

CLASS 12 CHEMISTRY — FORMULA SHEET

Chapter 10 : Biomolecules (NCERT)

10.1 Carbohydrates — Classification

Type	Detail / Example
Carbohydrates	Polyhydroxy aldehydes/ketones or compounds giving them on hydrolysis
Monosaccharides	Cannot be hydrolysed further (glucose, fructose, ribose)
Disaccharides	Give 2 monosaccharides on hydrolysis (sucrose, maltose, lactose)
Polysaccharides	Many units (starch, cellulose, glycogen)
Reducing sugars	Reduce Tollens'/Fehling's (all monosaccharides, maltose, lactose)
Non-reducing sugar	Sucrose (no free aldehyde/ketone group)
Aldose / Ketose	Sugar with aldehyde (glucose) / ketone (fructose) group

10.2 Glucose, Fructose & Sucrose

Concept	Detail
Glucose formula	$C_6H_{12}O_6$; an aldohexose
Glucose structure	Six C, $-CHO$ at C1, five $-OH$ groups
Glucose ring forms	α and β pyranose (cyclic hemiacetal)
Fructose	Ketohexose ($-C=O$ at C2)
Sucrose	Glucose + fructose ; non-reducing
Invert sugar	Hydrolysis of sucrose $\rightarrow$ glucose + fructose (rotation reverses)
Starch	Amylose (linear) + amylopectin (branched) ; α -glucose units
Cellulose	β -glucose units ; structural polysaccharide in plants

10.3 Proteins & Amino Acids

Concept	Detail
Amino acid	Contains $-NH_2$ and $-COOH$ groups
Essential amino acids	Not made by body ; must come from diet
Zwitterion	Dipolar ion form ($-NH_3^+$ and $-COO^-$)
Isoelectric point	pH at which amino acid has no net charge
Peptide bond	$-CO-NH-$ link between amino acids (amide bond)
Primary structure	Sequence of amino acids in the chain
Secondary structure	α -helix and β -pleated sheet (H-bonding)
Tertiary structure	3D folding of the whole chain
Denaturation	Loss of 2°/3° structure (1° intact) ; protein loses function

10.4 Enzymes, Vitamins & Hormones

Concept	Detail
Enzymes	Biological catalysts (proteins) ; highly specific
Fat-soluble vitamins	A, D, E, K (stored in liver/fat)
Water-soluble vitamins	B-complex and C (not stored ; needed regularly)
Vitamin C deficiency	Scurvy
Vitamin D deficiency	Rickets
Vitamin A deficiency	Night blindness
Hormones	Chemical messengers (e.g. insulin, adrenaline)

10.5 Nucleic Acids (DNA & RNA)

Concept	Detail
Nucleic acids	Polymers of nucleotides (DNA, RNA)
Nucleotide	Base + sugar + phosphate
Nucleoside	Base + sugar (no phosphate)
Sugar in DNA / RNA	Deoxyribose / Ribose
Purine bases	Adenine (A), Guanine (G)
Pyrimidine bases	Cytosine (C), Thymine (T, DNA), Uracil (U, RNA)
Base pairing (DNA)	A=T and G≡C (complementary)
DNA structure	Double helix (Watson-Crick) ; carries genetic info
RNA role	Protein synthesis (mRNA, tRNA, rRNA)

★ QUICK MEMORY AIDS & TRICKS

Reducing sugars	All monosaccharides + maltose + lactose reduce Tollens'/Fehling's. Sucrose does NOT.
Glucose vs fructose	Glucose = aldohexose (–CHO) ; Fructose = ketohexose (–C=O at C2).
Starch vs cellulose	Starch = α-glucose (digestible) ; cellulose = β-glucose (we can't digest).
Invert sugar	Sucrose hydrolysis flips optical rotation → glucose + fructose.
Zwitterion	Amino acids exist as dipolar ions: –NH ₃ ⁺ and –COO [–] .
Protein structures	1° sequence, 2° helix/sheet, 3° folding, 4° subunits.
Vitamins	Fat-soluble A,D,E,K ; rest are water-soluble. C→scurvy, D→rickets, A→night blindness.
Base pairing	A pairs with T (2 H-bonds), G pairs with C (3 H-bonds). RNA uses U instead of T.