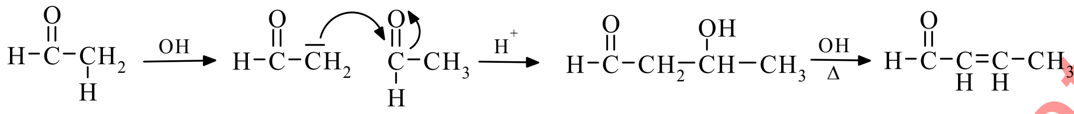
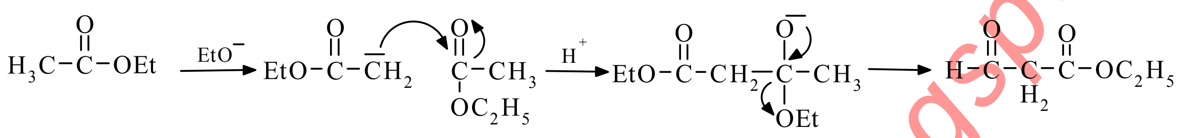
NUTSHELL REVIEW & PREVIEW OF
ORGANIC NAME REACTIONS

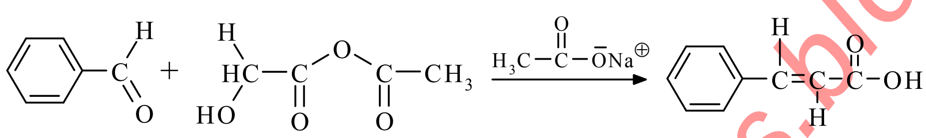
- **Aldol Condensation**



- **Claisen Condensation**

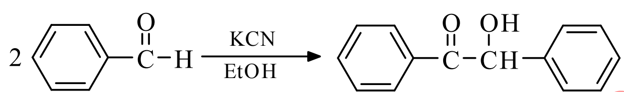


- **Perkin Condensation**



Cinnamic acid

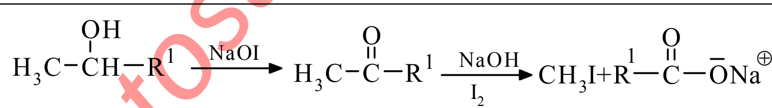
- **Benzoin Condensation**



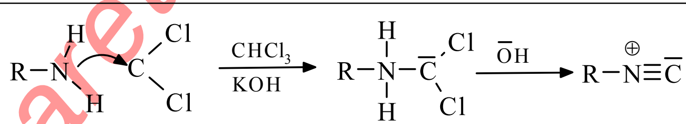
Benzoin

- **Wittig Reaction**

- **Haloform Reaction**

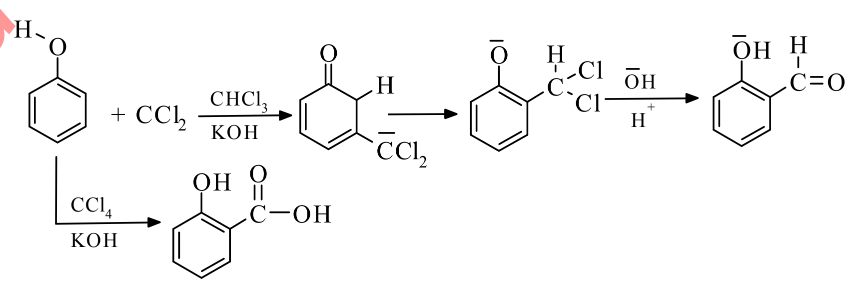


- **Carbylamine Test**

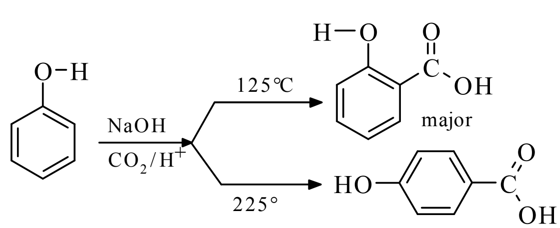


Isocyanide

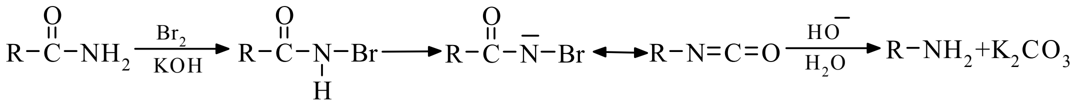
- **Reimer Tiemann Reaction**



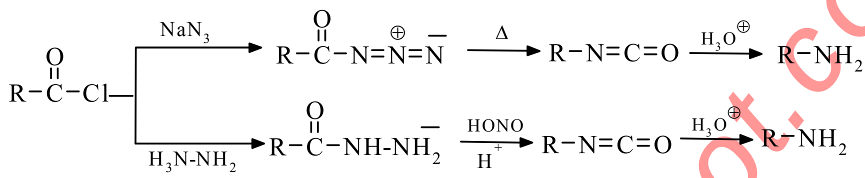
- **Kobe's Schimdt Reaction**



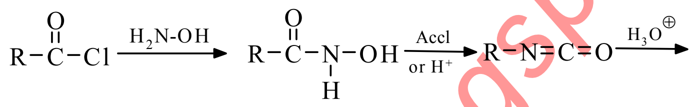
- **Hofmann Bromoamide Degradation**



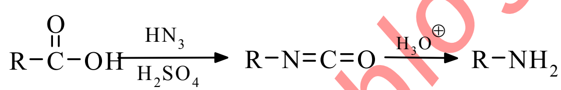
- **Curtius Reaction**



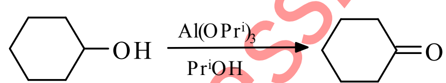
- **Lossen Reaction**



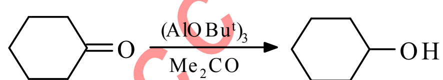
- **Schimdt Reaction**



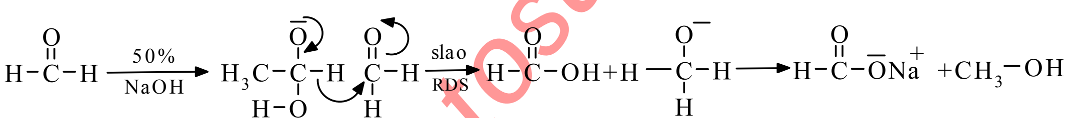
- **Meerwein Ponndorfverly reduction**



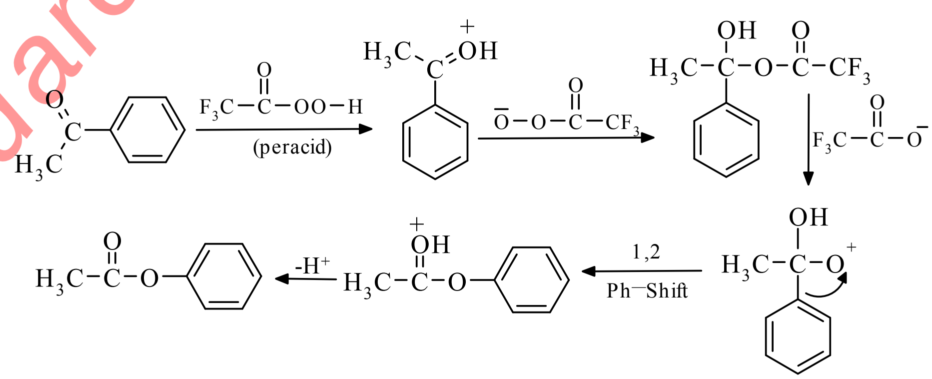
- **Oppeneuer Oxidation**



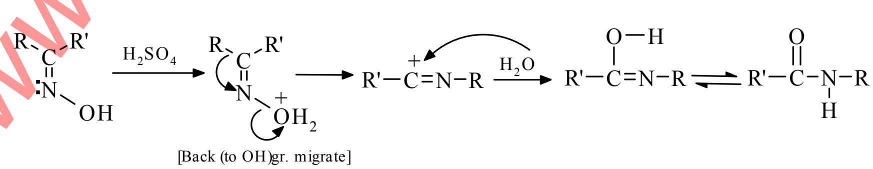
- **Cannizzaro reaction**



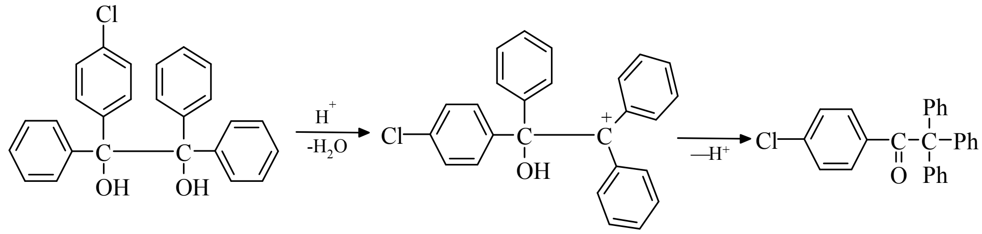
- **Bayer villiger oxidation**



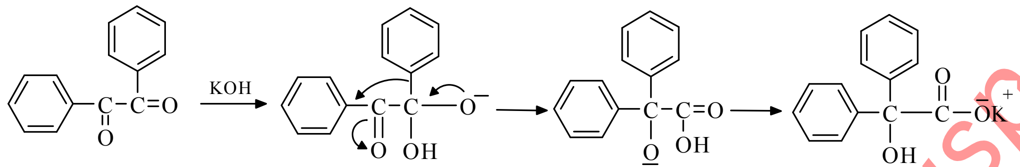
- **Beckmann Rearrangement**



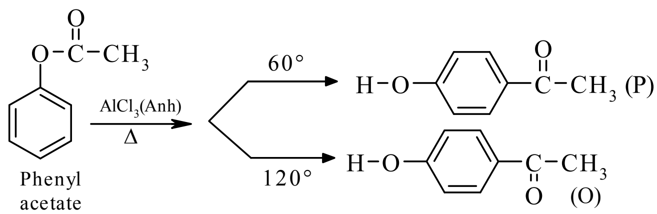
- **Pinacol Pincolone rearrangement**



- **Benzylic acid rearrangement**

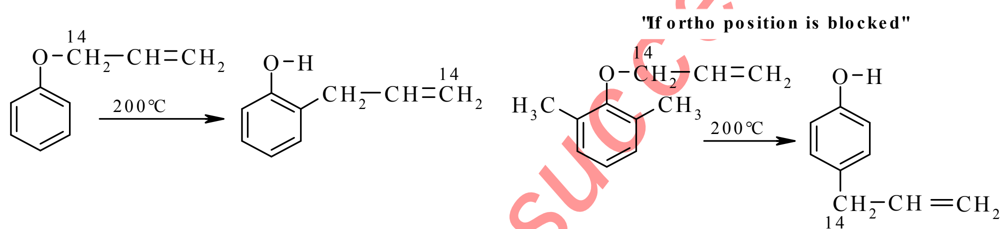


- **Fries Rearrangement**

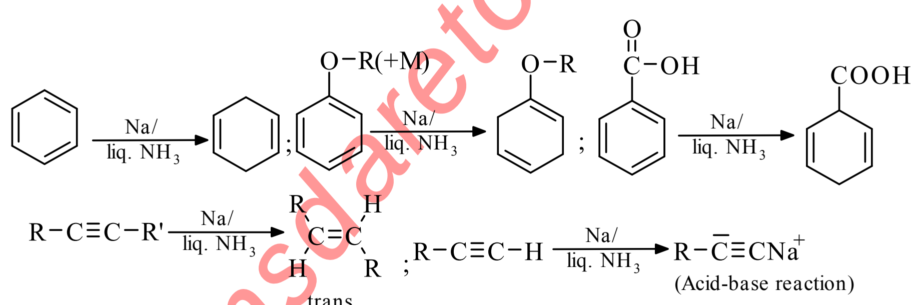


O,P (Hydroxy acetophenone)

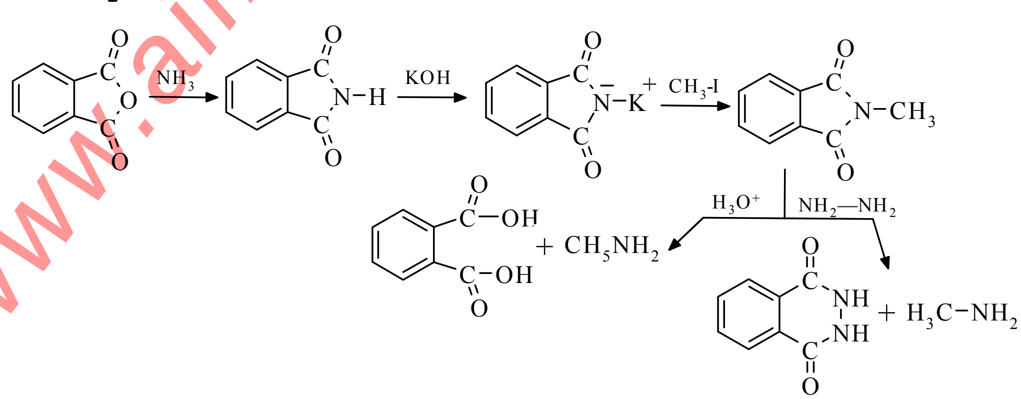
- **Claisen Rearrangement**

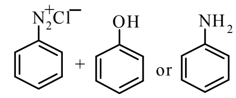
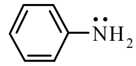
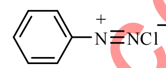
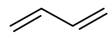
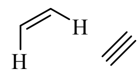
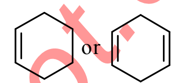
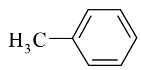
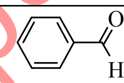
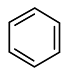
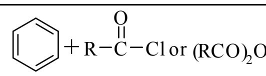
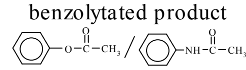


- **Birch Reduction**



- **Gabriel Synthesis**

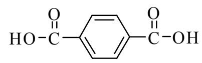
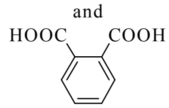
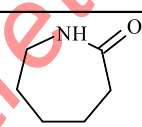


Name	Reactant	Reagent	Product
Clemmensen Reduction	Aldehyde & Ketone	Zn-Hg/ conc. HCl	Alkane
Coupling Reaction		NaOH (phenol) HCl (Aniline)	Azo Dyne (Detection of OH or NH_2 gr)
Diazotization		$NaNO_2$ + HCl 0° – 5°C	
Diels Alder Reaction	 Diene	 Dienophile	 cyclic addition product
Etard reaction		CrO_2Cl_2/ CS_2	 (Benzaldehyde)
Fittig Reaction	Halo benzene	Na/ Dry ether	Diphenyl
Friedel Craft alkylation	 +R—X	Anhydrous $AlCl_3$	Alkyl Benzene
Friedel Craft acylation		Anhydrous $AlCl_3$	Acyl Benzene
Gattermann aldehyde synthesis	C_6H_6	HCN+ HCl +$ZnCl_2$/ H_3O^+	Benzaldehyde
Gattermann-Koch reaction	C_6H_6 (CO + HCl)	anhy $AlCl_3$	Benzaldehyde
Hell-Volhard-Zelinksy reaction	carboxylic acid having α-hydrogen atom	Br_2/ red P	α– halogenated carboxylic acid
Hoffmann mustard oil reaction	primary aliphatic amine + CS_2	$HgCl_2$/ Δ	CH_3CH_2—N=C=S +HgS (black)
Hunsdiecker reaction	Ag salt of carboxylic acid	Br_2/ CCl_4, 80°C	alkyl or aryl bromide
Kolbe electrolytic reaction	alkali metal salt of carboxylic acid	electrolysis	alkane, alkene and alkyne
Meerwein - Ponndorf	Ketone	$[(CH_3)_2CHO]_3$ Al + $(CH_3)_2CHOH$	Secondary alcohol
Mendius reaction	alkyl or aryl cyanide	Na/ C_2H_5OH	primary amine
Rosenmund reduction	acid chloride	H_2, Pd/ $BaSO_4$, S, boiling xylene	aldehyde
Sabatier-Senderens reaction	Unsaturated hydrocarbon	Raney Ni/ H_2, 200—300°C	Alkane
Sandmeyer reaction	$C_6H_5\overset{+}{N_2}Cl^-$	CuCl/ HCl or CuBr/ HBr or CuCN/ KCN, heat	halo or cyanobenzene
Gattermann Reaction	$C_6H_5N_2^+Cl^-$	Cu/ Hx(HBr/ HBr/ HBr	Halobenzene
Schotten-Baumann reaction	(phenol or aniline or alcohol)	NaOH + C_6H_5COCl	benzolytated product 
Stephen reaction	alkyl cyanide	$SnCl_2$/ HCl	Aldehyde
Ullmann reaction	Iodobenzene	Cu (heat)	Diphenyl
Williamson synthesis	alkyl halide	sodium alkoxide or sodium phenoxide	ether
Wurtz-Fittig reaction	alkyl halide + aryl halide	Na/ dry ether	alkyl benzene

ADDITION POLYMERS

S. No	Name of Polymer	Abbreviation	Starting Materials	Nature of Polymer	Properties	Applications
I. Polyolefins						
1.	Polyethylene or Polyethene		$CH_2=CH_2$	Low density homopolymer (branched chain growth	Transparent, moderate tensile strength, high toughness	Packing material bags, insulation for electrical wires and cables. Buckets, tubes, house ware pipes, bottles and toys
2.	Polypropylene or Polypropene or Herculon		$CH_3CH=CH_2$	Homopolymer, linear, chain growth	Harder and stronger than polyethene	Packing of textiles and foods, liners for bags, heat shrinkage wraps, carpet fibres, ropes, automobile mouldings, stronger pipes and bottles.
3.	Polystyrene or Styron		$C_6H_5CH=CH_2$	Homopolymer, linear, chain growth	Transparent	Plastic toys, household wares, radio and television bodies, refrigerator linings.
II. Polydienes						
1.	Neoprene		$H_2C=CH-\underset{}{\overset{Cl}{\overset{\mid}{C}}}=CH_2$ Chloroprene or 2-Chloro-1,3-butadiene	Homopolymer, chain growth	Rubber like, a superior resistant to aerial oxidation, and oils, gasoline etc.	Horses shoe heels, stoppers.
2	Buna S (Styrene-Butadiene, Rubber)	SBR or GRS	$H_2C=CH-CH=CH_2$ 1,3-butadiene and $C_6H_5CH=CH_2$ Styrene	Copolymer, chain growth	Rubber like, a superior resistant to aerial oxidation, and oils, gasoline etc.	Manufacturer of tyres, rubber soles, water proof shoes.
III. Polyacrylates						
1.	Polymethylmethacrylate (Flexiglass Lucite, Acrylite or Perspex	PMMA	$H_2C=\overset{CH_3}{\overset{\mid}{C}}-COOCH_3$	Homopolymer	Hard, transparent, excellent light transmission. Optical clarity better than glass, takes up colours.	Lenses, light covers, light shades, signboards, transparent domes, skylights, air craft windows, dentures and plastic jewellery.
2.	Polyethylacrylate		$H_2C=CH-COOC_2H_5$	Homopolymer	Tough, rubber like product.	
3.	Polyacrylonitrile or Orlon	PAN	$CH_2=CH—CN$	Homopolymer	Hard, horny and high melting materials.	Orion, acrilon used for making clothes, carpets, blankets and preparation of other polymers.
IV. Polyhalofins						
1.	Polyvinyl chloride	PVC	$CH_2=CH—Cl$	Homopolymer, chain growth	Pliable (easily moulded)	(i) Plasticised with polyester polymers used in rain coats, hand bags, shower curtains, fabrics, shoe soles, vinyl flooring (ii) Good electrical insulator, (iii) Hose pipes.
2.	Polytetrafluoroethylene, or Teflon	PTFE	$F_2C=CF_2$	Homopolymer	Flexible and inert to solvents, boiling acids even aquaregia, stable upto 598 K	(ii) For nonstick utensils coating (ii) Making gaskets, pump packings, valves, seals, non lubricated bearings.
3.	Polymonochlorotrifluoro-ethylene	PCTFE	$ClFC=CF_2$		Less resistant to heat and chemicals due to presence of chlorine atoms.	Similar to those of Teflon.

CONDENSATION POLYMERS

S. No	Name of Polymer	Abbre viation	Starting Materials	Nature of Polymer	Properties	Applications
I. Polyesters						
1.	Terylene or Dacron or Mylar		$HO-CH_2-CH_2-OH$ Ethylene glycol or Ethane-1,2-diol And  Terephthalic acid or Benzene-1,4-dicarboxylic acid	Copolymer, step growth, linear	Fibre crease resistant, low moisture content, not damaged by pests likes moths.	For wash and wear fabrics, tyre cords, sea belts and sails.
2.	Glyptal or Alkyl resin		$HO-CH_2-CH_2-OH$ Ethylene glycol and  Phthalic acid or Benzene-1,2-dicarboxylic acid	Copolymer, linear step growth	Thermoplastic, dissolves in suitable solvents and solutions, on evaporation leaves a tough but not flexible film.	Paints and lacquers.
II. Polyamides						
1.	Nylon-6,6		$HO-\overset{O}{\overset{\|\|}{C}}(CH_2)_4-\overset{O}{\overset{\|\|}{C}}-OH$ Adipic acid and $H_2N-(CH_2)_6-NH_2$ Hexamethylenediamine	Copolymer, linear, step growth		
2	Nylon-6,10		$H_2N(CH_2)_6NH_2$ Hexamethylene diamine and $HOOC(CH_2)_8COOH$ Sebacic acid	Copolymer, linear, step growth	High tensile strength, abrasions resistant, somewhat elastic	(i) Textile fabrics, carpets, bristles for brushes. (ii) Substitute of metals in bearings (iii) Gears elastic hosiery. Mountaineering ropes, tyre cords, fabrics.
3.	Nylon-6 or Perlon L		 Caprolactum	Homopolymer, linear		Mountaineering ropes, tyre cords, fabrics.
Fermaldehyde resins						
1.	Phenolformaldehyde resin or Bakelite		Phenol and formaldehyde	Copolymer, step growth		(i) with low degree polymerization for binding glue, wood, varnishes, lacquers. (ii) With high degree polymerisation for combs, for mica table tops, fountain pen barrels, electrical goods (switches and plugs), gramophone records.
2.	Melamine formaldehyde resin		Melamine and formaldehyde	Copolymer, step growth	Tough, rubber like product.	Non-breakable and non-plastic crockery.

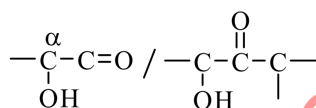
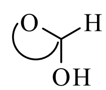
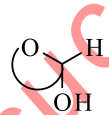
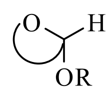
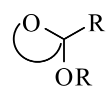
CARBOHYDRATES

- Polyhydroxy aldehyde or Ketone (cyclic hemiacetal / or hemiacetal or acetal or ketal
- Monosaccaride ($C_nH_{2n}O_n$) : single unit, can't be hydrolysed : Glucose; fructose (by glycosydic linkage)

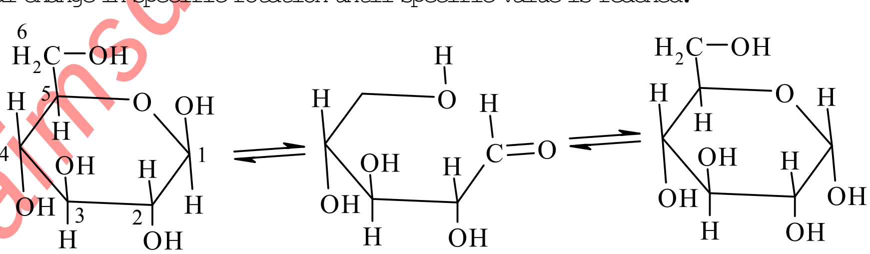
  Sucrose $\xrightarrow{H_3O^+}$ Glucose + Fructose; maltose $\xrightarrow{H_3O^+}$ 2 Glucose unit

  Lactose $\xrightarrow{H_3O^+}$ Glucose + Galactose
- Polysaccaride : Contain more than monosaccaride units

  $(C_6H_{10}O_5)_n$: Starch & cellulose.

TYPE OF SUGAR		
Give Test	**Reducing**	**Non Reducing**
1. Tollen's Reagent	+ve test	–ve test
2. Fehling Reagent	+ve test	–ve test
3. Benedict Test	+ve test	–ve test
4. Mutarotation	Yes	No
5. Functional Unit	  Hemiacetal  Hemiketal	 Acetal  Ketal
6. Example	All monossaccaride Glucose; fructose, mannose, galactose, Dissaccaride : maltose; lactose	Dissaccaride : Sucrose Polysaccaride : starch cellulose

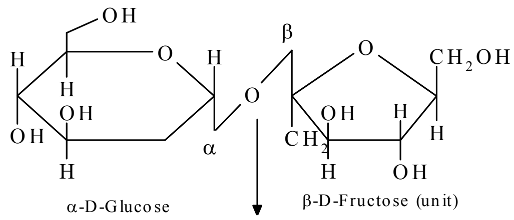
- **Mutarotation:** When either form is placed in solution it slowly form the other via open chain aldehyde form & gradual change in specific rotation until specific value is reached.



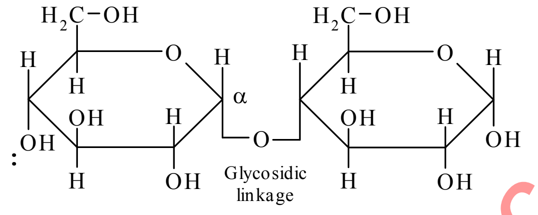
β-D-Glucose $[\alpha]_D = +19°$ | $[\alpha]_0 = 52.1$ | α-D-Glucose $[\alpha]_D = +112°$

- **Anomer's :** Difter in configuration at 1st carbon due to hemi (acetal or ketal) ring formation. The new-symmetric carbon is referred to as Anomeic carbon.
- **Epimer's :** Distereomer's which differ in conformation at one chiral carbon [maltose & glucose (epimers carbon is C_2]

- **Sucrose :**

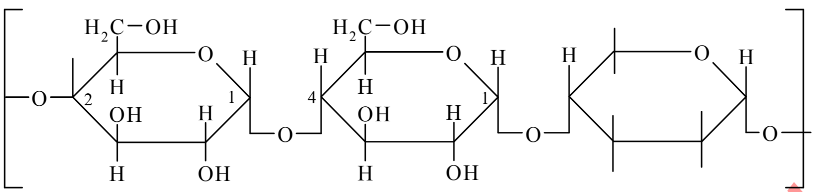


- **Maltose**



Two a-D-Glucose unit

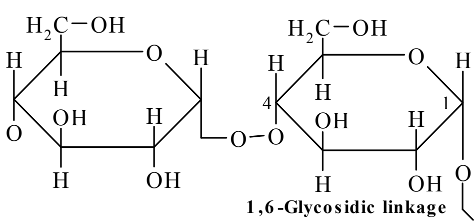
- **Starch :** (Amylose & Amylopectin)
- **Amylose : (Straight Chain) :**



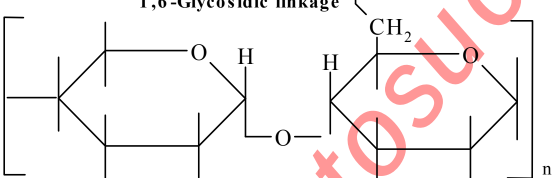
(α-1,4 Glycosidic linkage)

(i) Soluble in H_2O & give blue colour with I_2 (ii) 10 to 20%

- **Amylopectin (Branch chain) : $(C_6H_{12}O_5)_n$**



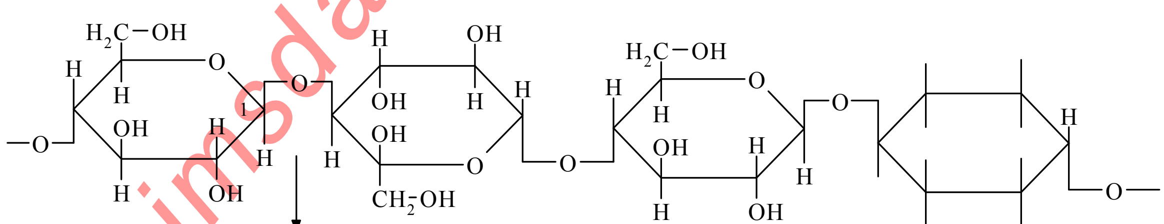
$(C_6H_{12}O_5)_n$
nH_2O ↓Diatase
$C_{12}H_{22}O_{11}$ (maltose)
nH_2O ↓maltose
$2C_6H_{12}O_6$ α-D-Glucose



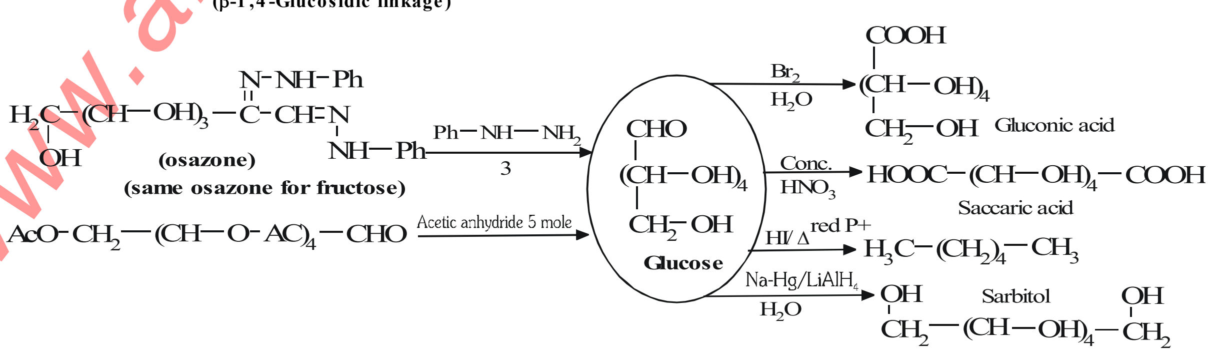
Cellulose
nH_2O ↓ Cellulose
$nC_6H_{12}O_6$
β-D-Glucose

1,4-Glycosidic linkage

- **Cellulose :** (Straight chain β-D-Glucose unit)

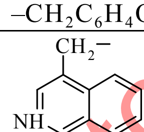
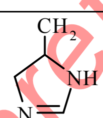
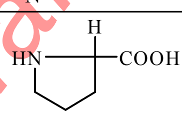


(β-1,4-Glucosidic linkage)



AMINO ACIDS

- $H_3N^+—CH_2—COO^−$ (Glycine) $H_3N^+—CH(CH_3)—COO^−$ (α-Alanine)

S.No.	Name of amino acid	Structure of R	Three letter symbol
1.	Glycine	$–H$	Gly
2	Alanine	$–CH_3$	Ala
3.	Valine	$–CH(CH_3)_2$	Val
4.	Leucine	$–CHCH(CH_3)_2$	Leu
5.	Isoleucine	$–CH(CH_3)–CH_2CH_3$	Ile
6.	Arginine	$–(CH_2)_3NH–C(=NH)–NH_2$	Arg
7.	Lysine	$–(CH_2)_4NH_2$	Lys
8.	Glutamic acid	$–CH_2CH_2COOH$	Glu
9.	Aspartic acid	$–CH_2COOH$	Asp
10.	Glutamine	$–CH_2CH_2CONH_2$	Gln
11.	Asparagine	$–CH_2CONH_2$	Asn
12.	Threonine	$–CHOH.CH_3$	Thr
13.	Serine	$–CH_2OH$	Ser
14.	Cysteine	$–CH_2SH$	Cys
15.	Methoionine	$–CH_2CH_2SCH_3$	Met
16.	Phenylalanine	$–CH_2C_6H_5$	Phe
17.	Tyrosine	$–CH_2C_6H_4OH$ (p)	Tyr
18.	Tryptophan		Trp
19.	Histidine		His
20.	Proline		Pro

ISOELECTRONIC POINT

- In electric field these ions will migrate towards the electrodes of opposite charge (+ve ions towards cathode and -ve ions towards anode). At a certain pH the dipolar ion exists as neutral ion and does not migrate to either electrodes. This pH is known as isoelectric point of amino acids. For neutral amino acids.

PEPTIDES

Condensation products of two or more molecules of α-amino acids is called peptides.

- **Peptide Linkage** : Linkage which unites the α-amino acid molecules together is called peptide linkage. It is -CO-NH- linkage.

STRUCTURE OF PROTEINS

- **Primary structure** : The sequence in which various amino acids are arranged in a protein is known as the primary structure of a protein. The number, sequence and identity of amino acids in a protein constitute primary structure of a protein.
- **Secondary structure** : The coiling of the long strings of amino acids in a protein is its secondary structure. The α-helix is a common secondary structure. In α-helix, the peptide chain coils and the turns of the coil are held together by hydrogen bonds. Another type of secondary structure is possible in which the protein chains are stretched out. It is a β-pleated sheet structure.
- **Tertiary structure** : The folding and binding of a-helix into more complex shapes illustrates the tertiary structure of proteins. At normal pH and temperature, each protein will take the energetically most stable shape. This shape is specific to a given amino acids which form proteins.
- **Quaternary protein structure** results when several protein molecules are bonded together to form a still larger units.

COLOUR TESTS

- **Biuret Test** : Proteins give a violet or blue colour with 10% NaOH solution and a drop of very dilute copper sulphate. The test is due to '-CO-NH-] group and is given by all compounds containing this group.
- **Millon's Test** : Millon's reagent is a solution of mercuric and mercurous nitrate in nitric acid. Protein, when warmed with Millon's reagent, gives a white precipitate which changes to red.