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1.3.1 – 1.3.4 Food & Biomolecules

Functions of food:

1. To provide organisms with energy, and
2. To provide the materials for growth and repair of cells and tissues.

Elements in Food:

carbon (C) hydrogen (H) oxygen (O),
nitrogen (N) sulphur (S) phosphorous (P)

Trace elements : Fe, Cu, Zn

Salts of Na, Mg, Cl, K, Ca

Biomolecules:

Carbohydrates Lipids (fats) Proteins
Vitamins Minerals Water

Carbohydrates

Composed of elements carbon, hydrogen and oxygen. Called saccharides .

General formula of carbohydrate

$$C_x(H_2O)_y$$

Three Types of Carbohydrates

Monosaccharides: single sugar units, e.g. **glucose** – $C_6H_{12}O_6$

Disaccharides: two sugar units, e.g. **Sucrose**, **maltose** – $C_{12}H_{22}O_{11}$

Polysaccharides: many sugar units, e.g.
starch (plant storage carbohydrate),
cellulose (plant structural carbohydrate),
glycogen (animal storage carbohydrate),
chitin (animal structural carbohydrate).

Sources in diet: bread, rice, pasta.

Lipids (Fats & Oils)

Composed of the elements carbon, hydrogen and oxygen, but not in the same proportion as sugars.

Triglyceride: smallest lipid – three fatty acid and one glycerol molecule).

Phospholipid: a lipid with one of its fatty acids replaced with a phosphate group.
Fats are solids at room temperature and lipids are liquids.
Sources in diet: Fat, butter, red meat, oil.

Proteins

Composed of the elements carbon, hydrogen, oxygen, nitrogen and sometimes sulphur. Basic unit is the amino acid. There are approximately twenty different amino acids.
Sources in diet: lean meat, fish, eggs

Structural Role of Biomolecules

Carbohydrates – cellulose (plant cell walls), chitin (fungi cell walls).
Proteins – myosin in muscle, collagen in hair
Lipids – phospholipids found in the cell membrane

Metabolic role of Biomolecules

Carbohydrates – primary sources of energy (glucose)
Proteins – enzymes control chemical reactions in cells
Lipids – release of energy & long term energy storage
Vitamins – essential organic catalysts of metabolism, e.g.

Vitamin	Solubility	Function	Source	Deficiency
C	Water	Skin, bone, blood	Citrus fruits, green veg	Scurvy
D	Fat	Absorb calcium	Dairy products, sunlight	Rickets, osteomalacia

Minerals needed by PLants

Mineral	Function
Calcium (Ca)	to make cell walls
Magnesium (Mg)	to make chlorophyll
Nitrates (N)	to make proteins
Phosphates (P)	to make ATP, DNA

Minerals needed by Animals

Mineral	Function
Calcium (Ca)	to make bones and teeth
Iron (Fe)	to make haemoglobin
Sodium (Na)	to regulate water content of cells and blood

Water

A major component of cells and body fluids

- Slow to heat up and cool down – maintains a constant temperature
- Good absorber of energy – sweating and transpiration are cooling processes
- Moves dissolved material in and out of cells, e.g. Glucose, O_2, CO_2, etc.
- Controls cell shape - osmosis
- Universal solvent – for transporting substances in blood or xylem
- Medium for metabolism
- Reactant in photosynthesis
- Product in respiration
- Has strong adhesive and cohesive properties – transpiration