

Essential Elements

Bulk Elements	required by the body in large amounts	Oxygen Carbon Hydrogen Nitrogen Phosphorus Sulfur
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Trace Elements	required in small amounts	Copper Iodine Iron
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Ultratrace Elements	required in very small amounts	Arsenic Boron Nickel Silicon Tin
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Principle Elements in the Human Body

Element	% of Body Weight	Function
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Oxygen (O)	65%	Component of water, essential for respiration
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Carbon (C)	18.6%	Found in all organic molecules
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Principle Elements in the Human Body (cont)

Hydrogen (H)	9.7%	Component of water and most compound in the body
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Nitrogen (N)	3.2%	Found in proteins and nucleic acids
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Calcium (Ca)	1.8%	Found in bones and teeth, needed for nerves and muscle contraction, blood clotting
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Phosphorus (P)	1%	Found in bones, teeth, ATP
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Potassium (K)	0.4%	Necessary for membrane function, nerve impulses, and muscle contractions
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Sodium (Na)	0.2%	Necessary for membrane function, nerve impulses, and muscle contractions
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Principle Elements in the Human Body (cont)

Chlorine (Cl)	0.2%	Important for membrane function and water absorption, major component of stomach acid
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Sulfur (S)	0.04%	Found in many proteins
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Iron (Fe)	0.007%	Essential for oxygen transport
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Iodine (I)	0.0002%	Component of hormones of the thyroid gland
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Ions

Name	Chemical Symbol
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Sodium	Na ⁺
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Potassium	K ⁺
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Calcium	Ca ²⁺
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Chlorine	Cl ⁻
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Bicarbonate	HCO ₃ ⁻
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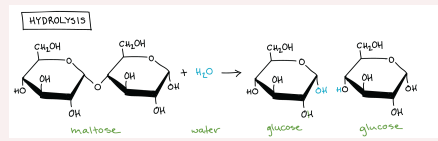
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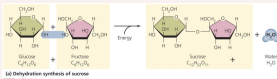
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Catabolism



Catabolism (Decomposition): breaks molecules into smaller fragments

Anabolism



Anabolism (Synthesis): assembles larger molecules from smaller ones

Exchange Reactions



Exchange Reactions (replacement): reacting molecules are rearranged

Reversible Reaction



Inorganic vs Organic Molecules

Inorganic	Organic
No C and H together	Contain C and H
Smaller molecules	Larger molecules
Dissociate in water	Dissolve in water
Water, oxygen, carbon dioxide, and salts	Carbohydrates, lipids, proteins and nucleic acids

Organic Building Blocks



Carbohydrates

Contains C, H, and O (often end in the suffix "-ose")

1:2:1 ratio

Monosaccharides and Disaccharides

(simple sugars): provide energy

- Monosaccharide examples: glucose, fructose, galactose
- Disaccharide examples: sucrose, maltose, lactose

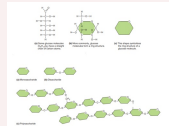
Polysaccharides: store glucose

- Examples: glycogen (in liver and muscle)

Glycoproteins and Glycolipids: on cell surfaces, aid in cell communication and recognition (ID tags)

- ex. MHC proteins, T-cell receptors, blood type

Carbohydrate Structures



Triglycerides

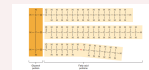
Functions:

- Used primarily for energy storage
- More energy rich than glucose
- Cushions and insulates the body and nerves (myelin sheath)

Structure:

- Made of 1 glycerol and 3 fatty acids
- Saturated fats contain three saturated fatty acids
- Saturated = all single C to C bonds (saturated in hydrogen)
- Mostly solid and come from animals
- Unsaturated fats contain at least one unsaturated fatty acid
- Unsaturated = at least one double C to C bond (causes kinks in the chain)
- Mostly liquid and come from plants

Triglyceride Structure



The first two fatty acid chains are saturated while the third fatty acid chain is unsaturated

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Phospholipids

Function:

- Major component of cell membranes
- Helps provide selective permeability (water barrier)

Structure:

- Made of 1 glycerol, 2 fatty acids, and 1 phosphate
- Hydrophilic head and hydrophobic tails (amphipathic)

Phospholipid Structure



Steroids

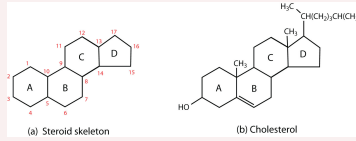
Function:

- Synthesize sex hormones
- Cholesterol: Needed for vitamin D and bile production
 - HDL "good kind" goes to the liver
 - LDL "bad kind" gets deposited on artery walls

Structure:

- Four connected rings of carbon, hydrophobic

Steroid Structure



Proteins

Functions:

- Structure and support: muscle, ligaments, fingernails, hair, skin
- Last resort energy source
- Hormones
- Receptors
- Antibodies
- Enzymes

Structure:

- Made of amino acids (20 in human body)
- Amine group, carboxyl group, variable R group
- Amino acids held together with peptide bonds
- Must have specific shape to function correctly

Protein Structure



Nucleic Acids

Function:

- DNA (deoxyribonucleic acid): encodes genetic information
- Provides instructions for making proteins
- RNA (ribonucleic acid): helps decode DNA

Structure:

- Contains the elements CHONP
- Made of nucleotides

Nucleic Acid Structure

