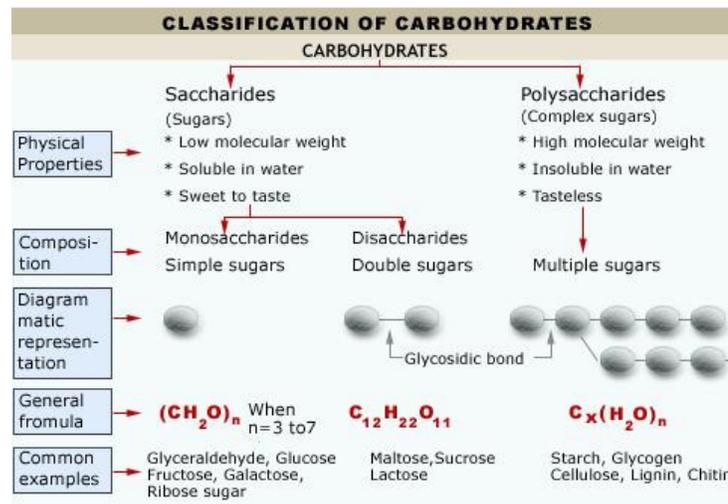


1. **Nutrients:** are chemical substances in foods that provide energy for vital cell activities and materials needed by the body for growth & repair.
2. **Water:**
 - a. Water made up 70% of body weight. It is the media in which chemical reactions occur in an organism.
 - b. Water helps to carry dissolve substances (Hormone, nutrients and waste products) around the body.
 - c. Water is the key components in Blood, Tissues, lubricating fluids in joints, digestive fluid.
 - d. **For Animals:**
 - To regulate the body temperature by sweating process.
 - To help in hydrolysis (digestion) of foods.
 - e. **For plants:**
 - To be used in photosynthesis.
 - To keep plants cells turgid.
 - To keep transport minerals salts in the plant.
 - To transport food substances from the leaves to other part of the plant.

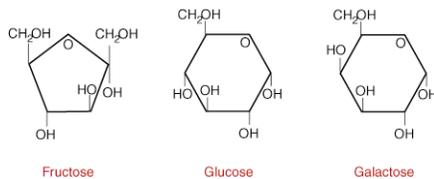
3. **Carbohydrates:**



- a. Organic compounds of C, H & O with the ratio of **H:O=2:1**
- b. **Functions:**
 - For respiration to provide energy.
 - To form supporting structure such as cellulose for cell walls.
 - To be converted to other substances such as proteins and fats.
 - For the formation of nucleic acid (DNA).
 - To synthesis lubricating fluid in the body.
 - To synthesise nectar in some flower.

c. Conversion of carbohydrates:

- Large polysaccharides are produced for storage within the cells as (a) they are not soluble in water thus do not change water potential in cell, (b) they cannot diffuse through the cell membrane and (c) are more compact in size.
- Condensation** reaction: 2 simple molecules are joined together to form a larger molecule with the removal of one molecule of water. Involved in formation of complex sugar from glucose.
- Hydrolysis** reaction: 1 water molecule is needed to break up a complex molecule into smaller molecules. Involved in digestion process of carbohydrates, fats and proteins.



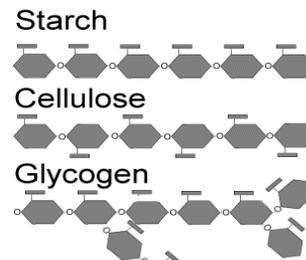
- Glucose (blue hexagon)
- Fructose (purple pentagon)
- Galactose (green hexagon)
- Maltose (glucose + glucose) (two blue hexagons)
- Sucrose (glucose + fructose) (blue hexagon and purple pentagon)
- Lactose (glucose + galactose) (blue hexagon and green hexagon)

d. Monosaccharide

- Glucose: found in all animals
- Fructose: common in plant not animals
- Galactose: in mammals' milk.

e. Disaccharides

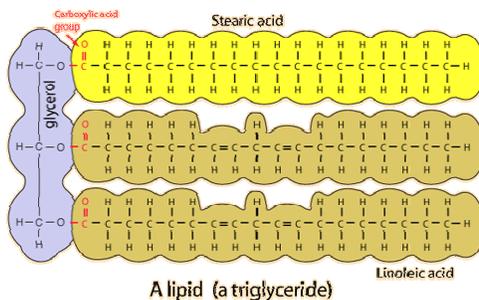
- Maltose: glucose+glucose → maltose+water
- Sucrose: glucose+fructose → sucrose+water
- Lactose: glucose+galactose → lactose+water



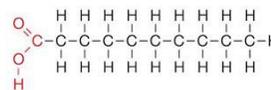
f. Polysaccharides

- Starch**: long straight chain of glucose molecules stored in plants
- Glycogen**: complex branch chains of glucose molecules store in fungi and animals
- Cellulose**: straight chain of glucose molecules bonded differently from starch to form cell wall in plants only some animals can digest not human.

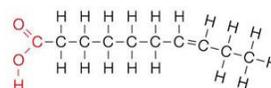
4. Fats



Saturated fatty acid molecule, C₉H₁₉CO₂H



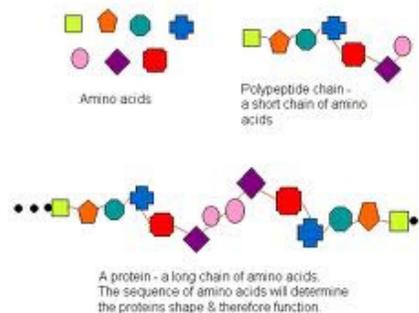
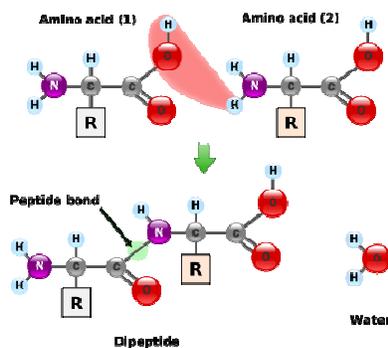
Mono-unsaturated fatty acid molecule, C₉H₁₇CO₂H



- Fats are made up of **fatty acids** and **glycerol**.

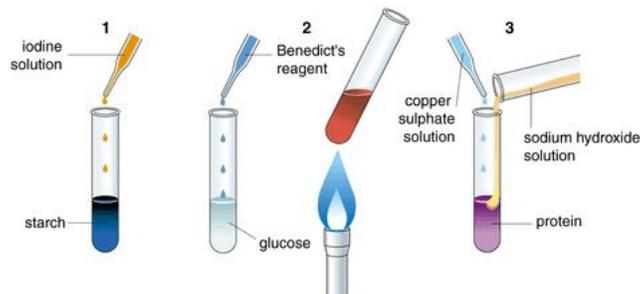
- **Saturated** (C-C) fats typical found in animals. **Unsaturated** (C=C) fats found in plants.
- Functions as:
 - A source of energy.
 - An insulating material that prevent excessive heat loss.
 - A solvent for fat-soluble vitamins and hormones.
 - An essential part of protoplasm especially cell membrane.
 - A way to reduce water loss from skin of animals or parts of plants.

5. Proteins



- Proteins are made up of amino acids (contains carbon, hydrogen, oxygen, nitrogen and sometimes sulfur).
- Functions are used:
 - In the synthesis of new protoplasm, for growth and for repair of worn out cells.
 - In the synthesis of enzymes and some hormones.
 - In the formation of antibodies to combat diseases.

6. Important experimental skills



- a. **Benedict test:** Blue Benedict's solution (CuSO₄) mixed boil with reducing sugar (glucose, maltose, fructose, lactose) to form brick red Cu(I)2O ppt.
- b. **Iodine test:** Iodine solution (brown) reacted with starch to form blue-black colour.
- c. **Ethanol emulsion test:** A cloudy white emulsion is formed when ethanol (alcohol) and water are added to fats. Alcohol first added to forces fats to be separated from food substances and then water added to form the emulsion.
- d. **Biuret test:** Blue Biuret solution (CuSO₄ + NaOH) turns violet (deep purple) when proteins are present and turns pink when short chain polypeptides are present.