BIOLOGICAL MOLECULES

Classifying biomolecules:

- Carbon based (except inorganic)
- Classified into categories; Each category has 2 types – big and small
- Cells consist mainly of water

Small - Micromolecule	Big - Macromolecular
-sugar	polysaccharides
-amino acids	proteins
-nucleotides	nucleic acids
-Lipids/fats	membranes

Structure of each type:

- **Carbohydrates**
  - ✓ Made up of carbon, hydrogen and water $(CH_2O)^n$
  - ✓ Dimers:

  Glucose + Fructose = Sucrose
  Glucose + glucose = Maltose
  Glucose + Galactose = Lactose
- ✓ Polysaccharide:

  Cellulose -> Plants
  Starch -> Plants
  Glycogen -> Found in animals

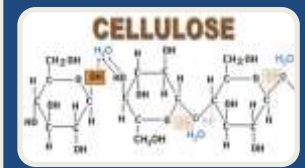
Learn as **S M i L e**

S S -> Plants; G -> Animals
"SPAGetti"

Starch

Found in plants; chloroplasts; in grains
made up of α glucose; glycosidic bonding; condensation reactions; tightly packed making it suitable for storage
good for energy storage: doesn't diffuse easily, compact; when hydrolysed, forms α glucose which can be used for transpiration

Cellulose



made up of β glucose; inverted; glycosidic bonding; condensation reaction
un-branched straight chains; runs parallel against each other
H Bond occurs within each OH group - forms strong bond
makes micro fibrils - very rigid property of cell walls of plants
walls prevent entry of water, therefore prevents cell bursting due to osmosis

Glycogen

shorter chains with lot more branching. easily broken down
found in humans.
stored in muscles and livers

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Structure of each type:

- **Amino acids**
  - ✓ Contains carboxyl group; variable group; amine group
  - ✓ More than one amino acid bonds to form a peptide bond by condensation reaction
  - ✓ Found on cytoskeleton – helps cells to move
  - ✓ Found in keratin, haemoglobin, enzymes, antibodies, nails and hormones

Structure of each type:

- **Nucleotides – Could be RNA or DNA**
  - ✓ Nucleotides are made up of: Sugar, Phosphate, Base
  - ✓ There are 2 types- DNA and RNA

DNA:

- ✓ Made up of lots of nucleotides
- ✓ Nucleotides made up of same S and P; B may vary
- ✓ A=T ; G ≡ C ; A and G are purines; T and C are pyrimidine

RNA:

- ✓ Made up of nucleotides
- ✓ Makes proteins from DNA's instructions
- ✓ Nucleotide forms polynucleotide strand

Difference between DNA and RNA:

- ✓ Sugar in RNA nucleotides (ribosomes; not deoxyribose)
- ✓ RNA produces single stranded polynucleotide (not double as with DNA)
- ✓ Uracil in RNA pairing with adenine (not Thymine with Adenine as with DNA)

Structure of each type:

- **Lipids and fats**
  - ✓ lipids are made of carbon, hydrogen and oxygen
  - ✓ the C:H:O ratio Is smaller in lipids than in carbohydrates

    Properties:
    -insoluble in water
    -insoluble in organic substances such as alcohol/acetone

    Main form = triglycerides (glycerol with 3 fatty acids)
    Phospholipids has a fatty acid replaced with a phosphate
    The property of this may vary to that of a lipid – as the P creates a hydrophilic end attracting water, whereas the non-polar end remains hydrophobic, repelling water.

Roles of lipids:
Found in the plasma membrane; the phospholipids contributes to the flexibility of the membranes and the transfer of lipid soluble substances

- Energy source: when oxidises, lipids contains more energy than carbs
- Water proofing: due to insolubility in water, they provide a water proof barrier
- Insulation: poor heat conductor, when stored under skin, retains body heat
- Protection: provides shock absorber around delicate organs in the body such as kidney
- Scents: lipids from plants perfumes attracts insects for pollination
- Water: during respiration the lipid will release water molecules (camels for example)
- Cell membranes: the structure of the phospholipids cause the membrane to form bilayers

Structure and functions are closely related:

- Proteins that lose their structure also lose their functions.
- i.e. DNA is more stable than RNA
- humans cannot digest cellulose, but cows can

Macromolecules all have primary, secondary, tertiary structures
Changes in shape could be disease causing.
I.e., sickle cell anaemia
Cystic fibrosis
Diabetes