

TOPIC 2.1: MOLECULAR BIOLOGY

Metabolism

Metabolism describes the totality of chemical processes that occur within a living organism in order to maintain life

- It is the web of all enzyme-catalysed reactions that occur within a particular cell or organism

Molecular biology explains these biological processes in terms of the chemical substances (molecules) involved

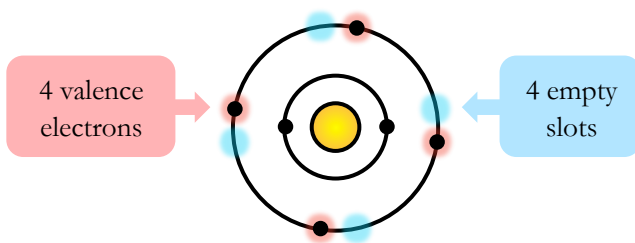
Organic Compounds

Organic compounds are molecules that contain carbon and are found in living things

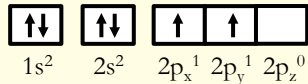
- Exceptions include carbonates and oxides of carbon

Carbon atoms form the basis of organic life due to their capacity to form four covalent bonds

- This allows a diversity of stable compounds to exist



CARBON ATOM CONFIGURATION
6 ELECTRONS



Biomacromolecules

There are four main groups of organic compounds in cells:

- Carbohydrates, lipids, proteins and nucleic acids

Carbohydrates, proteins and nucleic acids are all made up of recurring subunits (monomers)

CLASS	MONOMER	POLYMER
Carbohydrate	Monosaccharide	Polysaccharide
Protein	Amino acid	Polypeptide
Nucleic Acid	Nucleotide	DNA / RNA

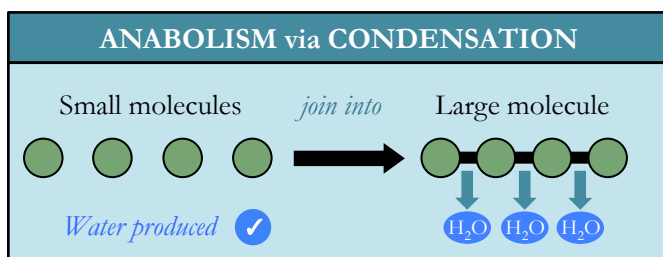
Lipids are not composed of repeating monomers, but *may* contain smaller subunits (e.g. triglycerides)

CLASS	SUBUNITS
Triglyceride	Glycerol + Fatty Acid (×3)

Types of Reactions

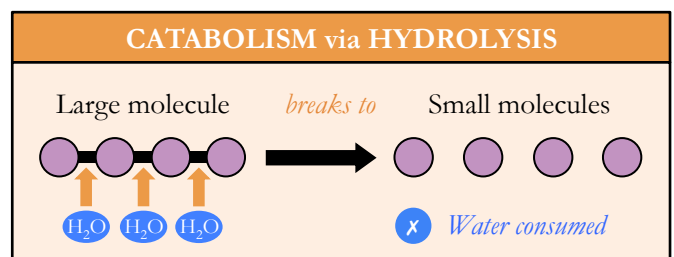
Anabolism

- The synthesis of complex molecules from simpler ones
- Involves condensation reactions (water is produced)
- An example of an anabolic reaction is photosynthesis



Catabolism

- The breakdown of complex molecules into simpler ones
- Involves hydrolysis reactions (water is consumed)
- An example of a catabolic reaction is cellular respiration



Vitalism

Theory of Vitalism

Vitalism was a doctrine that dictated that organic molecules could only be synthesized by living systems

- Living organisms were thought to possess a “vital force” that was required to manufacture organic molecules

Falsification of Vitalism

In 1828, Frederick Woehler disproved the theory of vitalism by artificially synthesizing an organic molecule

- He heated an inorganic salt (ammonium cyanate) under laboratory conditions to produce urea (organic)