HOW TO ANALYSE CHEMICAL COMPOSITION?

Chemical analysis allows for the study of various biomolecules present in living tissues, such as vegetables or liver. The process involves grinding the living tissue in trichloroacetic acid (CCl3COOH) using a mortar and pestle, resulting in the formation of a thick slurry. This slurry, when strained through cheesecloth or cotton, yields two fractions: the filtrate, known as the acid-soluble pool, containing thousands of organic compounds, and the retentate or acid-insoluble pool, containing compounds like proteins, nucleic acids, and polysaccharides.

In advanced studies, higher classes explore the analysis of living tissue samples to identify specific organic compounds. The process involves extracting compounds, subjecting them to various separation techniques until a particular compound is isolated, and then isolating and purifying that compound.

Analytical techniques are applied to the isolated compound to determine its molecular formula and probable structure. The term 'biomolecules' encompasses all carbon compounds obtained from living tissues, including a wide range of organic compounds essential to the molecular makeup of living tissues.

Inorganic elements and compounds are also present in living organisms and can be identified through a technique called 'ash' analysis. A small amount of living tissue is weighed, dried to evaporate water, and the remaining material gives the dry weight. Burning the tissue results in 'ash,' which contains inorganic elements like calcium and magnesium. The acid-soluble fraction also contains inorganic compounds like sulfate and phosphate.

A comparison of elements present in non-living and living matter

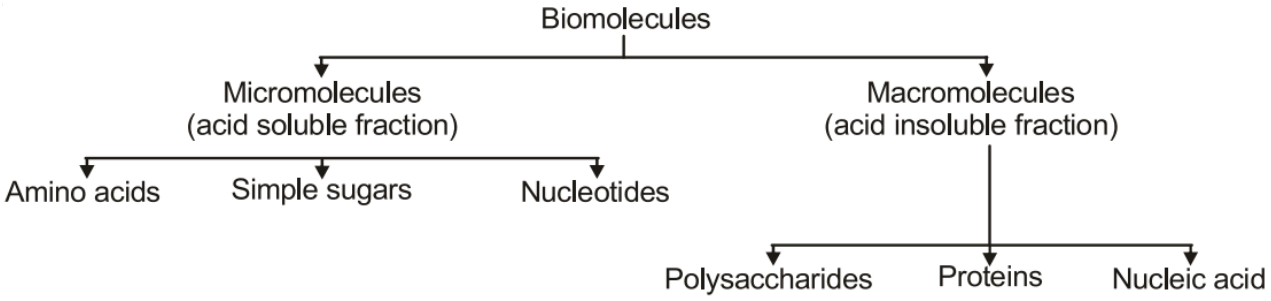
Element	% Weight of	
	Earth's crust	Human body
Hydrogen (H)	0.14	0.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	Very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	Negligible

From a chemistry perspective, functional groups like aldehydes, ketones, and aromatic compounds can be identified. From a biological standpoint, biomolecules are classified into micromolecules (or biomicro-molecules) and macromolecules.

A list of inorganic constituents of Living tissues

Component	Formula
Sodium	Na^+
Potassium	K^+
Calcium	Ca^{++}
Magnesium	Mg^{++}
Water	H_2O
Compounds	NaCl, $CaCO_3$
	PO_4^{3-} , SO_4^{2-}

The acid-soluble pool contains micromolecules with small molecular masses (18-800 daltons approximately), including amino acids, sugars, and nucleotides. The acid-insoluble fraction comprises four types of organic compounds: proteins, nucleic acids, polysaccharides, and lipids. Macromolecules, with molecular weights exceeding 10,000 daltons, are found in the acid-insoluble fraction. Lipids, though not strictly macromolecules, are present in the acid-insoluble fraction due to the formation of vesicles when cell membranes break during tissue grinding.



The acid-soluble fraction represents the cytoplasmic composition (without organelles), while the acid-insoluble fraction represents the macromolecules of the cytoplasm and cell organelles. Together, these two fractions represent the entire chemical composition of living tissues or organisms, with water being the most abundant chemical in living organisms.

Average composition of cells	
Component	**% of the total cellular mass**
Water	70-90
Proteins	10-15
Carbohydrates	3
Lipids	2
Nucleic acids	5-7
Ions	1