Biomolecules

- All the elements present in earth's crust are also present in living tissue. However, carbon and hydrogen present in relative abundance in living organism.
- Biomolecules - Chemicals or molecules present in the living organism. Types-
- Inorganic- minerals, gases and water
- Organic (Carbon & its compound) - carbohydrates, fats, proteins, nucleic acids, vitamins, etc.
- Chemical forms- aldehyde, ketones and aromatic compounds.
- Biochemical form- amino acids, nucleotides and fatty acids.

Analysis- Living tissue is made up of Organic compound-

Living Tissue (Vegetable/liver piece)

Grind → In Tri-chloroacetic acid (Cl_3CCOOH)

Slurry

Filter → using Cheese cloth

Acid Soluble (Filtrate)
(18-800/1000 Daltons)
Represents Cytoplasmic Composition

Acid In-soluble (Retentate)
(800/1000 and above Daltons)
Represents Cell wall, cell membrane Nucleic composition

1 Daltons= 1.66×10^{-27}Kg

Bio-Micro molecules	Bio-Macromolecules
Non-Polymeric	**Polymeric**
Amino Acids, Simple Sugar, Nucleotides, Nucleosides, Ions, Glycine etc	Polysaccharides, Nucleic Acids (DNA, RNA), Protein, Fats, Collagen, t-RNA, Starch, Insulin etc

Compounds in Earth Crust: **O>Si>Ca>Na**
Human Body: **O>C>N>Ca**

ELEMENT	% WEIGHT OF	
	EARTH'S CRUST	HUMAN BODY
Hydrogen (H)	0.14	0.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	Very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	Negligible

Analysis of inorganic compound in Living tissue:

Wet Weight- **Living Tissue** (Vegetable/liver piece)

Dry It → Water evaporate

Tissue (dry mass)

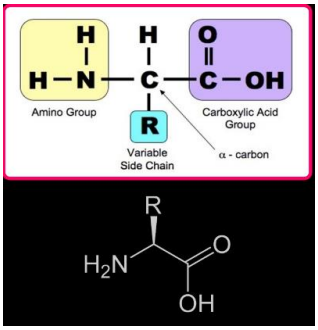
Combustion → Carbon Compound Oxidised

Ash (Contains- Na, K, Ca, Mg, H_2O, NaCl, PO_4^{-3}, SO_4^{-2} etc)

BIOMICROMOLECULES

Molecules found in living organisms that have low molecular weight (18-800 dalton) and generally found in acid soluble pool.

1. Amino Acids 2. Lipids 3. Simple Sugar 4. Nitrogenous Bases

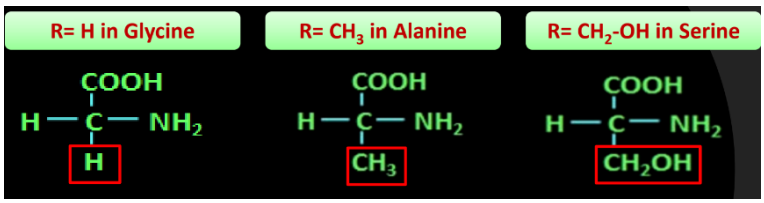


Amino acids- Organic compounds containing an amino group(NH_2), an acidic group (-COOH), a Hydrogen (H) and a Variable R group as substituents on the same (0)-carbon (also called α-amino acids). There are 20 types of Amino Acids.

- Amino acids could be Acidic , Basis, Neural , aromatic, Polar , non-polar etc on the basis of its structure and compound substituted hence called Substituted Methane.
- They could be classified as:
  Essential Amino Acid: Can not be synthesized by body and should be supplied through diet.
  Non-Essential: Can be synthesized by the body.
- Based on R group Amino Acids could be classified as:

Non-polar/Neutral	Acidic	Basic	Aromatic
VIP MLA G	AG	HAL	PTT

Amino Acid	Abbr.	Class	Polarity	Requirement	CODONS
Alanine	Ala	Aliphatic	Nonpolar	Non-Essential	GCU, GCC, GCA, GCG
Arginine	Arg	Fixed cation	Basic	Conditionally	CGU, CGC, CGA, CGG, AGA, AGG
Asparagine	Asn	Amide	Polar	Non-Essential	AAU,AAC,
Aspartic Acid	Asp	Anion	Acidic	Non-Essential	GAU, GAC
Cysteine	Cys	Thiol	Polar	Conditionally	UGU, UGC
Glutamine	Gln	Amide	Polar	Conditionally	CAA, CAG
Glutamic Acid	Glu	Anion	Acidic	Non-Essential	GAA, GAG
Glycine	Gly	Aliphatic	Nonpolar	Conditionally	GGU, GGC, GGA, GGG
Histidine	His	Aromatic cation	Base	Essential	CAU, CAC
Isoleucine	Ile	Aliphatic	Nonpolar	Essential	AUU, AUC, AUA
Leucine	Leu	Aliphatic	Nonpolar	Essential	UUA, UUG, CUU, CUC, CUA, CUG
Lysine	Lys	Cation	Base	Essential	AAA, AAG
Methionine	Met	Thioether	Nonpolar	Essential	AUG
Phenylalanine	Phe	Aromatic	Nonpolar	Essential	UUU, UUC
Proline	Pro	Cyclic	Polar	Conditionally	CCU,CCC, CCA, CCG
Serine	Ser	Hydroxylic	Polar	Conditionally	AGU, AGC
Threonine	Thr	Hydroxylic	Polar	Essential	ACU, ACC, ACA, ACG
Tryptophan	Trp	Aromatic (indole)	Nonpolar	Essential	UGG
Tyrosine	Tyr	Aromatic	Polar	Conditionally	UAU, UAC
Valine	Val	Aliphatic	Nonpolar	Essential	GUU, GUC, GUA, GUG



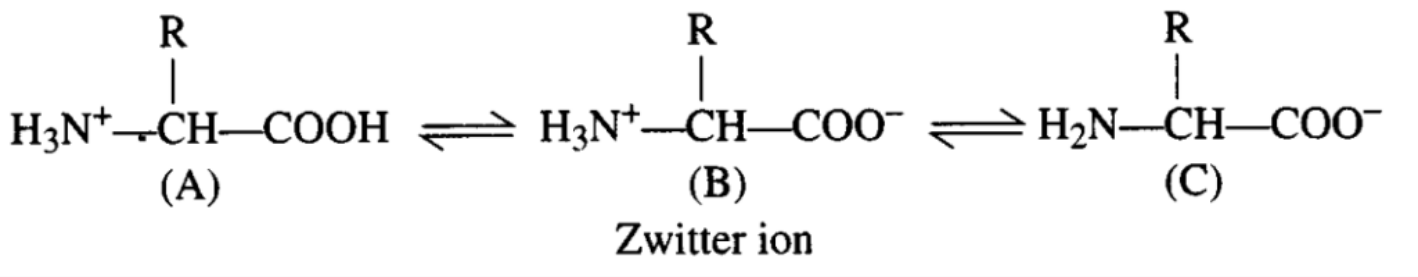
Role of some Amino Acid

i) Glycine – Simplest & only amino acid that is optically Inactive.

ii) Tryptophan- Most complex – Indole ring present. Precursor of Auxin.

iii) Tyrosine- Triggers Melanine, T3 & T4, (thyroxine), Adrenaline, Dopamine

Zwitter Ion- An ionizable amino acid that possess both positive and negative electrical charges. It is electrically neutral. Its structure changes in different pH.



In Acidic Solution **In Basic Solution**