**Biological Macromolecules**

**Date: Student Mostly Made of Macromolecules:**

**By the end of the lesson you should be able to:**

* Recognize the structure of the 4 molecules of life
* State the function and give examples of the 4 biological macromolecules

**4 Molecules of Life**

* Besides water, a cell is mainly made up of 4 types of molecules:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

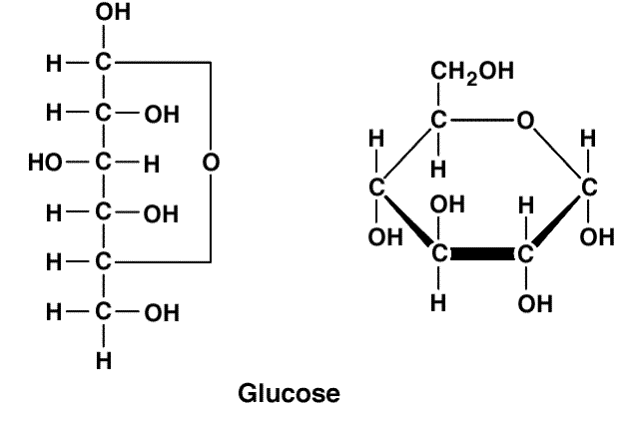
 3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

These molecules are composed mostly of four elements: C, H, O & N.

**Carbohydrates**

* Carbohydrates are \_\_\_\_\_\_\_ molecules and are your main source of \_\_\_\_\_\_\_\_\_\_\_. You eat your carbs in the form of breads, cereals, rice, and pasta.
* The mitochondria in your cells use the sugar for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to make \_\_\_\_\_\_\_\_. ATP is the cellular energy that all cells use.

****

Carbohydrates are composed of the elements carbon (C), hydrogen (H), and oxygen (O).

They typically form 5 or 6 sided carbon rings.

* A black background with a black square

  Description automatically generated with medium confidenceThere are 3 types:

1. Monosaccharides

2. Disaccharides

3. Polysaccharides

* A black background with a black square

  Description automatically generated with medium confidence\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are a single unit of sugar.
* If two monosaccharides are combined together, the result is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **A black background with a black square

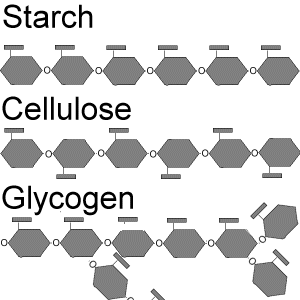
  Description automatically generated with medium confidence**If there are many monosaccharides combined, the resulting molecule is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**Examples of Carbohydrates**

* Monosaccharides: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, fructose, galactose
* A diagram of a simple and complex substance

  Description automatically generatedDisaccharides: sucrose, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, maltose
* Polysaccharides: starch, chitin, glycogen, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

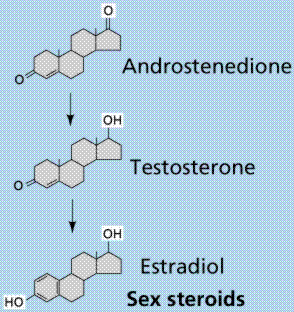
**Functions of Carbohydrates**

* Simple monosaccharide sugars (such as glucose) and disaccharides (such as lactose) are used in cellular respiration to quickly make energy for cell in the form of ATP.
* Polysaccharides are more complex sugars and have two main functions:
* - short term energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **** - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are examples of short-term energy storage polysaccharides.
* They are made of long branching chains of \_\_\_\_\_\_\_\_\_\_\_\_ molecules which canbe stored and saved for use in cellular respiration later.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is an example of a structural carbohydrate at it forms plant \_\_\_\_\_\_\_\_\_\_\_\_\_.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is an example of a structural polysaccharide as it forms \_\_\_\_\_\_\_\_\_\_\_\_ cell walls and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

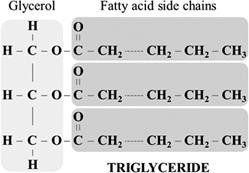
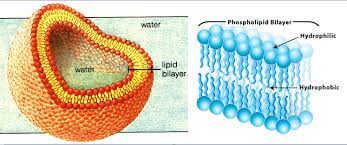
**Lipids (Fats)**

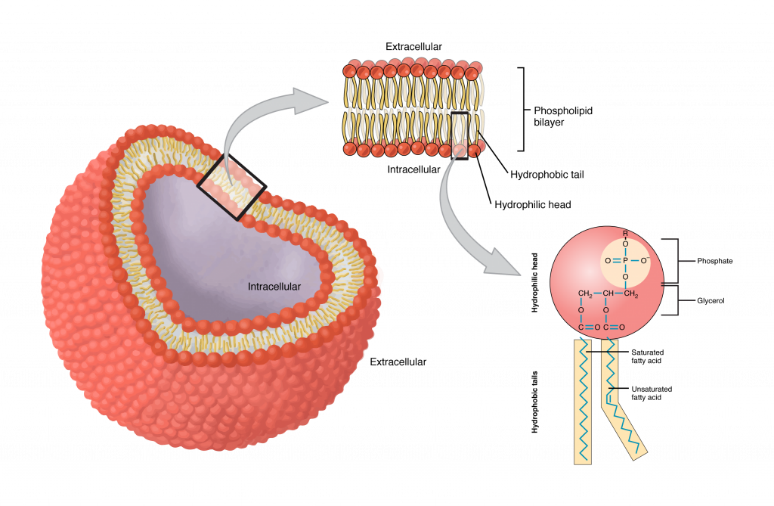
* Lipids are fatty, waxy, or oily compounds that are insoluble in water. You eat your lipids in the form of butter, oils, cheese, meat fats, avocados, etc.
* Lipids are used for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, insulation, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and sending signals through the body.
* Lipids are composed of the elements C, H, and O.
* There are 3 main types:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: long term energy storage, insulation (blubber) 🡪 fat!

**** 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: used to make cell membranes

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: hormones (signalling molecules)

 ****

****Phospholipids have a glycerol structure attached to two fatty acid tails and the one phosphate head.

One end of the phospholipid is attracted to water

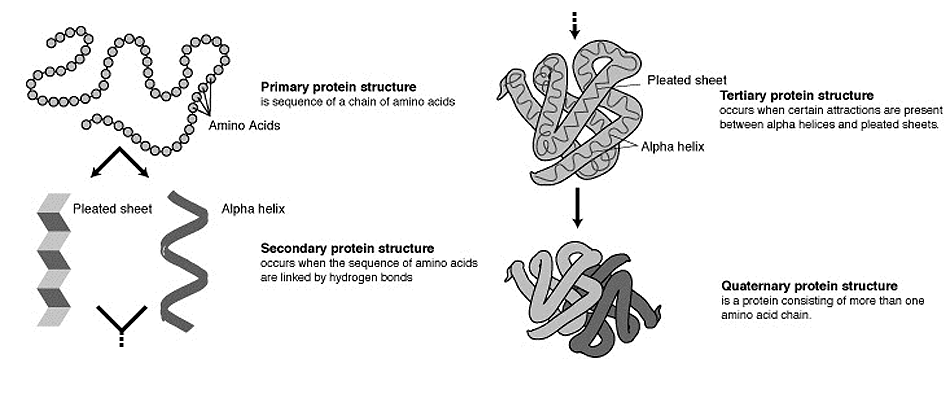
(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and the other end is repelled

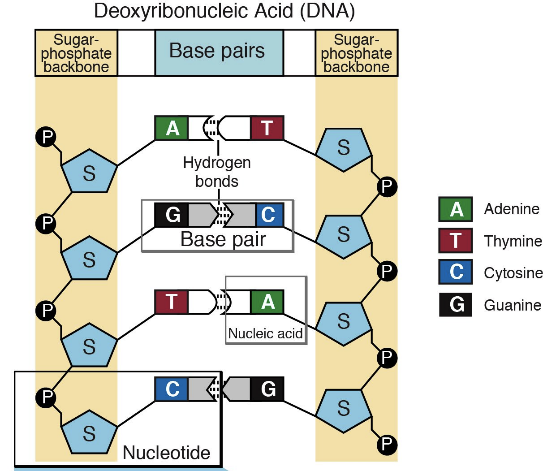
by water (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_). This causes

phospholipids to automatically form a spherical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when placed in water.

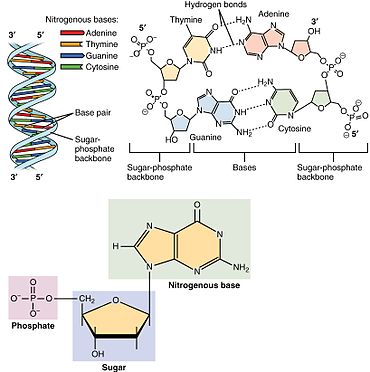
**Proteins**

* Proteins are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for muscle, skin, hair, bones, cell structures, enzymes, immune system (antibodies), and are responsible for the majority of functions of cells in the body. You eat your proteins in the form of meats, eggs, nuts, beans, etc.
* Proteins are primarily made up of the elements C, H, O, and nitrogen (N).
* Proteins are made up of smaller units called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Amino acids are located in the cytoplasm (jelly) of the cell \* remember for later! \*
* The amino acids link together to form a chain.
* These long chains of amino acids fold up in a very specific way.
* The difference between proteins is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and how they are folded up

****



**Nucleic Acids**

* Nucleic acids contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Nucleic acids are found in all living things so fruit, vegetables, meats, etc. are good sources of nucleic acids.
* Nucleic acids are made of C, H, O, N, and phosphorus (P).
* There are two types of nucleic acids used for heredity: \_\_\_\_\_\_\_\_\_\_\_\_
* A nucleic acid is made up of small molecules called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which include a base (ACTG&U), a sugar and phosphate group.
* Nucleotides are found inside the nucleus of a cell in the nucleoplasm.
* 
* **Deoxyribonucleic Acid (DNA)**

Largest molecule on earth!

Contains all the genetic information (a

\_\_\_\_\_\_\_\_\_\_\_\_) to build a living organism

DNA is found in the nucleus (\*\*\* remember for later \*\*\*) and is twisted into a double helix

A diagram of a cell

Description automatically generated

* **Ribonucleic Acid (RNA):** there are 3 main types

1. Messenger RNA (mRNA) a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the DNA

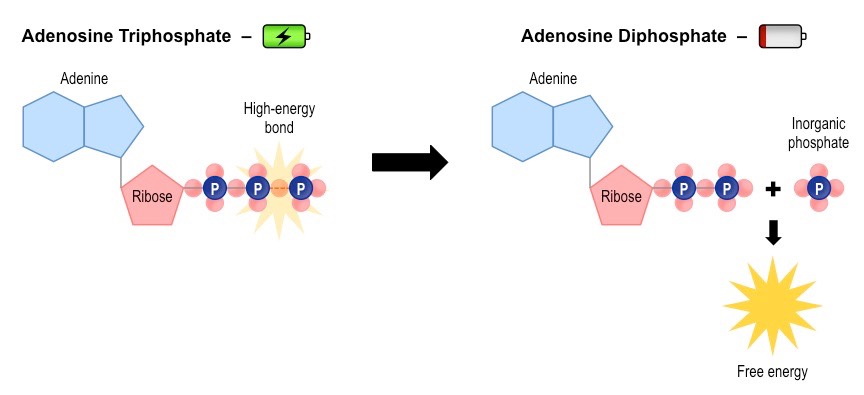
that exits the nucleus

2. Transfer RNA (tRNA) (Grade 12)

3. Ribosomal RNA (rRNA) (Grade 12 - makes ribosomes)

* + All are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and help DNA make proteins
  + Has a U base instead of the T base

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (ATP)**

.

This is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule of life which acts like a rechargeable battery that cells can use.

There are 3 phosphate molecules bonded together. The last two have a lot of energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Can You …**

… recognize the structure of the 4 molecules of life?

… state the function and give examples of the 4 biological macromolecules?