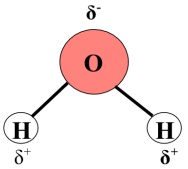
Vocabulary list:

1. Inorganic compound refers to a substance that does not contain both carbon and hydrogen. (water, salts, acids and bases)
2. **Cohesion** which is the stickiness **between** water molecules. It is essential for plants as it allows them to take up water at their roots.
3. **Adhesion** refers to the stickiness of water molecules **to other substances**, which is a result of a covalent bond between oxygen and hydrogen atoms. (For example: water droplets that are stuck to the end of a pine needle)

Water Properties:

Formula: H2O

Structure:



! water molecules connect with each other by weak hydrogen bonds !

Melting point: 0°C

Boiling point: 100°C

1. **Thermal Properties:**
   - The molecules of water can absorb a lot of heat energy
   - water is a very, thermally stable medium → to make water change from a liquid to a vapour requires a lot of energy
   - water helps living organisms resist changes in their environment
2. **Solvent properties:**
   - Polar molecules (e.g. sugars and alcohols). These form hydrogen bonds with the water molecules
   - Ionic compounds (e.g. salts, acids and bases). These dissociate into their component ions

! water is a very important transport medium for living organisms because of its solvent properties and because it remains a liquid over a large range of temperatures !

3. **Cohesion** which is the stickiness **between** water molecules. It is essential for plants as it allows them to take up water at their roots.

4. **Adhesion** refers to the stickiness of water molecules **to other substances**, which is a result of a covalent bond between oxygen and hydrogen atoms. (For example: water droplets that are stuck to the end of a pine needle)

5. **Surface tension**
   - Water molecules hold together forming **a skin** at the surface. This is strong enough for some organisms to be supported, for instance: a water skater.

6. **Density**
   - Water is densest at 4°C whilst it is still a liquid. So icebergs float on the surface of water and create a good habitat for living organisms.

7. **Transparency**
   - Plants can photosynthesise under water and animals can use their visual systems.

Carbohydrates

-used for short-term energy storage

-divide into 3 groups:

- disaccharide: sucrose, lactose, maltose, $C_{12}H_{22}O_{11}$
- monosaccharides: glucose, fructose, galactose, $C_6H_{12}O_6$
- polysaccharides: starch, glucose, glycogen

-functions: quick energy, energy storage, structure (cell wall in plants)

- starch: energy storage in plants
- glycogen: energy storage in animals
- starch: cell wall in plants
- chitin: structure in arthropods & fungi

Lipids

- Lipids are chains (polymers) made of monomers. Example: triglycerides

- They are a great source of <u>STORED ENERGY</u> so we have it in the future.
- They <u>INSULATE</u> the body to maintain normal body temperature and they <u>CUSHION</u> the internal organs for protection.
- They produce hormones for the body called <u>STERIODS</u>
- They have <u>waterproof</u> (don't dissolve in water) surfaces of animals,plants, and fruits-

these are waxes!

- **Fats can be:**
  - **Saturated:** has no double bonds between C atoms in the fatty acid tails; has the maximum number of H atoms; **are** solid at room temperature
  - **Unsaturated:** has at least a double bond between C atoms in the fatty acid tails; has fewer H atoms; are liquid at room temperature
  - **Phospholipids** are the main component of <u>cell membrane.</u>
  - waxes are firm, pliable, water repelling, lubricating

Proteins:

-have a wide range of functions:

- **enzymes:** catalyze chemical reactions (rubisco, catalase)
- **hormones:** messengers that regulate body functions (insulin, glucagon)
- **storage proteins:** make essential substances readily available
- **transport proteins:** carry substances through body fluids (hemoglobin)
- **structural proteins:** support and maintain shape of the cell (collagen, spider silk)
- **protective proteins:** provide protection against foreign substances (immunoglobins)
- **contractile proteins:** do mechanical work (actin, myosin)
- Amino Acids are the monomers of ptoteins
- Amino acids covalently joined together in a condensation reaction
- The covalent bond between the amino acids is called a *peptide bond*
  polypeptides

Enzymes:

- Most enzymes are **<u>globular proteins</u>**
- Act as biological catalyst to **<u>accelerate</u>** the rate of a chemical reaction
- Not permanently changed in the process - remain the same at the end of the reaction.
- They are **<u>reusable</u>**
- End in -ase: sucrase, lactase, maltase
- They are used **<u>specifically</u>**: each enzyme catalyzes very few reactions
- Enzymes work by weakening bonds which lowers activation energy
- **<u>Factors that affect enzyme activity:</u>** pH, temperature, substrate concentration
- **Denaturation:** is changing the structure of an enzyme (or other protein) so it can no longer carry out its function.

DNA:

- macromolecules that **store genetic information** and **enable protein production**
- Nucleic acids: very large molecules that are constructed by linking together nucleotides to form a polymer.
- Nucleotides consist of three parts:

1. Deoxyribose - a sugar, which has five carbon atoms, hence a pentose.
2. A phosphate group, which is the acidic, negatively charged part of the nucleic acid
3. A base that contains nitrogen, and has either one or two rings of atoms in its structure

- There are 4 nitrogen bases: Adenine-Thymine, Guanine-Cytosine
- DNA strands are antiparallel

RNA:

- **Contains of:**
- 1. The sugar is ribose instead of deoxyribose
    - 2. Single stranded
    - 3. Uracil replaces Thymine

- RNA function groups:
    1. Messenger RNA- copies a portion of unzipped DNA in the NUCLEUS
    2. Ribosomal RNA- mRNA carries the message to the ribosome
    3. Transfer RNA attaches the proper amino acids at the ribosome

DNA Replication:

Processes of Protein Synthesis

a. Transcription - genetic template for a protein is copied and carried out to the cytoplasm

b. Translation - template serves as a series of codes for the amino acid sequence of the protein

Gene expression:

- Transcription occurs in nucleus:

DNA sequence is transcribed into RNA sequence

- initiated when RNA polymerase binds to promoter binding site
- moves along DNA strand and adds corresponding complementary RNA nucleotide
- disengages at stop signal