone	- Ovary		- Prepare uterus for implantation.
6. Epinephrine	- Adrenal	- Amino acid derivative	- Prepare for emergency situation.
Nor-epinephrine			

Protein - Heteropolymer of α -Amino acids -



Zwitter ion

Bipolar ion formed by A.A in Aq. solution. It shows Amphoteric nature.



R = H - Glycine - Simplest A.A

R = CH_3 - Alanine - Simplest optical active A.A

1. Essential Amino acids - 10 A.A (Body can't form these)
2. Non-essential Amino acids - 10 A.A (Body can form these)

Fibrous and Globular protein

- | | |
|-------------------|-----------------------|
| ↳ Insoluble | ↳ Soluble |
| ↳ Parallel struc. | ↳ Spherical structure |
| ↳ Keratin | ↳ Insulin |
| ↳ Myosin | ↳ Albumin |

Peptide Bond - CO-NH- bond b/w two amino acid.
→ Polypeptide bond more than 10,000 is protein.

Level of structure of protein-

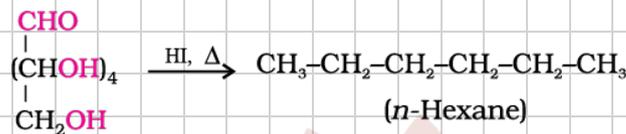
1. Primary - Peptide bond
2. Secondary - α -helix & β -pleated sheet
3. Tertiary - Fibre & Globular protein
4. Quaternary - H-bond, disulphide linkage, van der Waals & electrostatic forces.

Denaturation of Protein-

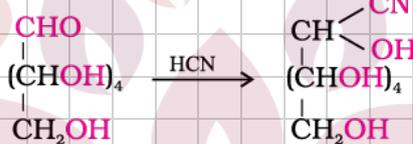
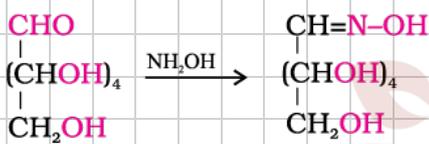
Change in 2^o & 3^o structure of protein and loss of biological activity due to change in pH and temp.

1. Curdling of Milk
2. Coagulation of egg white

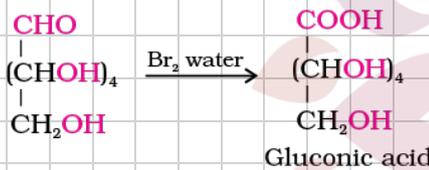
Reaction of Glucose



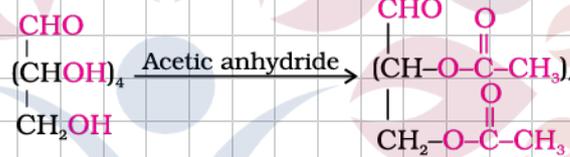
[Glucose has 6C in straight chain]



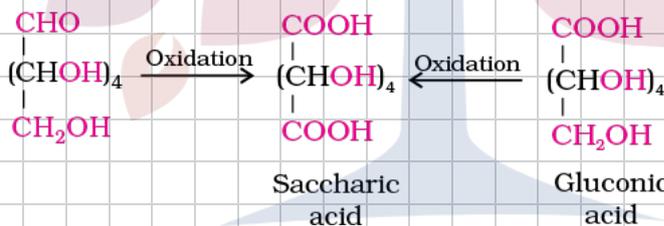
Glucose has carbonyl group



[Glucose has Aldehyde functional group]



[Glucose has 5 OH group]



[Glucose has primary Alcohol Group].

DRGP Institute

Board 2022

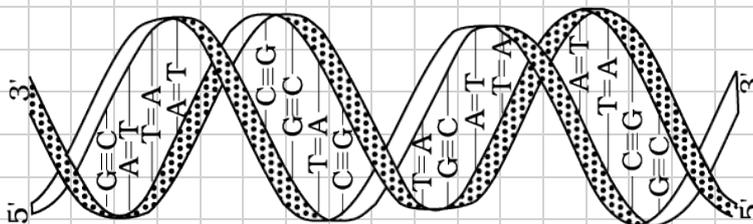
1. Explain denaturation of protein.

⇒ Change in 2^o & 3^o structure of protein and loss of biological activity due to change in pH or change in temperature is called denaturation of protein. Example-

1. Curdling of Milk - Due to change in pH.
 2. Coagulation of Egg white - Due to change in temp.
- During Denaturation primary structure of protein remain intact.

2. Draw Double Helix Structure of DNA.

⇒



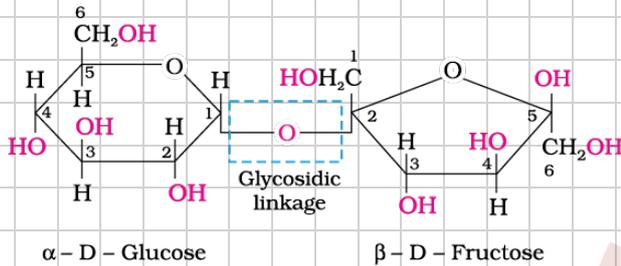
Board 2023

3. The nitrogenous base not present in DNA-

⇒ Uracil

4. Write the Haworth structure of Sucrose.

⇒



Sucrose has two monomers α -D Glucose and β -D fructose bonded by 1-2 Glycosidic bond. Reducing group of Glucose and Fructose are involved in Glycosidic bond formation, Sucrose is a Non-reducing Sugar.

Board 2024

5. Glucose is -

- A. Aldopentose B. Ketopentose
C. Aldohexose D. Ketohexose

Glucose is Aldohexose
↳ Aldehyde
↳ 6 Carbon

6. Milk sugar is -

- A. Sucrose B. Lactose
C. Maltose D. Galactose

Milk Sugar - Lactose
Malt Sugar - Maltose
Cane Sugar - Sucrose

7. Deficiency of vitamin _____ causes Beri-beri disease.

⇒ vitamin B₁

8. The name of sugar present in RNA is _____

⇒ Ribose

9. Draw the double stranded helix structure of DNA.

⇒ Board exam 2022 (Ques 2)

Board 2024 (Supp.)

10. Monosaccharides is -

- A. Sucrose B. Maltose
C. Lactose D. Ribose

⇒ Ribose

11. _____ disease is caused by the deficiency of vitamin C.

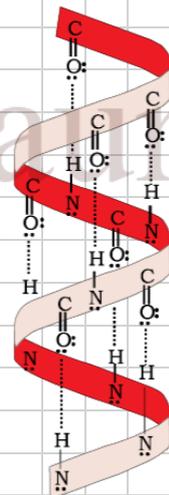
⇒ Scurvy

12. Write the name of product obtained from the hydrolysis of Maltose.

⇒ 2 molecules of α -D Glucose.

13. Draw a diagram of α -helix structure of protein.

⇒



Board 2025

14. Disacchaxide is- A. Glucose B. Fructose C. Sucrose D. Starch
Sucrose is a Disaccharide.

15. Sucrose on hydrolysis gives Glucose and _____.
⇒ Fructose

16. write two examples of fibrous protein.
⇒ Keratin and Myosin.

17. Draw a diagram of double strand helix structure of DNA.
⇒ Board exam 2022 (Ques 2)

Board 2025 (Supp.)

water soluble vitamin
B & C can't store in
Body.

18. water soluble vitamin- A. A B C D D.K

19. Essential Amino acids-

A. Glycine B. valine C. Glutamine D. Cysteine
valine - Essential
Glycine, Glutamine, Cysteine - N.E

20. Hydrolysis of sucrose brings about a change in sign of rotation, from dextro (+) to laevo (-) and the product is named as _____ sugar.

⇒ Invert sugar
Sucrose \longrightarrow Glucose + Fructose
 \downarrow $(+52.5^\circ)$ (-92.4°)
Dextro Rotatory \downarrow
Net rotation is Levorotatory

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Best of Luck for Exam

Dharmendra Gaur