CLASS-12th

Organic Chemistry
Cheat Notes

Designed By :-
Bharat Panchal.

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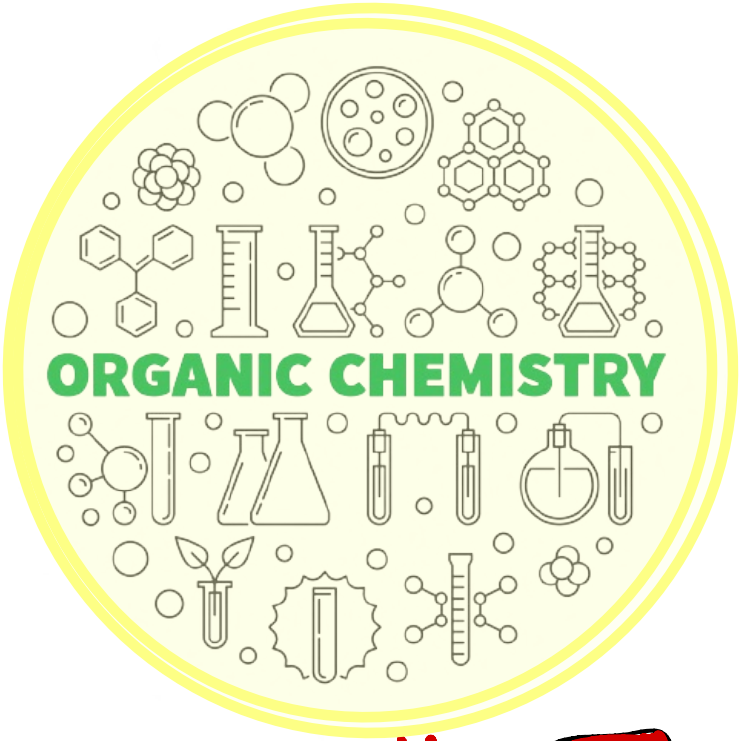

Best Wishes..

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1) Name Reaction....

2.) Resonance....

3.) Organic Conversions Road map.

4.) Test to distinguish

5.) Physical properties related question

6.) Acidic & Basic Strength of Amines.

7.) Organic Reagents. & Reaction Means

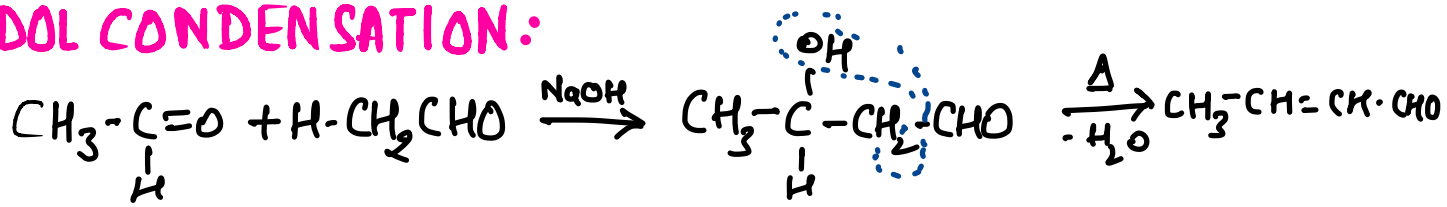
8) Organic Reaction Mechanisms.

9.) Bio molecules.

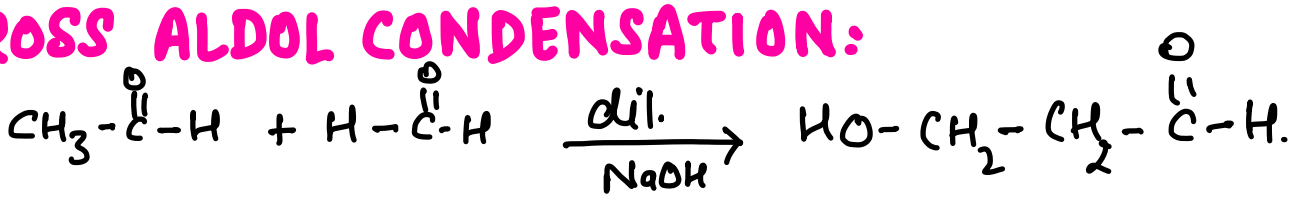
Price - Just your support & share

Name Reactions

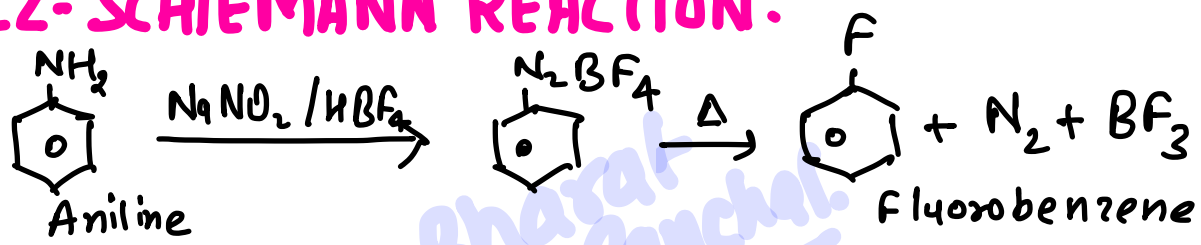
a) ALDOL CONDENSATION:



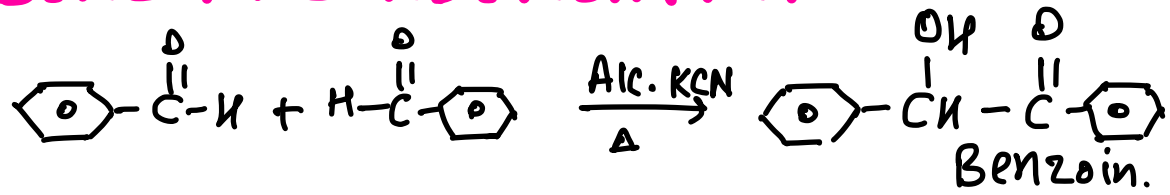
b) CROSS ALDOL CONDENSATION:



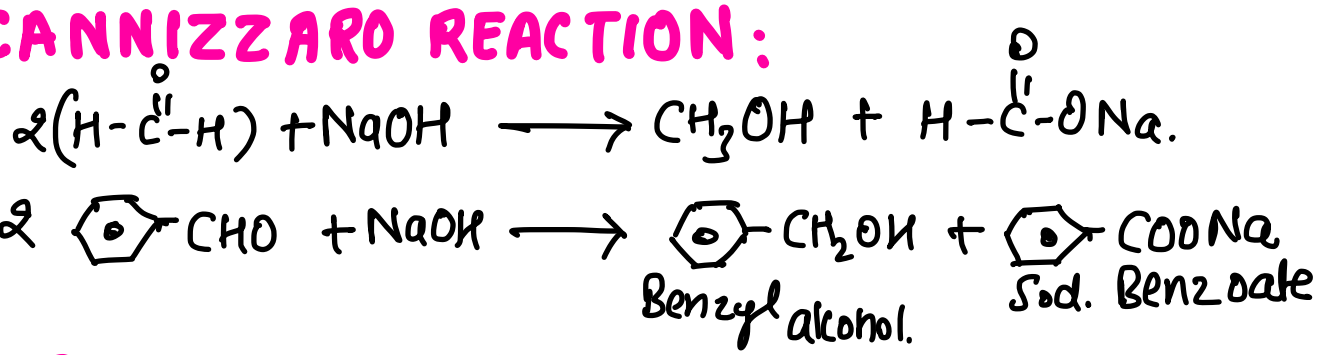
c) BALZ-SCHIEMANN REACTION:



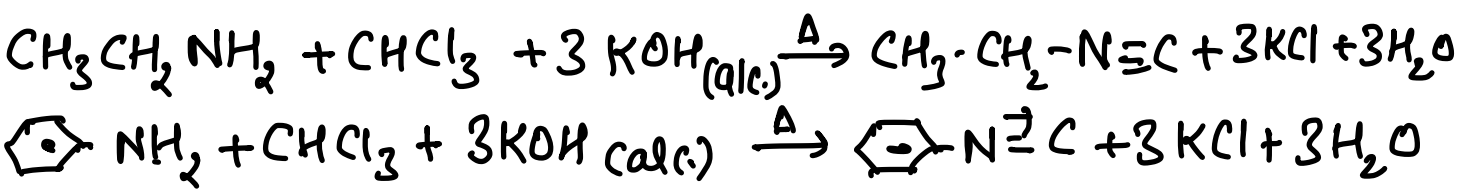
d) BENZOIN CONDENSATION:



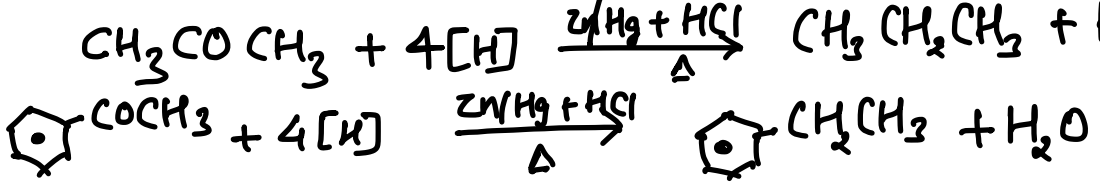
e) CANNIZZARO REACTION:



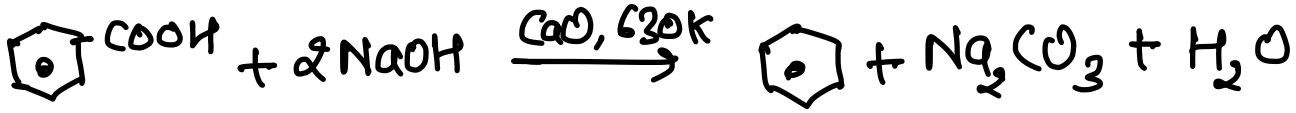
f) CARBYL AMINE REACTION:



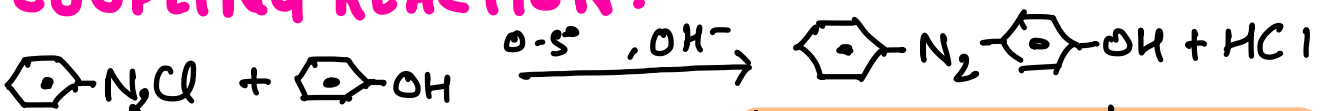
g) CLEMMENSEN REDUCTION:



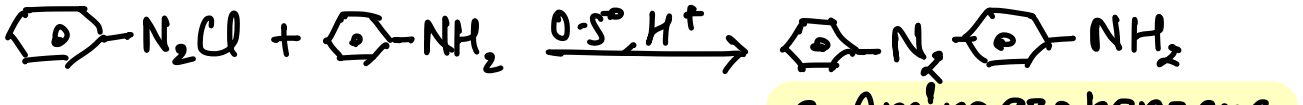
h) DECARBOXYLATION REACTION:



i) COUPLING REACTION:

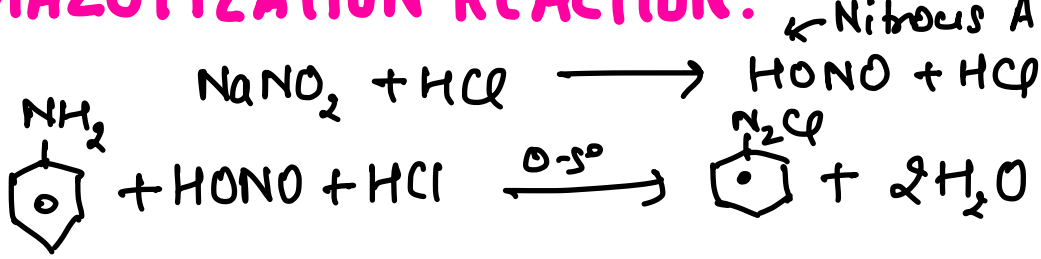


p-hydroxyazobenzene

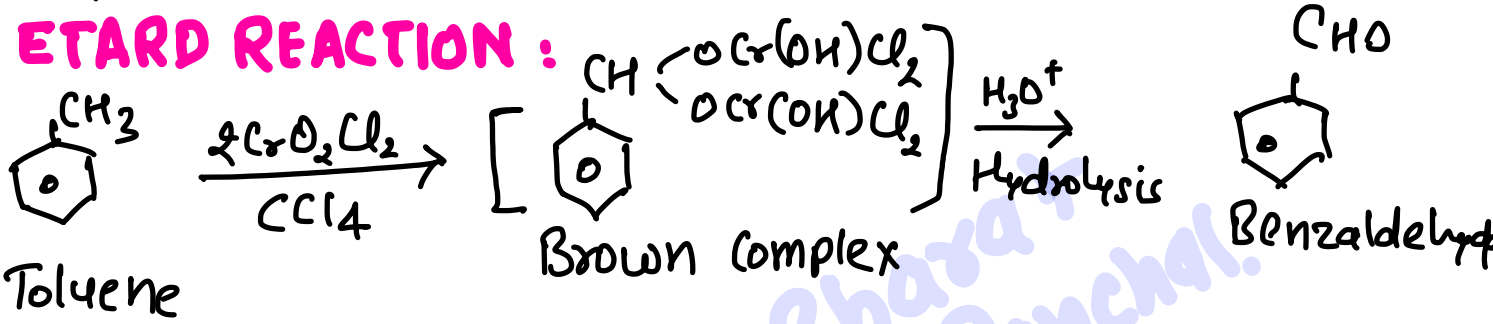


p-Aminoazobenzene

j) DIAZOTIZATION REACTION:



k) ETARD REACTION:



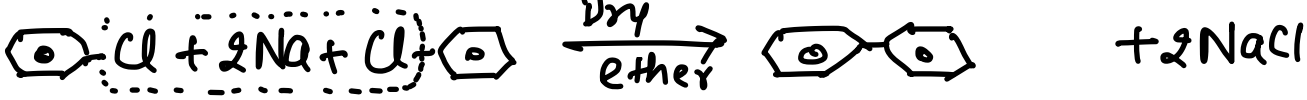
Toluene

Brown Complex

Benzaldehyde

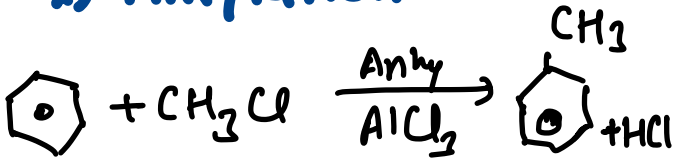
l) FINKELSTEIN REATION:

m) FITTIG REACTION.



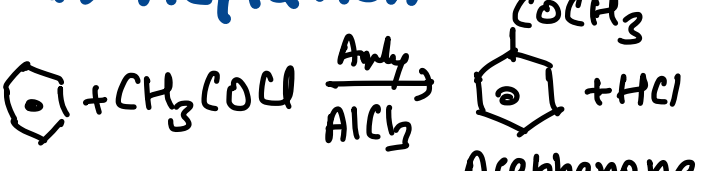
n) FRIEDAL CRAFT REACTION:

i) Alkylation



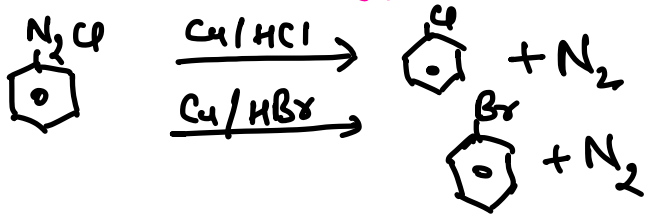
Toluene

ii) Acylation

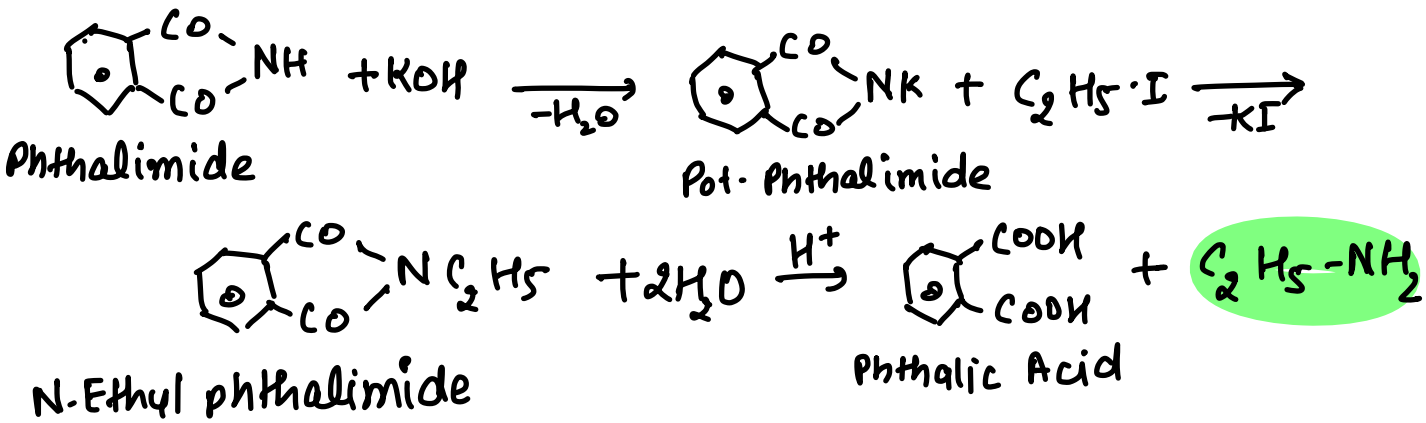


Acephenone

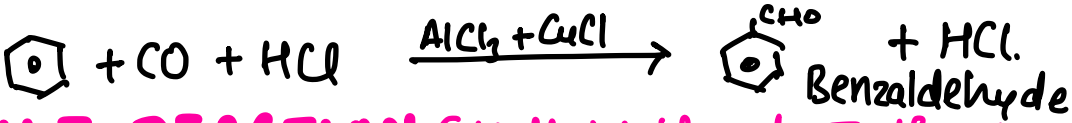
o) GATTERMANN REACTION:



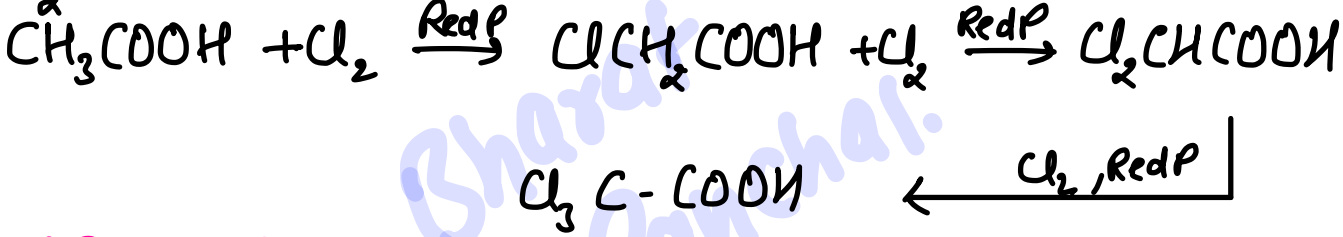
p) GABRIEL PHTHALIMIDE SYNTHESIS :



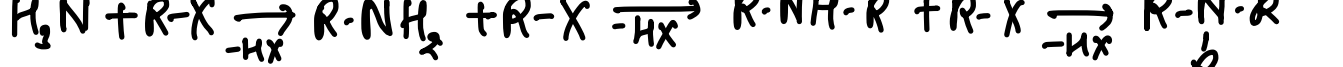
q) GATTERMANN KOCH REACTION :



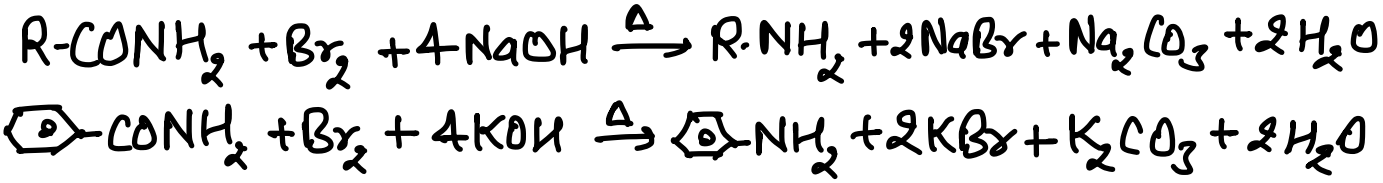
r) H.V.Z REACTION (Hell Volhard Zelinsky Reaction)



s) HOFMANN AMMONOLYSIS :

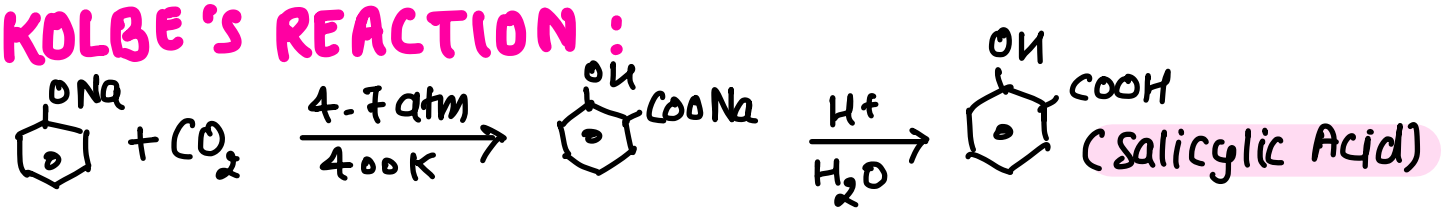


t) HOFMANN BROMAMIDE DEGRADATION :

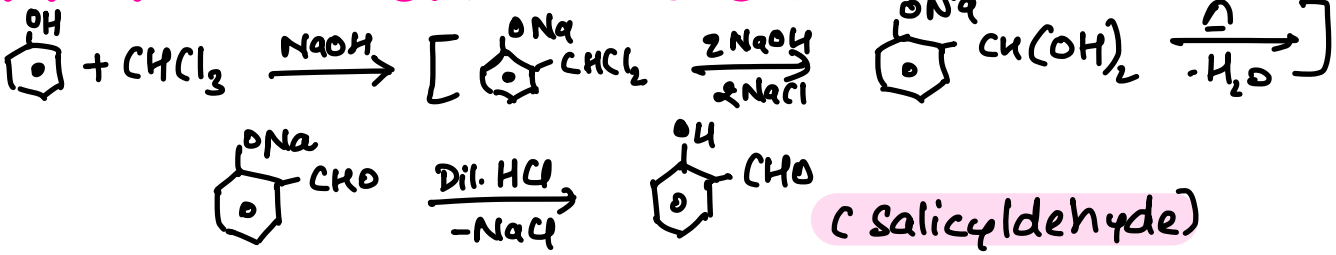


u) HUNSDIECKER REACTION :

v) KOLBE'S REACTION :



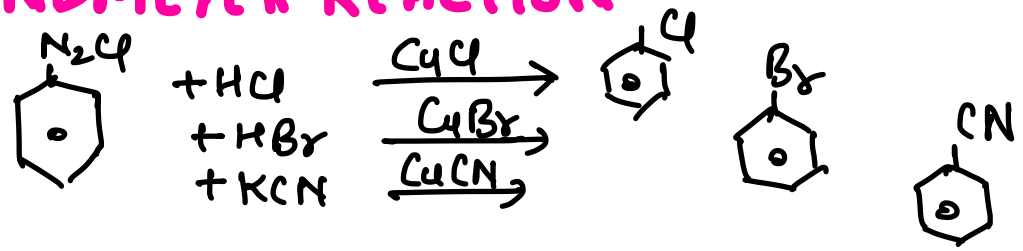
w) REIMER-TIEMANN REACTION :



x) ROSENMUND REDUCTION :

$$R-\overset{O}{\overset{\|}{C}}-Cl + H_2 \xrightarrow[\text{Boiling xylene}]{Pd, BaSO_4, S} R-\overset{O}{\overset{\|}{C}}-H + HCl$$

y) SANDMEYER REACTION :



z) STEPHEN REDUCTION : $SnCl_2 + 2HCl \longrightarrow SnCl_4 + 2[H]$

$$R-C\equiv N + 2[H] + HCl \xrightarrow[\text{ether}]{\text{Dry}} R-CH=NH\cdot HCl \xrightarrow{\text{Boiling } H_2O} RCHO + NH_4Cl$$

i) WILLIAMSON SYNTHESIS :

$$R-X + R'ONa \longrightarrow ROR' + NaX$$

$$CH_3-I + C_2H_5-ONa \longrightarrow \underset{\text{ether.}}{CH_3-O-C_2H_5} + NaI$$

ii) WOLFF KISHNER REDUCTION :

$$R-CHO \xrightarrow[\text{glycol}]{H_2N-NH_2, KOH} R-CH_3 + N_2$$

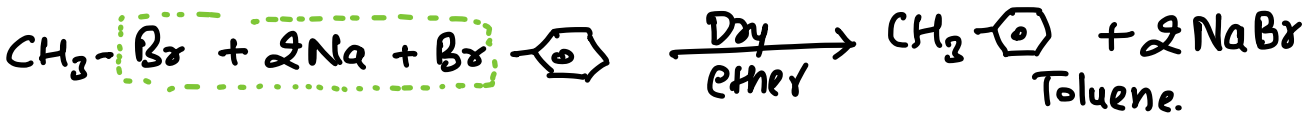
$$CH_3COCH_3 \xrightarrow{"} CH_3-CH_2-CH_3$$

iii) WURTZ REACTION :

$$R-X + 2Na + X-R \xrightarrow[\text{ether}]{\text{Dry}} R-R + 2NaX$$

$$CH_3-Br + 2Na + Br-CH_3 \xrightarrow[\text{ether}]{\text{Dry}} C_2H_6 + 2NaBr$$

iv) WURTZ - FITTIG REACTION

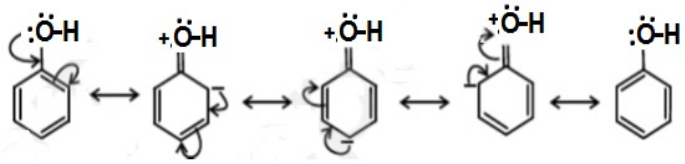


#02. RESONANCE

Positive Resonance

Positive resonance effect (+R effect)

Phenol

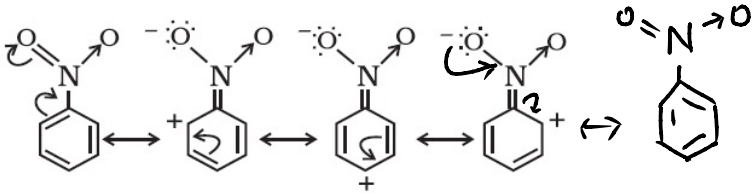


+R effect showing groups: – halogen, – OH, – OR, – OCOR, – NH_2, – NHR, – NR_2, – NHCOR

↳ These are ortho and para directing

Negative Resonance

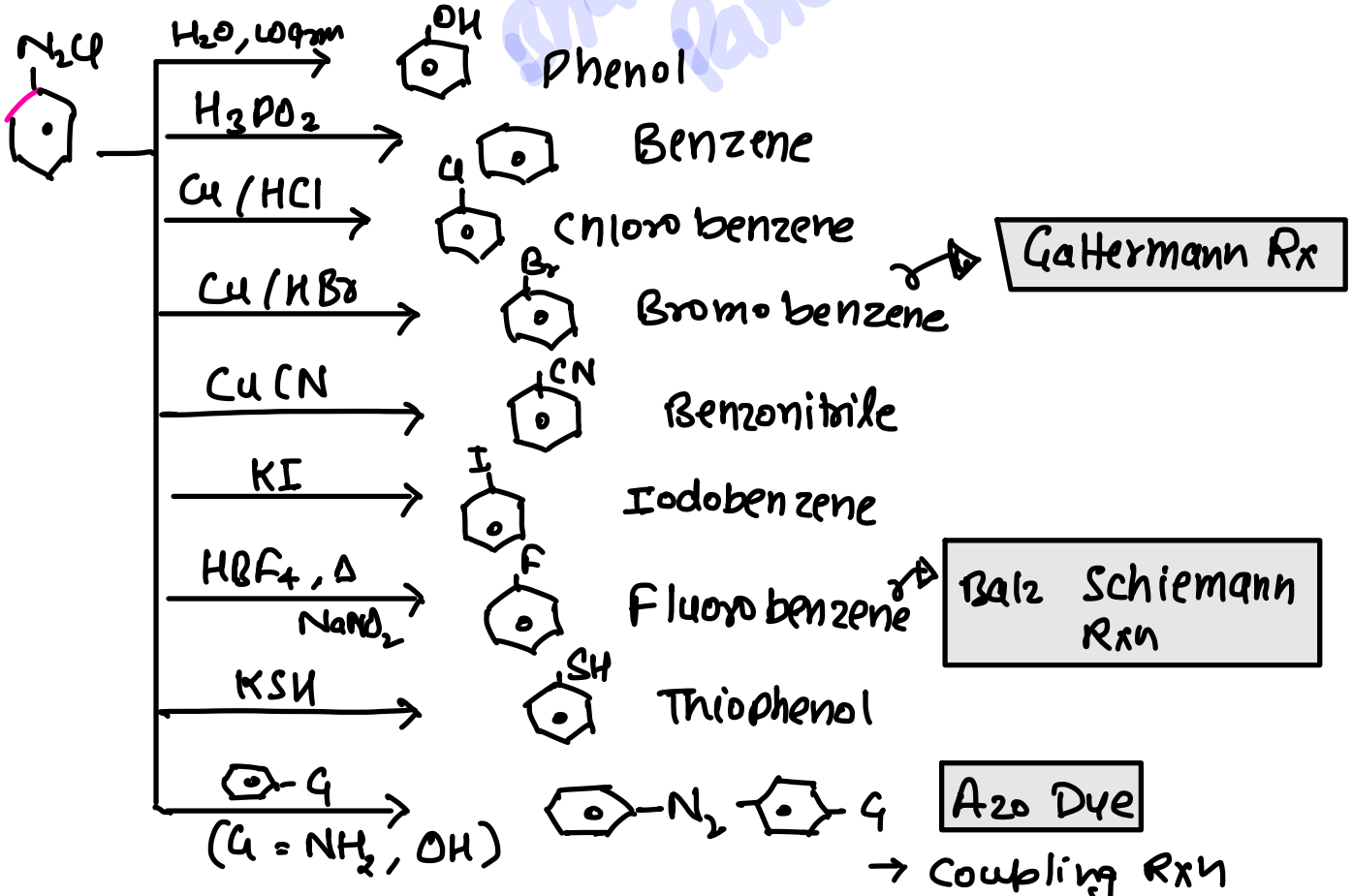
Negative resonance effect (-R effect) in nitrobenzene



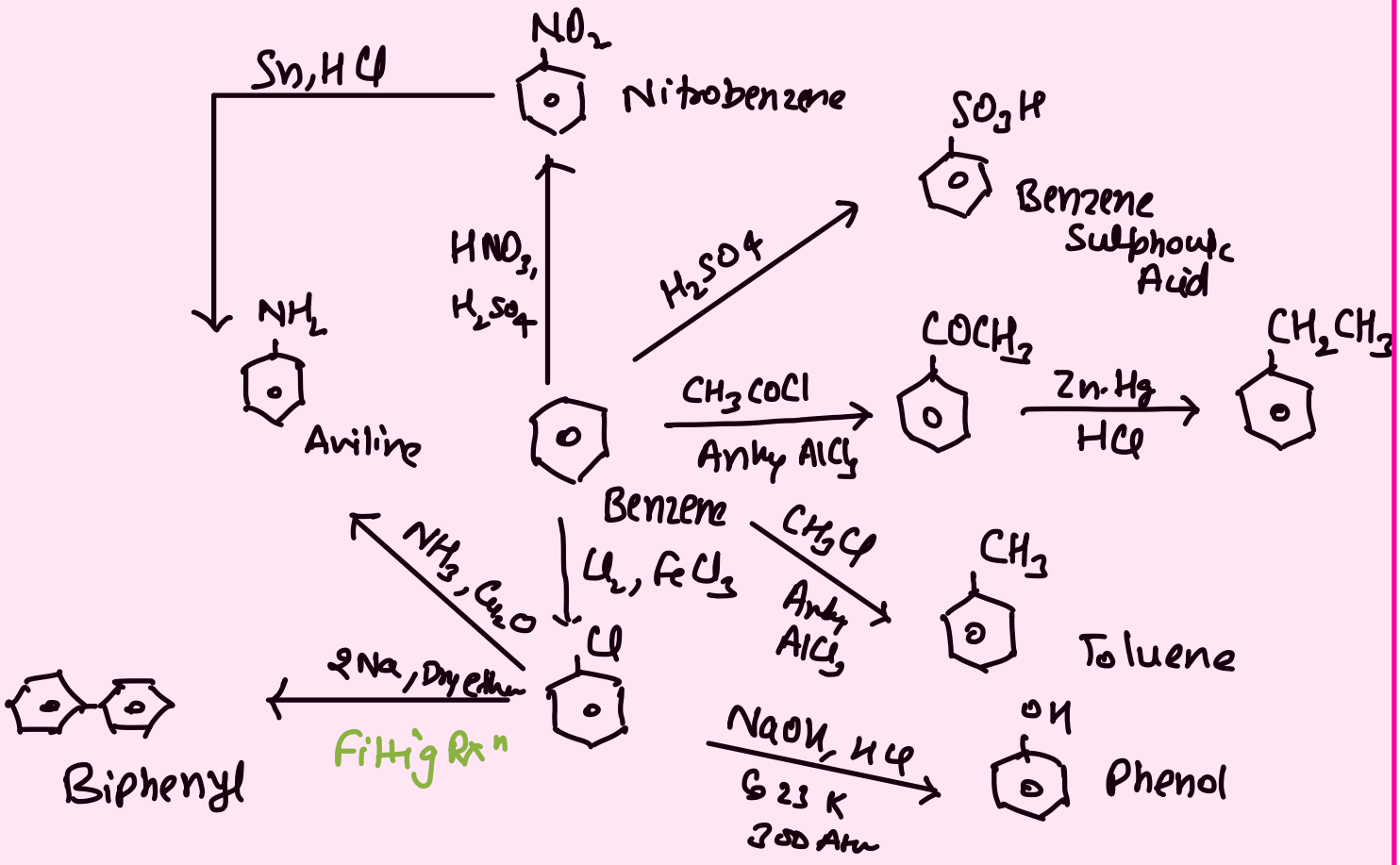
–R effect showing groups: – COOH, – CHO, >C=O, – CN, – NO_2

↳ These are meta-directing

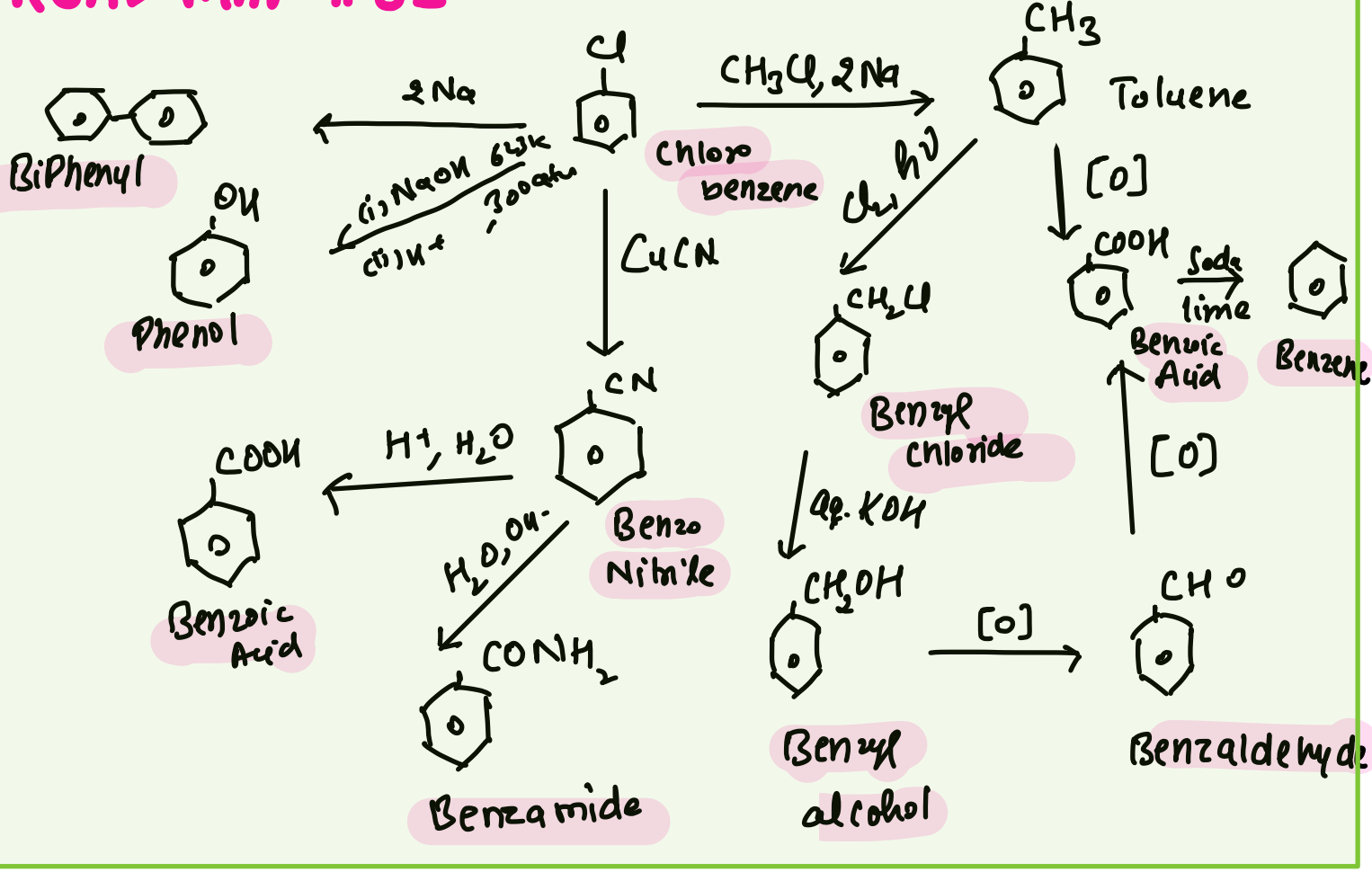
ROAD MAP #01 (DIAZONIUM SALT)



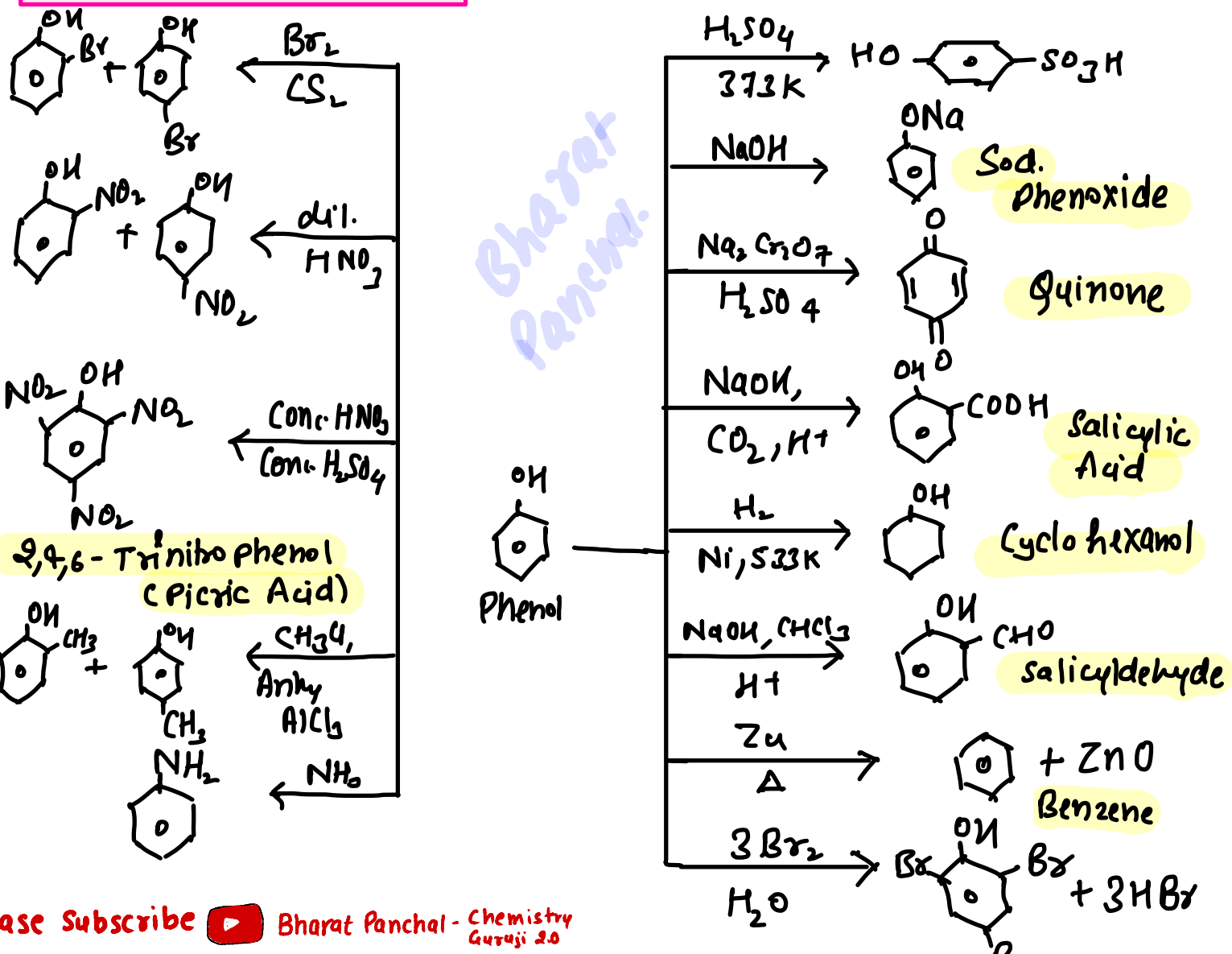
AROMATIC CONVERSIONS



ROAD MAP #03



ROAD MAP # 04



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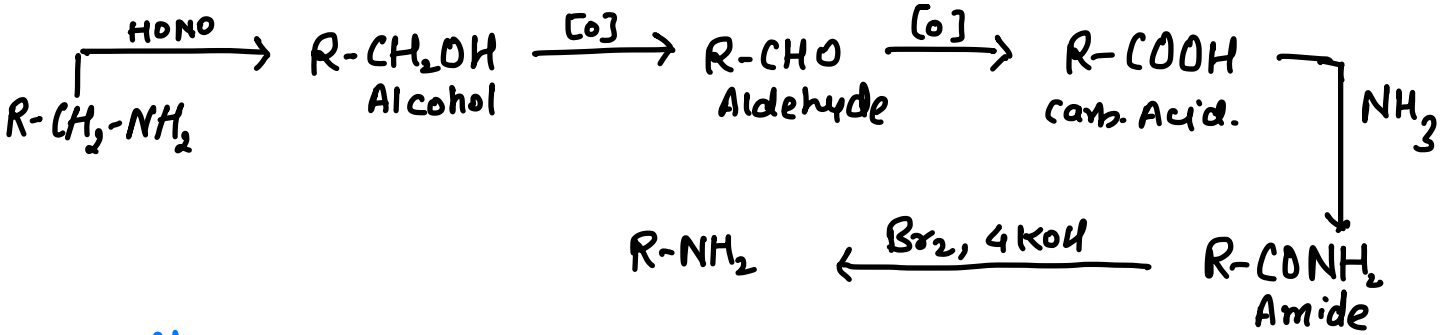
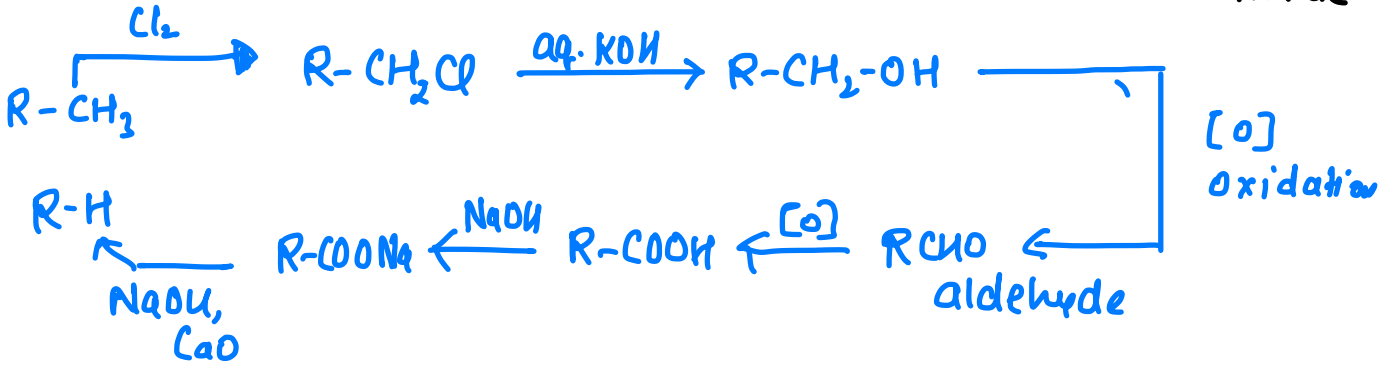
ROAD MAP # 05

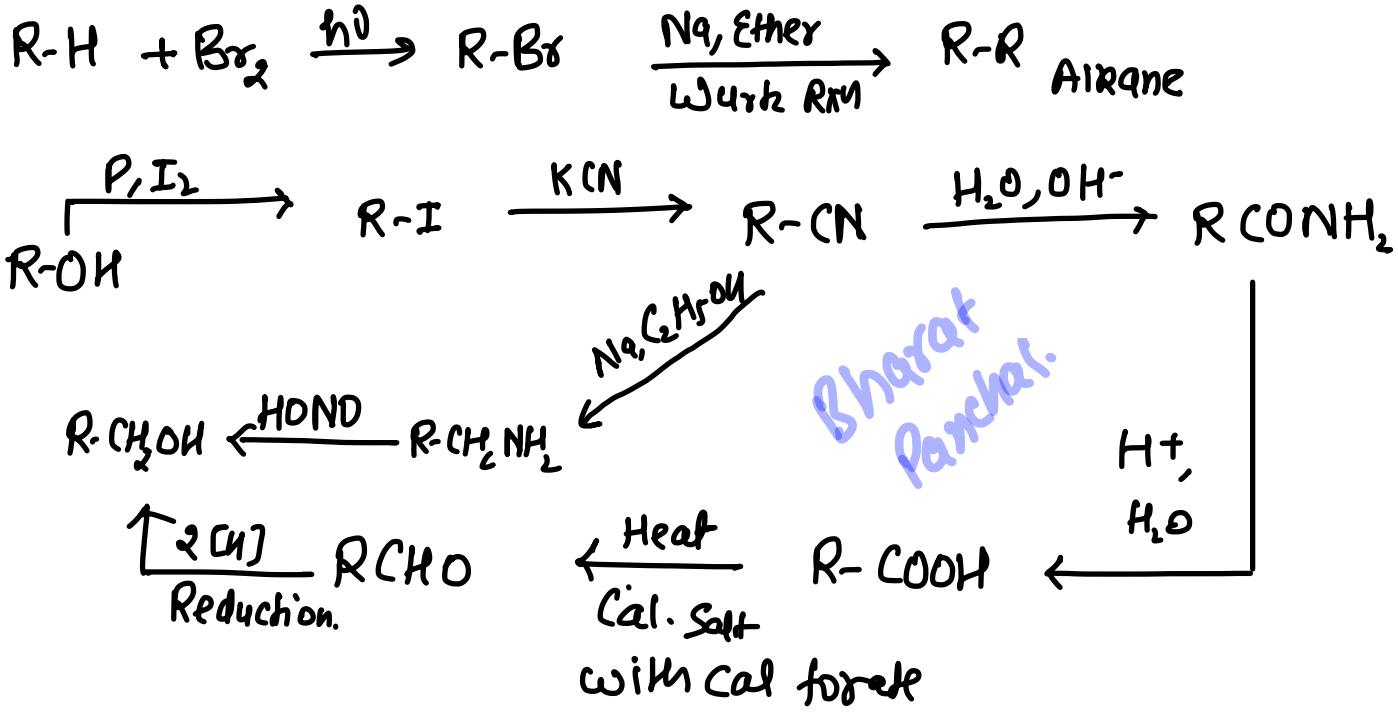
STEP DOWN



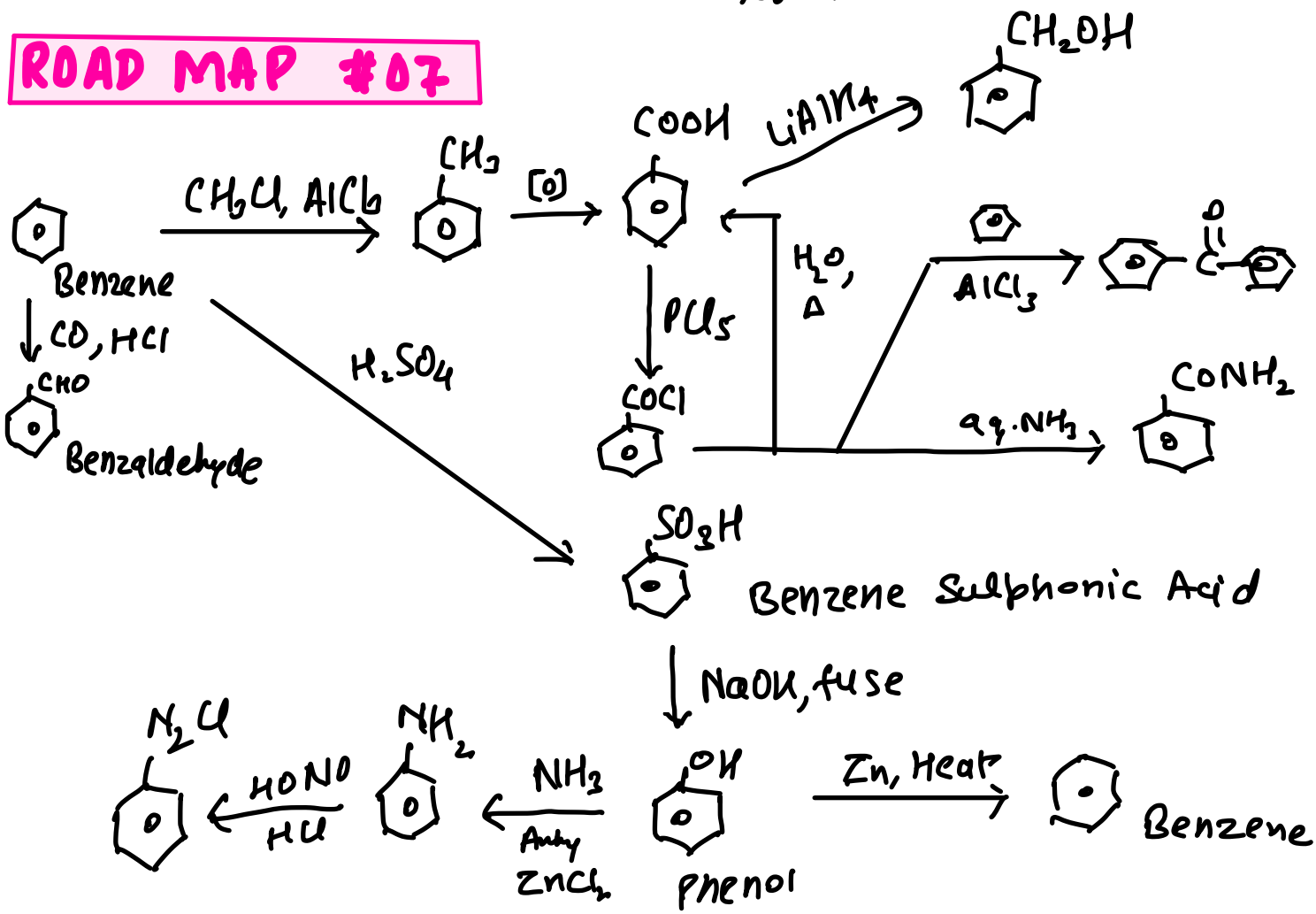


ROAD MAP # 06

Step Up.



ROAD MAP #07



#04. Test To Distinguish.

▶ How will you distinguish b/w propanol and propanone

Iodoform Test

Propanol

$C_3H_7\text{-}OH + I_2 + NaOH \longrightarrow$ No Rxn

Propanone

$CH_3COCH_3 + I_2 + NaOH \longrightarrow CHI_3 + CH_3COONa + H_2O + NaI$

Yellow ppt

▶ How will you distinguish b/w ethanol and Phenol.

Litmus Test

Ethanol: Doesn't give litmus Test

Phenol: Turn blue litmus into red.

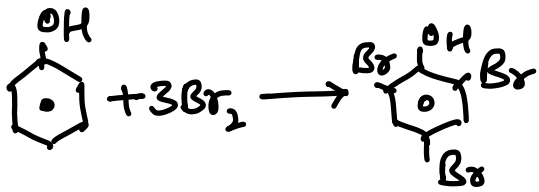
Iodoform Test

$C_2H_5OH + I_2 + NaOH \longrightarrow CHI_3 + HCOONa + NaI + H_2O$

No Rxn.

Br_2 Water Test

$C_2H_5\text{-}OH \xrightarrow[\text{Water}]{Br_2}$ No white ppt.



▶ How will you distinguish b/w ethanal and propanal

Iodoform Test

Ethanal

$CH_3CHO + I_2 + NaOH \xrightarrow{\Delta} CHI_3 + HCOONa + 3NaI + 3H_2O$

Propanal

$C_2H_5\text{-}CHO + I_2 + NaOH \longrightarrow$ No yellow ppt.

▶ Distinguish b/w Pentan-2-one & Pentan-3-one

Iodoform Test

$CH_3CO CH_2CH_2CH_3 + I_2 + NaOH \longrightarrow CHI_3 + C_3H_7COONa + H_2O + NaI$

$CH_3CH_2COCH_2CH_3 + I_2 + NaOH \longrightarrow$ No Yellow ppt. of CHI_3.

M.Sub.

▶ How will you distinguish b/w propanal & propanone

	Propanal	Propanone
Iodoform Test	$CH_3CH_2CHO + I_2 + NaOH \rightarrow$ No Yellow ppt	$CH_3COCH_3 + I_2 + NaOH \rightarrow CHI_3 + CH_3COONa + H_2O + NaI$
Tollen's Reagent Test	$CH_3CH_2CHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow CH_3CH_2COO^- + 2Ag\downarrow$ (silver mirror) $+ 4NH_3 + 2H_2O$	$CH_3COCH_3 \xrightarrow{\text{Tollen's Reagent}}$ No Silver Mirror
Fehling Soln Test	$CH_3CH_2CHO + 2Cu^{2+} + 5OH^- \rightarrow CH_3CH_2COO^- + Cu_2O + 3H_2O$	$CH_3COCH_3 \xrightarrow{\text{Fehling soln}}$ No Red ppt.

▶ Distinguish b/w Benzaldehyde () & Acetophenone ()

	Benzaldehyde	Acetophenone
Iodoform Test	 $+ NaOH + I_2 \rightarrow$ No yellow ppt	 $+ NaOH + I_2 \rightarrow CHI_3 +$  $+ H_2O + NaI$
$AgNO_3$ Test	 $\xrightarrow{\text{Tollens Reagent}}$ Gives Silver mirror	 $\xrightarrow{\text{Tollens Reagent}}$ No silver mirror

▶ Acetophenone () and benzophenone ()

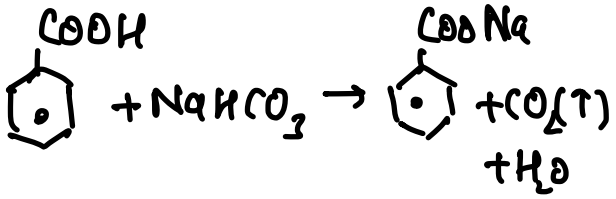
	Acetophenone	Benzophenone
Iodoform Test	 $+ I_2 + NaOH \rightarrow CHI_3 +$  $+ H_2O + NaI$	 $+ I_2 + NaOH \rightarrow$ No yellow ppt of CHI_3

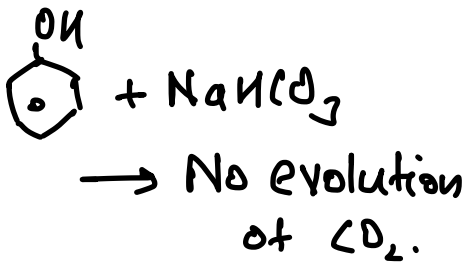
▶ Methanoic Acid ($HCOOH$) and Ethanoic Acid (CH_3COOH)

	Methanoic Acid	Ethanoic Acid
Tollen's Test	$HCOOH + 2[Ag(NH_3)_2]^+ + 2OH^- \rightarrow 2Ag\downarrow + CO_2 + 2H_2O + 4NH_3$	$CH_3COOH \xrightarrow{\text{Tollens Reagent}}$ No Silver Mirror

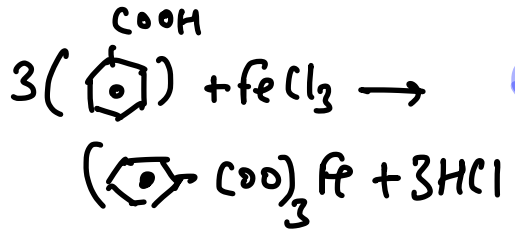
▶ Benzoic Acid (C_6H_5COOH) and Phenol (C_6H_5OH)

$NaHCO_3$ Test





$FeCl_3$ Test



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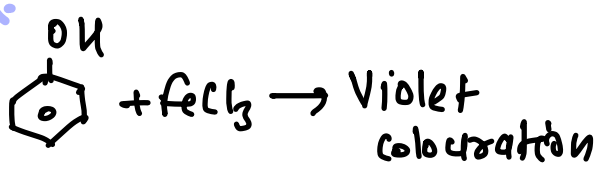


▶ Methylamine (CH_3NH_2) and dimethylamine (CH_3NHCH_3)

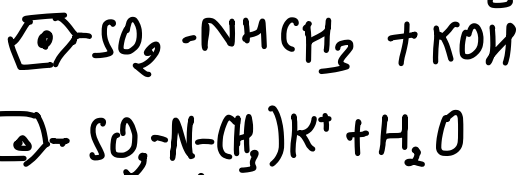
Carbyl Amine Test

$CH_3NH_2 + CHCl_3 + 3KOH \xrightarrow{\Delta} CH_3NC + 3KCl + 3H_2O$.

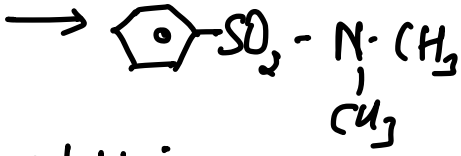
$CH_3NHCH_3 + CHCl_3 + 3KOH \rightarrow$ No Rxn

Hinsberg Reagent

$CH_3\cdot NH_2 +$  $\xrightarrow{-HCl}$ Hinsberg Reagent



$CH_3\cdot NH\cdot CH_3 +$ 



insoluble in aq KOH.

QUES RELATED TO PHYSICAL PROPERTIES

⇒ p- dichlorobenzene has higher m.pt than that of ortho and meta isomers.

Ans. p- dichlorobenzene has higher m.pt than those of o- and m- isomers because it is more symmetrical and packing is better in solid form. Hence it has stronger inter molecular force of attraction than o- and m- isomers

⇒ Alkyl halides though polar are immiscible with water?

Ans. Alkyl halides are polar but are insoluble in water because energy required to break the intermolecular H-bonding among water molecules is much higher than energy released by water halide interaction.

▸ Why the dipole moment of chlorobenzene is lower than cyclohexyl

Ans. 

In chlorobenzene C-Cl bond has some double bond character so its bond length is smaller

Hence dipole moment is smaller than cyclohexyl chloride which has a longer C-Cl single bond.

▸ SOLUBILITY OF ALCOHOLS

Solubility of alcohols in water is due to their ability to form hydrogen bond with water molecules. The solubility decreases with increase in size of alkyl groups and solubility increases with increase in branching the order is $1^\circ < 2^\circ < 3^\circ$

▸ BOILING POINT OF ALCOHOLS

The B.Pt of alcohol increases with increase in no. of carbon atoms as van der waal forces increases and b.pt decreased with increase in branching of carbon chain due to decrease in van der waal forces with decrease in surface area and the order is $1^\circ > 2^\circ > 3^\circ$

▸ ACIDITY OF ALCOHOLS

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$$2ROH + 2Na \longrightarrow 2RONa + H_2$$

Sod. Alkoxide

The acid strength of alcohols decrease in order

$$R \rightarrow CH_2OH \; (1^\circ) \; > \; \begin{matrix} R \\ R \end{matrix} > CHOH \; (2^\circ) \; > \; \begin{matrix} R \\ R \\ R \end{matrix} > C\text{-}OH \; (3^\circ)$$

▸ SOLUBILITY OF ETHERS

Ethers are soluble in water to certain extent due to H-Bonding

- Solubility decreases with increase in mol. mass
- Ethers are fairly soluble in all organic solvents such as chloroform, alcohol, benzene etc

▶ SOLUBILITY OF PHENOLS Like alcohols, phenols are soluble in water due the formation of H-bonding with water.

- Phenols are less soluble than alcohols due to large hydrocarbon (benzene ring) part.
- Phenols are soluble in alcohols, ethers and also in NaOH.

▶ Boiling Point Much higher than corresponding hydrocarbons and haloarenes due to intermolecular H-Bonding.

▶ Boiling Point of Aldehydes and Ketones The B.Pt of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular mass due to weak dipole-dipole interaction.

- Their b.pt are lower than those of alcohols of similar molecular mass due to absence of intermolecular H-Bond.
- Among isomeric aldehydes and ketones, ketones have slightly higher B.Pt due to the presence of two e⊖ releasing gp which make carbonyl group more polar.

▶ Solubility of aldehydes and ketones lower members of aldehydes and ketones upto (C_4) are soluble in water due to H-Bonding blw Polar carbonyl group and water However, solubility decreases with increase in mol. wt.

- Aromatic aldehydes and ketones are much less than corresponding aliphatic aldehydes and ketones due to larger benzene ring.
- All carbonyl compounds are fairly soluble in organic solvents.

▶ Solubility of Carboxylic Acid

- Simple aliphatic carboxylic acids having upto C_4 atoms are miscible in water due to formation of H-Bond with water.
- The solubility decreases with increasing no. of carbon atoms. Higher carboxylic acids are practically insoluble in water due to the increased hydrophobic interaction of hydrocarbon part.
- Benzoic acid, the simplest aromatic carboxylic acid is nearly insoluble in cold water.

▶ Boiling Point of Carboxylic Acid

Carboxylic acids have higher B.Pt than aldehydes, ketones and even of comparable molecular mass due to more extensive association of their molecules through intermolecular H-Bonding. The H-Bonds are not broken completely even in their vapour phase.

▶ Boiling Point and Solubility of Amines

1° and 2° amines have higher B.Pt than other organic compounds due to Hydrogen bonding.

Primary and secondary amines are soluble in water due to H-Bonding b/w $>NH_2$ & H_2O molecules.

ACIDIC AND BASIC CHARACTER

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▶ Basic Character of Amines

- Amines are basic in nature due to the presence of lone pair of $e^{\ominus}$ on nitrogen atom
- Aliphatic amines are stronger bases than ammonia due to +I effect of alkyl group present in Amines.
- Aromatic amines are weaker bases than ammonia due to -I effect of aryl group.
- Besides inductive effect there are effects like steric effect, solvation effect, resonance effect which affect the basic strength of amines.
- In gaseous phase, the order of basicity

$$3° \text{ amines} > 2° \text{ amines} > 1° \text{ amines} > NH_3$$

- In aqueous phase, despite of inductive effect, solvation effect and steric hindrance also plays an important rule. Thus, the orde of basicity of amines is

$$\underset{2°}{(C_2H_5)_2NH} > \underset{3°}{(C_2H_5)_3N} > \underset{1°}{C_2H_5NH_2} > NH_3$$

and

$$\underset{2°}{(CH_3)_2NH} > \underset{1°}{CH_3NH_2} > \underset{3°}{(CH_3)_3N} > NH_3$$

Aryl groups are more acidic than alkyl groups.

Table of activating & deactivating groups

Strongly activating	$-O^{\ominus}$ $-NR_2$ $-NHR$ $-NH_2$ $-OH$
Moderately activating	$-OR$ $-NHCOR$ $-OCOR$
Mildly activating	Alkyl groups (R) Aryl groups (Ar)
Mildly deactivating	$-F$ $-Cl$ $-Br$ $-I$
Strongly deactivating	$-CONH_2$ $-COOR$ $-COR$ $-SO_3R$ $-CN$ $-CF_3$ $-NO_2$ $-\overset{\oplus}{N}R_3$

→ Electron Donating Groups increase +I effect hence decrease acidic strength increase Basic Strength

→ Electron withdrawing group increase -I effect hence increase acidic strength and decrease basic strength.

$K_a \propto$ acidic strength

$pK_a \propto \frac{1}{\text{acidic strength}}$

$K_b \propto$ basic strength

$pK_b \propto \frac{1}{\text{Basic strength}}$

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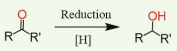
Organic Reagants and Reations

Reducing Agents

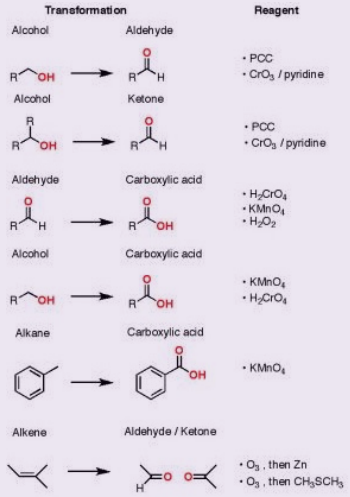
Preparation of Alcohols by Reduction of Carbonyl Compounds



	[H]	$LiAlH_4$	$NaBH_4$	Raney Ni	Pd/C	DIBAL-H
Aldehyde		✓	✓	✓	Not effective	✓
Ketone		✓	✓	✓		✓
Ester		✓	✗	✗	✗	✓
Acid		✓	✗	✗	✗	✓
Acid Chloride		✓	✓	✗	✗	✓

* DIBAL-H can reduce esters and acid chlorides to an aldehyde at -78 °C.

Oxidising Agents



Name of Reagent	Conditions	Example of its Use
$K_2Cr_2O_7$ with conc. H_2SO_4	Warm gently	**Oxidising agent**, used commonly for oxidising secondary alcohols to ketones.
Excess conc. H_2SO_4	heat to 170 C	Dehydrating agent, used to dehydrate alcohols to alkenes.
$Cl_2(g)$	Ultra Violet light	Free radical reaction, used to convert alkanes to haloalkanes.
Br_2 in CCl_4	Room temperature, in the dark	Electrophilic addition, converts alkenes to dihaloalkanes.
$H_2(g)$	Nickel catalyst, 300 C and 30 atmospheres pressure	**Hydrogenating agent**, used to convert benzene to cylcohexane.
$H_2(g)$	Nickel catalyst, 150 C	**Reducing agent**, used to convert alkenes to alkanes
Tin in hydrochloric acid	Reflux	Reducing agent for converting nitrobenzene to phenylamine.
Acidified KMNO4	Room temperature	**Oxidising agent**, converts alkenes to diols.
NaOH in ethanol	Reflux	Elimination reaction, converts haloalkanes to alkenes.

Aqueous NaOH	Reflux	Nucleophilic substitution, converts haloalkanes to alcohols.
Mg in dry ether	Reflux	Used to make grignard reagents with haloalkanes.
PCl_5	Room temperature	Chlorinating agent, reacts with OH group in alcohols and carboxyllic acids
HNO_3 and H_2SO_4	55 C	Adds NO_2 group onto benzene ring.
Cl_2 and $AlCl_3$	Warm gently	Adds Cl group onto benzene ring.
CH_3CH_2Cl and $AlCl_3$	Warm gently	Adds CH_3CH_2 group onto benzene ring.
HCl and $NaNO_2$	Below 5 C	Forms diazonium salts with phenylamine.

Organic Reaction Mechanisms

Nucleophilic Substitution Reaction.

Bharat Parmar

Comparing the SN1 and the SN2 reactions

	S_N1	S_N2
Rate Law	Unimolecular (substrate only)	Bimolecular (substrate and nucleophile)
"Big Barrier"	Carbocation stability	Steric hindrance
Alkyl halide (electrophile)	3° > 2° >>1° (worst)	1° > 2° >>3° (worst)
Nucleophile	Weak (generally neutral)	Strong (generally bearing a negative charge)
Solvent	Polar protic (e.g. alcohols)	Polar aprotic (e.g. DMSO, acetone)
Stereochemistry	Mix of retention and inversion	Inversion only

S_N1 Mech.

S_N2 mech.

S_N1 Mechanism

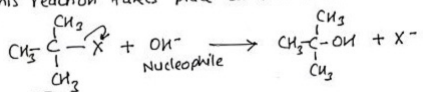
Unimolecular Nucleophilic Substitution Rxn.

The rate of reaction depends only on the conc. of 1 reactant i.e alkyl halide

e.g order of reaction = 1

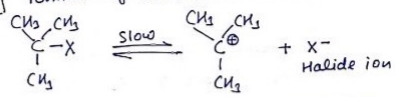
molecularity of reaction = 1

This reaction takes place in two steps.

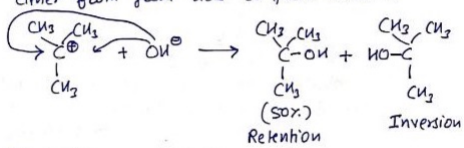


Mechanism

Step-I Formation of intermediate carbocation



Step-II Attack of nucleophile on C^+ may occur either from front side or from backside



Rate of Rxn = $K[(CH_3)_3X]$

Order = 1

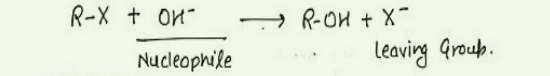
S_N2 Mechanism

Bimolecular Nucleophilic Substitution Rxn

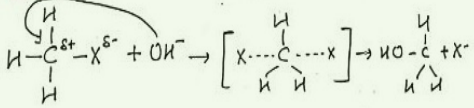
Order = 2, molecularity = 2

because the rate of reaction depends upon the conc. of both reactants i.e alkyl halide and Nucleophile

ex: Substitution by hydroxy group.



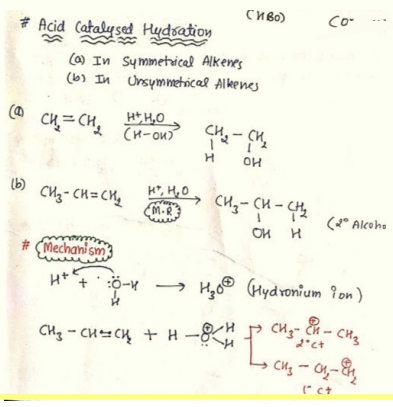
Mechanism

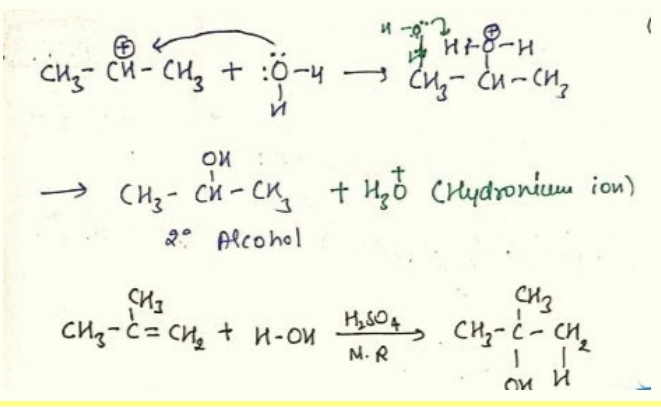


Rate of Rxn = $K[CH_3X][OH^-]$

- In this mechanism, the configuration of alkyl halide gets inverted. This is called inversion of configuration or Walden inversion.

Acid Catalysed Hydration of Alkenes.





Dehydration of Alcohol

→ Alkene

→ Ethers.

Dehydration of Alcohol

Removal of water ($-H_2O$)

$-\overset{|}{\underset{|}{C}}-\overset{|}{\underset{|}{C}}- \xrightarrow{\text{conc } H_2SO_4/\text{conc } H_3PO_4} H-\overset{H}{\underset{H}{C}}=\overset{H}{\underset{H}{C}}-H$ (H, OH)

In case of 1° alcohol

$CH_3-CH_2-OH \xrightarrow[443\,K]{\text{conc. } H_2SO_4} CH_2=CH_2$

2° alcohol

$CH_3-CH(OH)-CH_3 \xrightarrow[\text{or } H_3PO_4]{80\%\ H_2SO_4} CH_3-CH=CH_2$ (440K)

3° alcohol

$(CH_3)_3C-OH \xrightarrow[H_2SO_4]{20\%\ H_3PO_4} (CH_3)_2C=CH_2$ (358 K)

Order of Dehydration $3° > 2° > 1°$

Mechanism of Dehydration of alcohol

Step-1

$CH_3-CH_2-\ddot{O}-H \underset{\text{(fast)}}{\overset{[H^+]}{\rightleftharpoons}} CH_3-CH_2-\overset{H}{\overset{|}{\overset{\oplus}{O}}}-H$ (Protonated alcohol)

Step-2

$CH_3-CH_2-\overset{H}{\overset{|}{\overset{\oplus}{O}}}-H \underset{RDS}{\overset{\text{slow}}{\rightleftharpoons}} CH_3-\overset{\oplus}{C}H_2 + H_2O \xrightarrow{\text{fast}} CH_2=CH_2 + H^+$

Preparation of Ethers

(32)

(•) Dehydration of Alcohol

$CH_3-CH_2-OH \xrightarrow[443K]{H_2SO_4} CH_2=CH_2$ ← elimination

$2(HO-CH_2-CH_3) \xrightarrow[413K]{H_2SO_4} CH_3-CH_2-O-CH_2-CH_3$

Condition

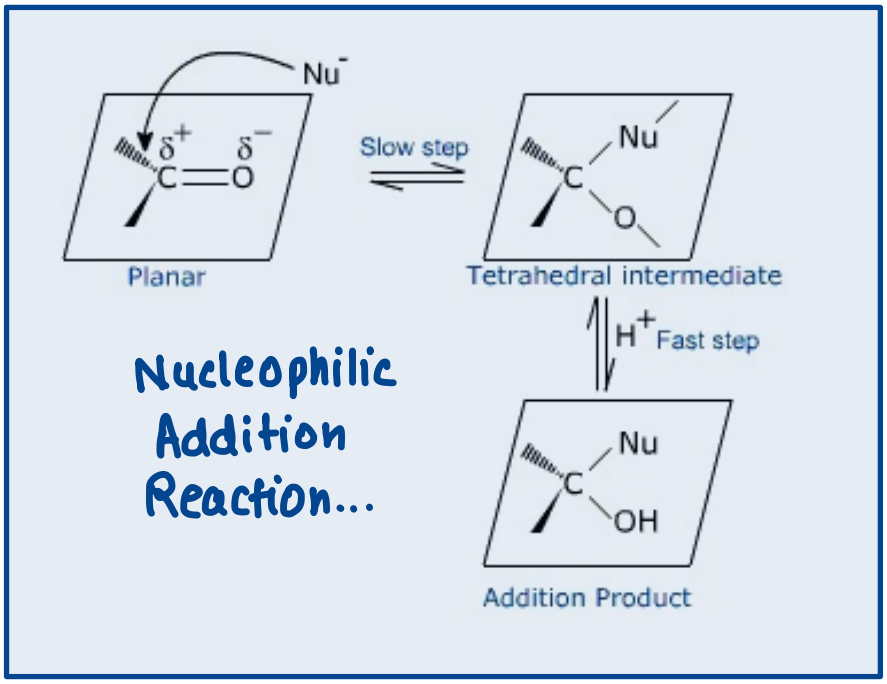
(i) Low temperature
(ii) Less hindered
(iii) S_N1 mechanism is followed
(iv) High concentration of alcohol is used

$CH_3-CH_2-\ddot{O}-H \xrightarrow{H^+} CH_3-CH_2-\overset{\oplus}{\overset{H}{\overset{|}{O}}}-H$

$CH_3-CH_2-\ddot{O}-H$

$CH_3-CH_2-\overset{H}{\overset{|}{\overset{+}{O}}}-CH_2-CH_3 \xrightarrow{-H_2O}$

$\xrightarrow{-H^+} CH_3-CH_2-O-CH_2-CH_3$



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BIOMOLECULES

CARBOHYDRATES

These are optically active polyhydroxy aldehydes or ketones

General formula : $C_x(H_2O)_y$

CLASSIFICATION ON THE BASIS OF HYDROLYSIS

MONOSACCHARIDES
Cannot be hydrolysed further
eg glucose, fructose, ribose etc.

OLIGOSACCHRIDES
Give 2-10 molecules of monosaccharides
eg Sucrose, maltose

POLYSACCHARIDES
Give large number of monosaccharides
eg starch, cellulose.

PREPARATION OF GLUCOSE

From Sucrose

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + C_6H_{12}O_6$$
(Glucose) (Fructose)

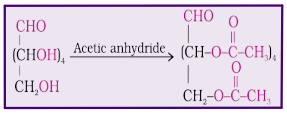
From starch

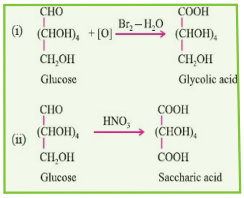
$$(C_6H_{10}O_5)_n + nH_2O \xrightarrow{H^+} nC_6H_{12}O_6 \text{ (Glucose)}$$

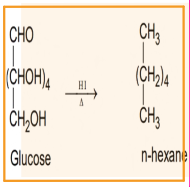
STRUCTURE

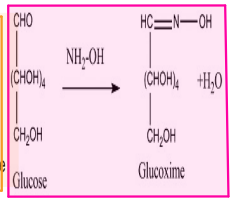
CHO ← one aldehyde group
(CHOH)$_4$ ← four 2° alcohol
CH_2OH ← one 1° alcohol

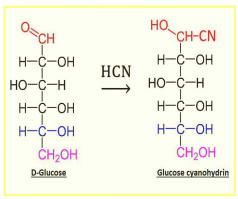
CHEMICAL PROPERTIES OF GLUCOSE





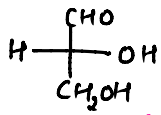




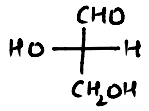


Str.

D-Glyceraldehyde



L-Glyceraldehyde

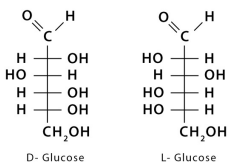


(D) means -OH is R.H.S

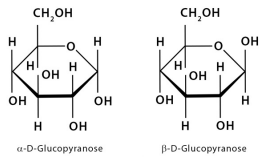
(L) means -OH in L.H.S

Str. of Glucose

Fischer Projection



Haworth Projection



ON THE BASIS OF NATURE

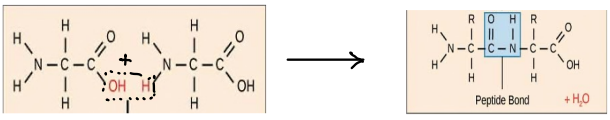
NEUTRAL
Equal no. of amino and carboxyl gp.
eg Glycine, Alanine, Valine

ACIDIC
More no. of carboxyl group
e.g Aspartic Acid, Glutamic Acid

BASIC
More no. of amino group.
e.g lysine, Arginine.

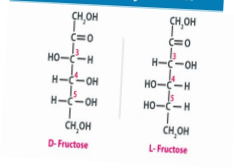
PEPTIDE BOND

When two α-amino acids combined together to form peptide by the elimination of water, the bond CO-NH present in peptide is known as peptide bond.

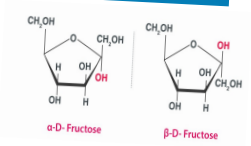


Str. of fructose

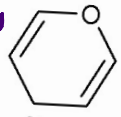
Fischer Projection



Haworth Projection



Six membered Cyclic ring



five membered Cyclic Ring

Reducing Sugars

- Free aldehydic or ketonic group
- Reduce fehling Soln and Tollens Reagent.
- Maltose and Fructose

Non Reducing Sugars

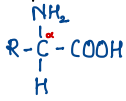
- Do not have free aldehydic or ketonic gp.
- Do not reduce fehling Soln and Tollens Reagent.
- Sucrose

PROTENS

These are the biomolecules from which living system made up of.

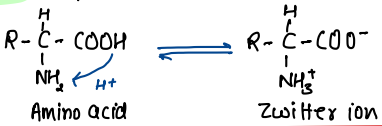
"These are the polymers prepared by the monomers of "α-amino acid by condensation polymerisation.

Str. of α-amino acid.



AMINO ACIDS colourless, water soluble, high melting crystalline solids and behave like salts.

In aqueous solution carboxyl group can lose a proton and amino group can accept one forming **ZWITTER ION** (Amphoteric Nature)



except glycine (R=H) all α-amino acids are optically active and have D and L configuration

CLASSIFICATION OF AMINO ACIDS

ON THE BASIS OF SOURCE

Essential amino acids
Which can be synthesized in the body and must be supplied through diet.

Non essential amino acids
Which can be synthesised in the body.

Leucine	Cysteine
Lysine	Glutamate
Methionine	Glutamine

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Peptides are further divided into di, tri, tetra depending upon the number of α-amino acid combined.

ISOELECTRIC POINT: The pH at which dipolar ion (zwitter ion) exists as neutral ion. i.e +ve and -ve charge is equal and it does not migrate to either electrode is called isoelectric point.

Str. of Proteins

Primary str.

It refers to sequence of amino acid in each polypeptide chain

Secondary str.

It refers to shape in which polypeptide chain exist

(i) α- helix
(ii) β- pleated

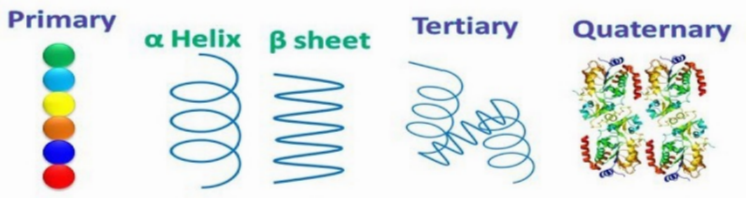
Tertiary str.

It represents the overall folding of polypeptide chain i.e further folding of 2° str.

i) Fibrous (ii) Globular

Quaternary str.

It refers to spatial arrangement of subunits w.r.t each other



DENATURATION OF PROTEIN

- A protein found in a biological system with a unique 3-D str. and biological is called as Native Protein
- When a protein in its native form is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed due to which globules unfold and helix get uncoiled and protein loses its biological activity.
- During denaturation, 2° and 3° str. are destroyed but 1° str. remains intact

e.g coagulation of egg white on boiling
curdling of milk.

GLOBULAR PROTIEN

- They have nearly spherical structure.
- These are soluble in water
- Have α-helix str.
- insuline, albumin

FIBROUS PROTIEN

- They have linear thread like str.
- These are insoluble in water
- have β-pleated str.
- Keratin (hair, wool, silk) myosin (muscles)

DIFFERENCE BETWEEN DNA & RNA

DNA	RNA
It is double stranded nucleic acid.	It is single stranded nucleic acid.
It contains deoxyribise sugar.	It contains ribose sugar.
It contains Thymine (T) as a nitrogenous base.	It contains Uracil (U) instead of Thymine.
It is the genetic and hereditary material of the cells.	It is involved in synthesis of proteins.
It is present in the nucleus of the cells.	It is present in both nucleus and cytoplasm.

NUCLEIC ACIDS

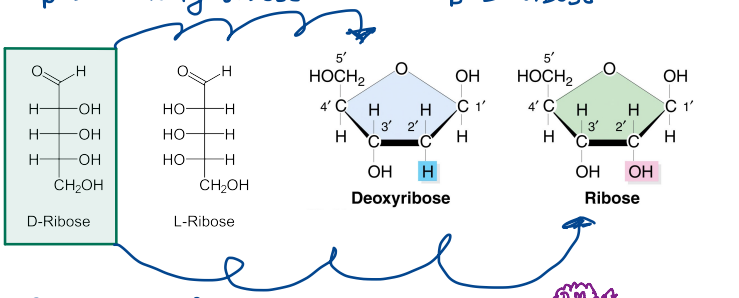
These are polymers of nucleotides present in the nucleus of the cell. These are also called polynucleotides.

1.) Deoxy ribonucleic acid (D.N.A)
2.) Ribonucleic acid (R.N.A)

COMPOSITION OF NUCLEIC ACID

1.) Pentose sugar 2.) Phosphoric Acid 3.) Nitrogeneous base

- In DNA sugar present is β-D-2-deoxy ribose
- In RNA, sugar present is β-D-ribose

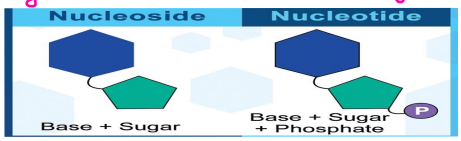


- Base present in Nucleic Acids are adenine (A), guanine (G), Cytosine (C) Uracil (U) and thymine (T)

In DNA → A, G, C, T In RNA → A, G, C, U

NUCLEOSIDE ← Sugar + Base

NULLEOTIDE ← Sugar + Base + Phosphoric Acid.



	Nucleoside	Nucleotide
(i)	Nucleoside is a compound formed by the union of a nitrogen base with a pentose sugar.	Nucleotide is a compound formed by the union of a nitrogen base, a pentose sugar and phosphate.
(ii)	It is a component of nucleotide.	Nucleotide is formed through phosphorylation of nucleoside.
(iii)	It is slightly basic in nature.	A nucleotide is acidic in nature.

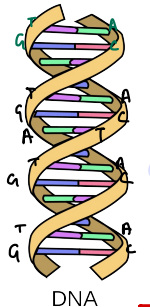
TYPES OF RNA:

(i) Messenger RNA (m-RNA): This carries genetic code from DNA to ribosomes where protein is synthesised

(ii) Ribosomal RNA (r-RNA): This provide site for protein synthesis.

(iii) Transfer RNA (t-RNA): This transfer amino acid from different parts of cytoplasm to ribosomes during Protein Synthesis

STRUCTURE OF DNA:-



= Adenine
= Thymine
= Cytosine
= Guanine
T=A
G≡C
= Phosphate backbone

DNA has a double helical structure with A & T and G & C linked together through two and three hydrogen bond respectively.

Intermediate
Mitochondria