

Chapter 3: Biological Molecules:

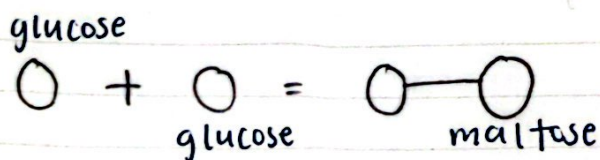
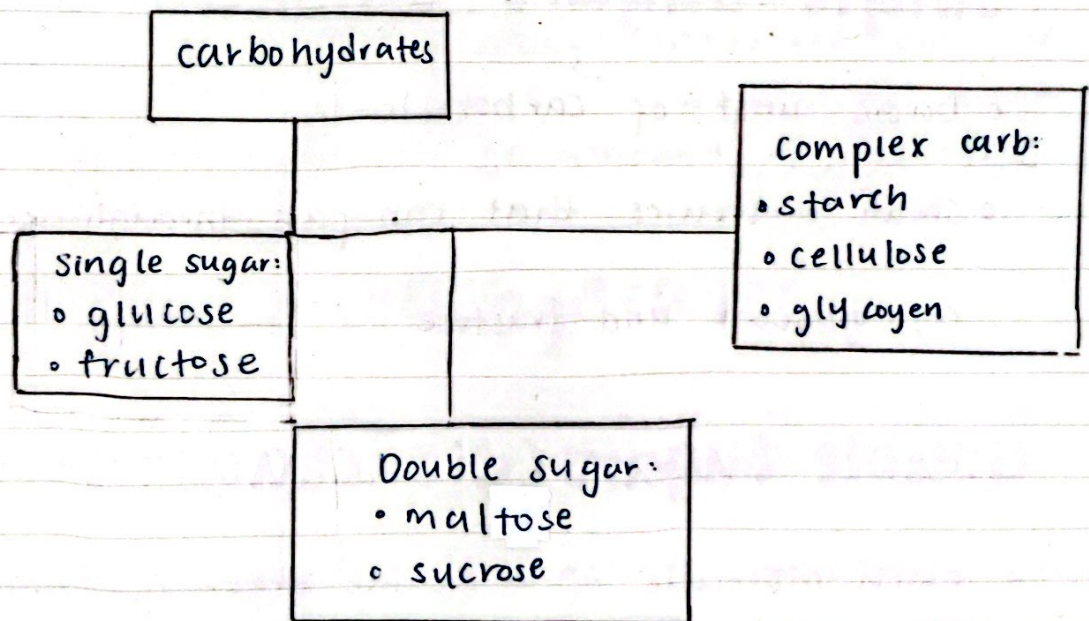
what are carbohydrates?

- carbohydrates are organic molecules made up of carbon, hydrogen and oxygen, with the formula $C_xH_{2x}O_x$.

eg: glucose: $C_6H_{12}O_6$

- The ratio of hydrogen atoms to oxygen atoms is 2:1

carbohydrates can be classified as:



glucose + fructose: sucrose

Carbohydrates are needed to:

- provide energy for cell activities
- form supporting structures
- convert into other organic compounds such as amino acids and fats.
- synthesise lubricants eg, mucus
- synthesise nectar in flowers
- form nuclei acids (DNA)

Single sugars (monosaccharides)

- basic unit of carbohydrate
- small molecules that can pass through cell membrane
eg, glucose and fructose

double sugars (disaccharides) :

- each molecule of a double sugar is formed when 2 single sugars are joined together
eg, maltose and sucrose
- can be split into 2 single sugar molecules in the presence of an enzyme

reducing sugars.

eg of reducing
sugars: glucose, fructose
and maltose

Benedict's Test.

reagent: Benedict's solution

(refer to pg 44 of
tb)

steps: 1- add 2cm^3 of food sample into test tube

2- add 2cm^3 of Benedict's solution

3- Shake the mixture and place the test tube in a boiling water-bath.

ROYGB

solution remained blue: no reducing sugar

solution turns green: traces of reducing sugar

solution turns yellow/orange: moderate amt of
↳ reducing sugar

solution turn red: large amount of reducing sugar

complex carbohydrates.

- made up of many similar molecules of single sugar joined together to form a large molecule

- starch, glycogen and cellulose are complex carbohydrates: made up of numerous glucose molecules.

Starch

Structure
several thousand
glucose molecules joined
together

role:
Storage for
carbohydrates for
cellular activities

Occurance: found in storage organs
of plants

cellulose.

structure.

A cellulose molecule is made up of many glucose molecules joined together. The bonds are different from starch

role:

The cellulose cell wall protects plant cells from bursting or damage. Cellulose cannot be digested in our intestines. Serves as dietary fibre that prevents constipation.

Occurrence.

present in cell wall of plants.

Glycogen:

Structure:

A branched molecule, that is made up of many glucose molecules joined together.

role:

A storage form of carbohydrates in mammals. When needed, it is digested to glucose to provide energy for cell activities

Occurrence.

Stored in the liver and muscles of mammals.

glycogen and starch are stores of glucose

- They are suitable as storage materials because they are:
 - insoluble in water
 - big molecules that cannot diffuse through cell membranes.
 - broken down to glucose when needed
 - made of molecules that have compact shape, so they occupy less space

◦ Starch (substrate) is broken down into maltose molecules (product) by amylase

- Maltose (substrate) molecules are broken down into glucose molecules by maltase.
- Presence of starch can be tested using iodine test.

Iodine test.

Steps:

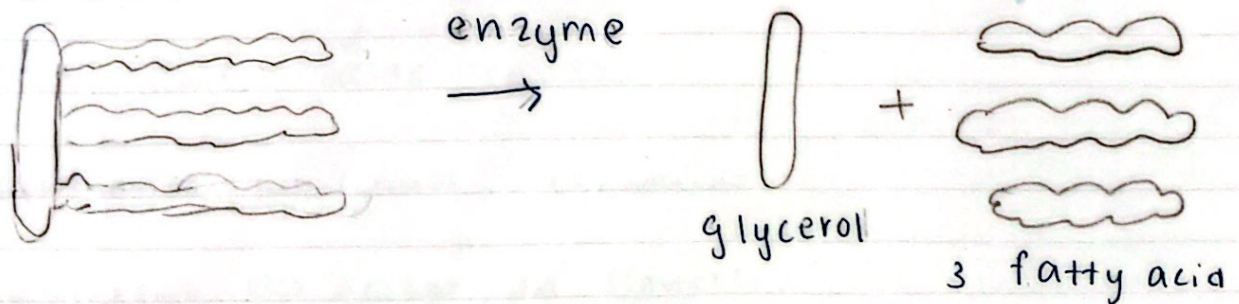
- 1) add a few drops of iodine in potassium iodine solution to a food sample.

Iodine solution turns from brown to blue black upon contact with starch.

What are fats?

- Fats are organic molecules made up of the elements carbon, hydrogen, and oxygen. Unlike carbohydrates, fats contain much less oxygen in proportion to hydrogen.

A fat molecule is made up of:



(i cant draw it)

- fats are broken down into fatty acid and glycerol by lipase (enzyme)

• Sources of fats are, butter, olive and oil, for eg.

Function of fats:

SWICE!!

- o source and store of energy
- o act as insulating material to prevent excessive heat loss
- o solvent for fat soluble vitamins and some hormones
- o form the main part in cell membranes
- o help reduce water loss from skin surface

Fats test: Ethanol Emulsion test:

Steps:

(if cloudy white emulsion appears, fats is present!!)

- o Add 2cm^3 of ethanol to a drop of liquid sample in a test tube and shake the mixture thoroughly.
- o Add 2cm^3 of water to the mixture and shake the mixture

What are proteins?

- o Proteins are made up of the elements carbon, hydrogen, oxygen and nitrogen. Sulfur may also be present
- o They are the largest and most complicated of the three biological molecules.

◦ Each protein molecule is made up of smaller basic units called amino acids

◦ Peptide bonds link up amino acids to form polypeptide.

◦ Two or more polypeptide chains fold to form a 3D shape

sources of proteins include milk, egg and meat

Functions of proteins:

◦ Proteins are used in the synthesis of new cytoplasm, for growth and repair of worn out body cells

◦ Synthesise enzymes and some hormones

◦ form antibodies to combat diseases

Test for proteins: biuret test

Steps:

◦ To 2cm^3 of liquid food sample, add an equal volume of biuret solution.

◦ Shake well and allow the mixture to stand for five minutes

◦ A violet colour indicates the presence of proteins

◦ The solution will remain blue in the absence of proteins