Biomolecules

Molecules we need to survive

Where did Biomolecules come from?

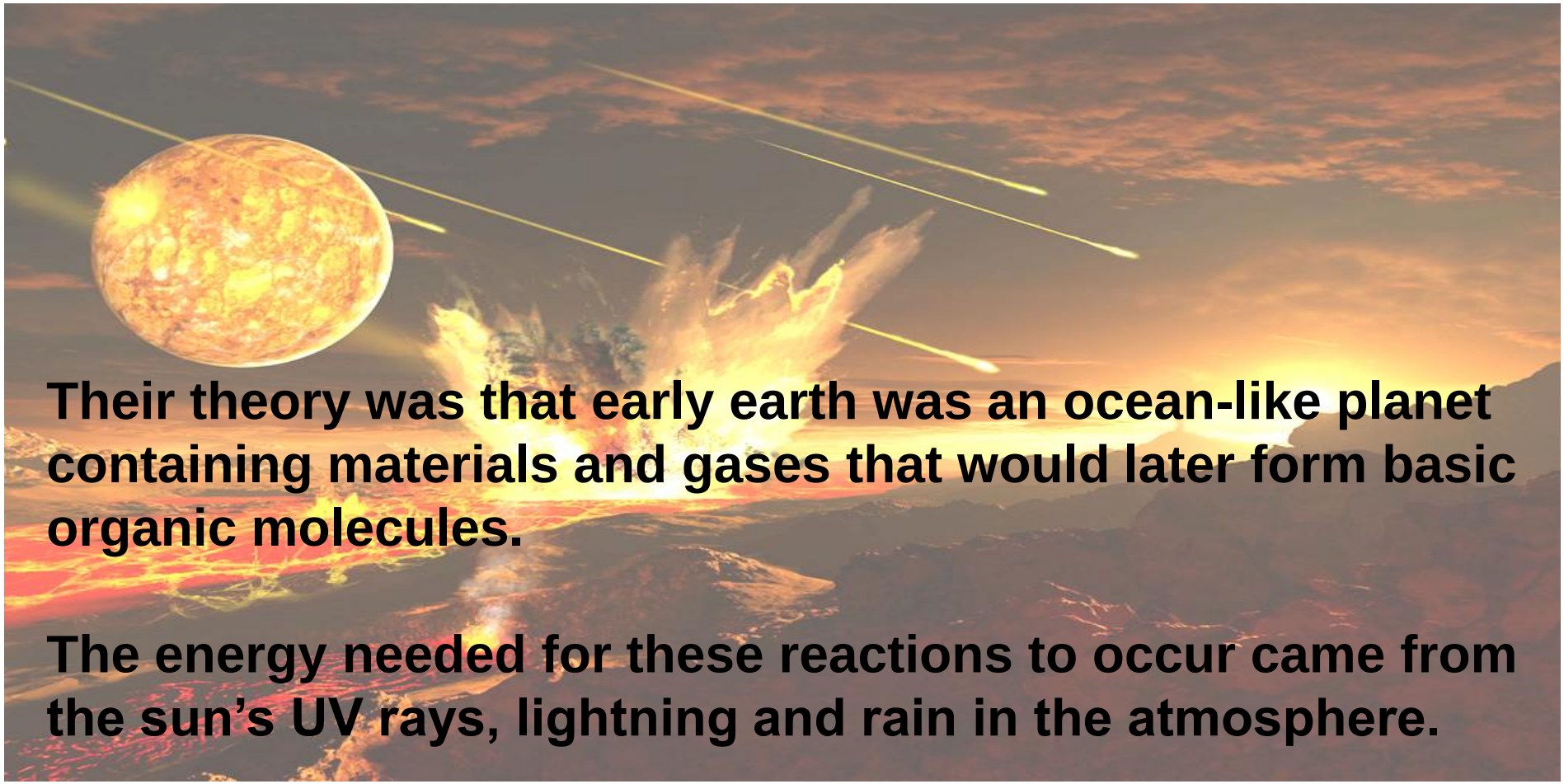
- To begin learning about biomolecules we must understand how biomolecules were formed.

Scientists knew that early earth had raw materials such as:

Water,
Hydrogen gas,
Nitrogen,
Ammonia,
Methane,
Carbon dioxide and Carbon monoxide.

1920 - The Primordial Soup Theory is born.

In the early 1920's Russian Chemist A.I. Oparin and English Geneticist J.B.S. Haldane conceived the idea of primordial soup.



Their theory was that early earth was an ocean-like planet containing materials and gases that would later form basic organic molecules.

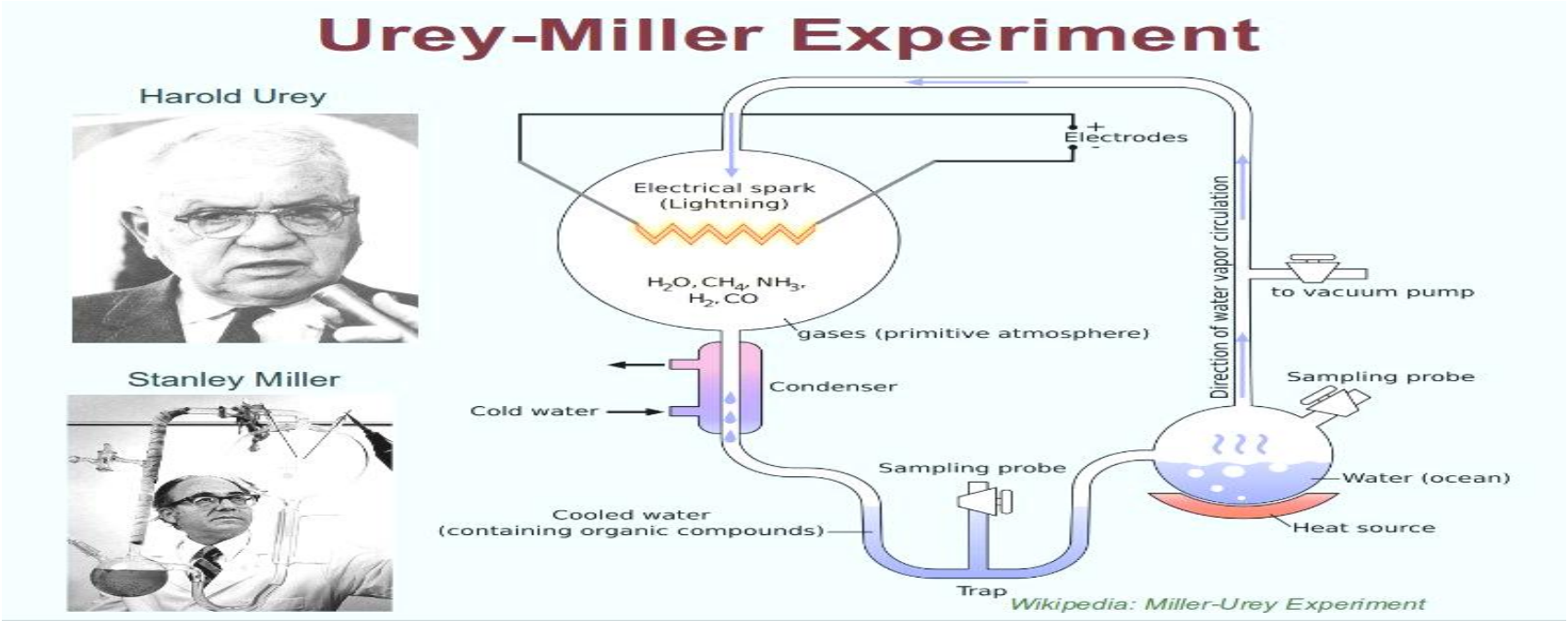
The energy needed for these reactions to occur came from the sun's UV rays, lightning and rain in the atmosphere.

Miller and Urey

- In 1953 Stanley Miller and Harold Urey tested the Primordial Soup theory.
- Click the link below will illustrate their experiment.

http://highered.mcgraw-hill.com/sites/9834092339/student_view0/chapter26/animation__-_miller-urey_experiment.html

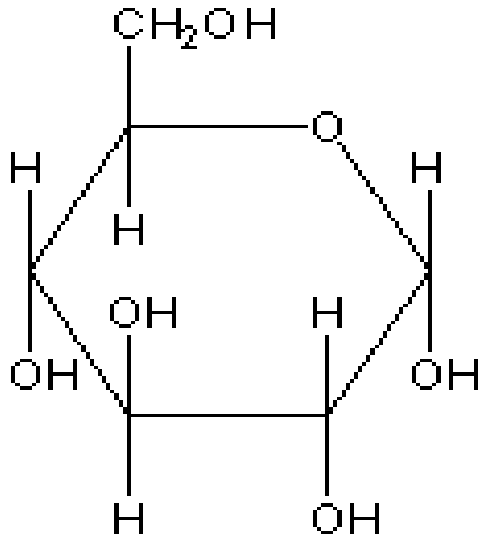
Miller and Urey showed it was possible to form simple organic molecules from the inorganic material on early Earth.



Molecules covered in this presentation

- **1.** Carbohydrates – Sugars “ose”
- **2.** Lipids – Fats
- **3.** Proteins (enzymes)
- **4.** Nucleic Acids
- **5.** Calories
- **6.** ATP
- **7.** Water
- **8.** Vitamins and Minerals

1. Carbohydrates



C-6 H-12 O-6

Carbohydrates are the main source of **energy**

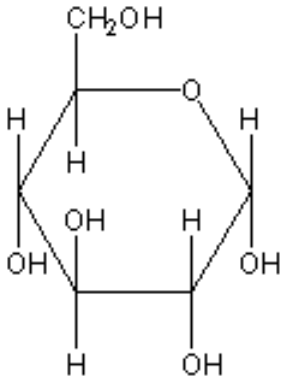
Made of **C, H,** and **O** atoms in a **1:2:1 ratio**

2 types of carbohydrates:

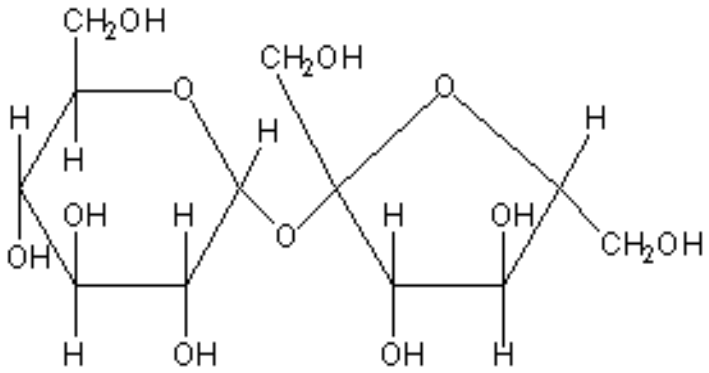
- **1. - Simple Carbohydrates** (sugars)="ose"
- Have smaller structures and are broken down faster in your body.
- Ex: Candy gives you a quick boost.

- **2. - Complex carbohydrates** (starch)
- Much larger, take longer to break down.
- Ex: pasta, spaghetti, oatmeal, whole grains

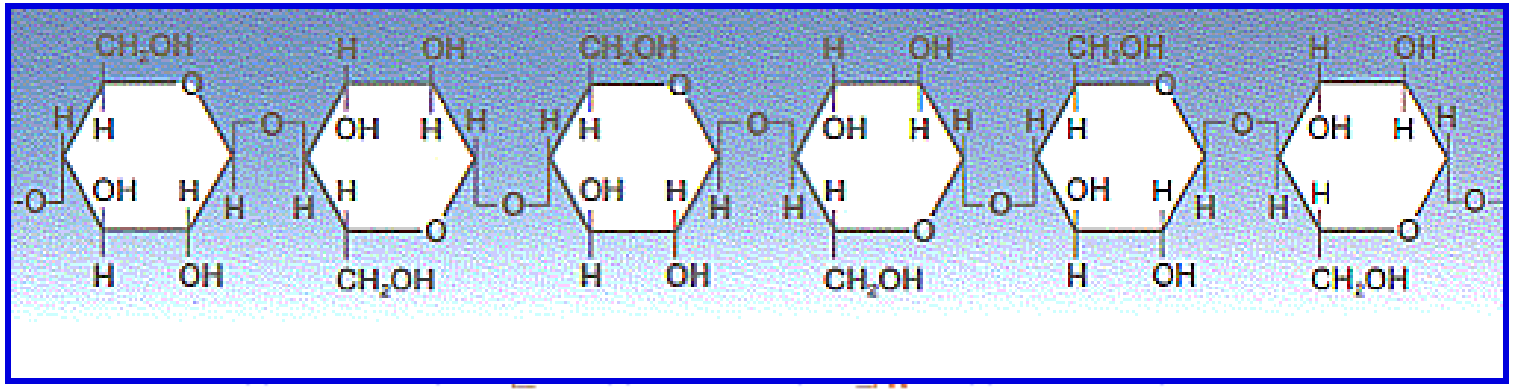
Simple sugars are:
<u>mono</u>-saccharides
(like glucose, fructose, Ribose, galactose)



and <u>di</u>-saccharides
(like sucrose, maltose, lactose)

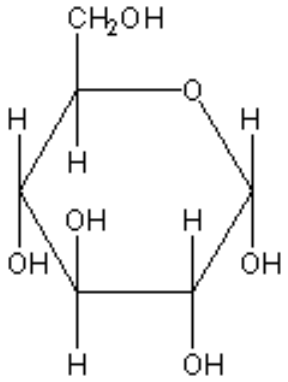


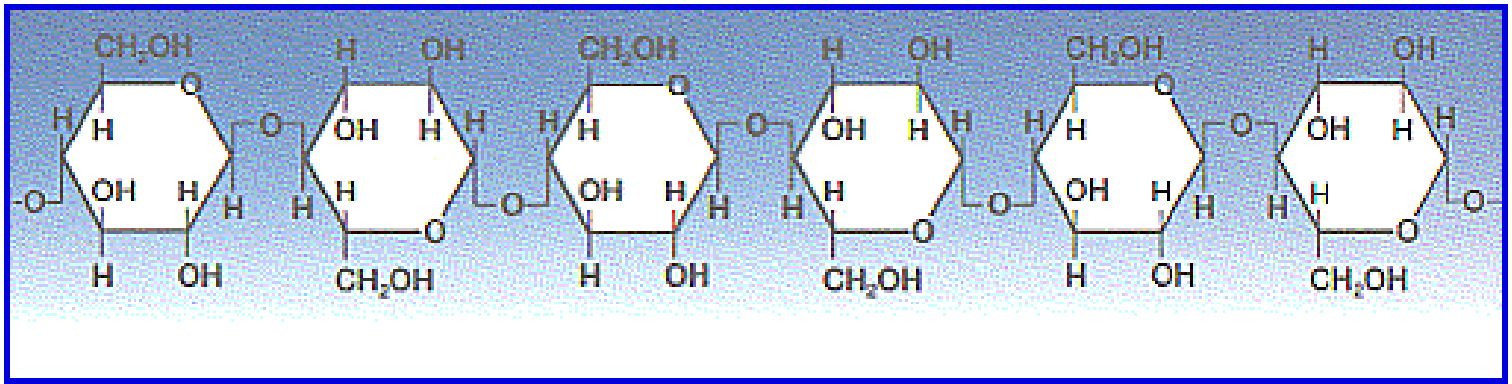
Complex starches are Poly-saccarides



Complex carbohydrates

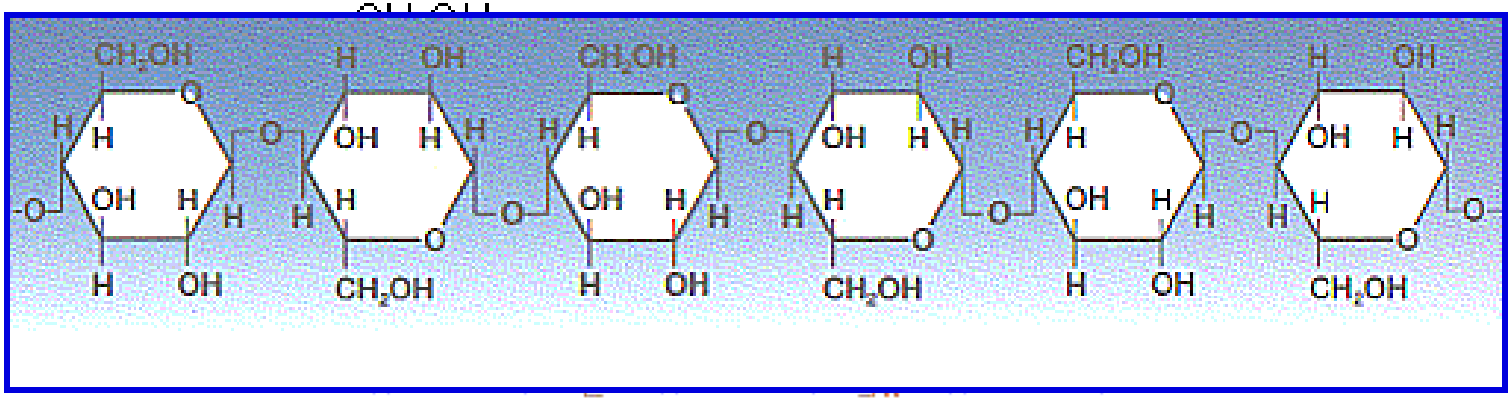
or Simple Carbohydrate?





Saccharide = sugar

Are these
mono-saccharide
di-saccharide
or poly-saccharide?



Simple carbohydrates

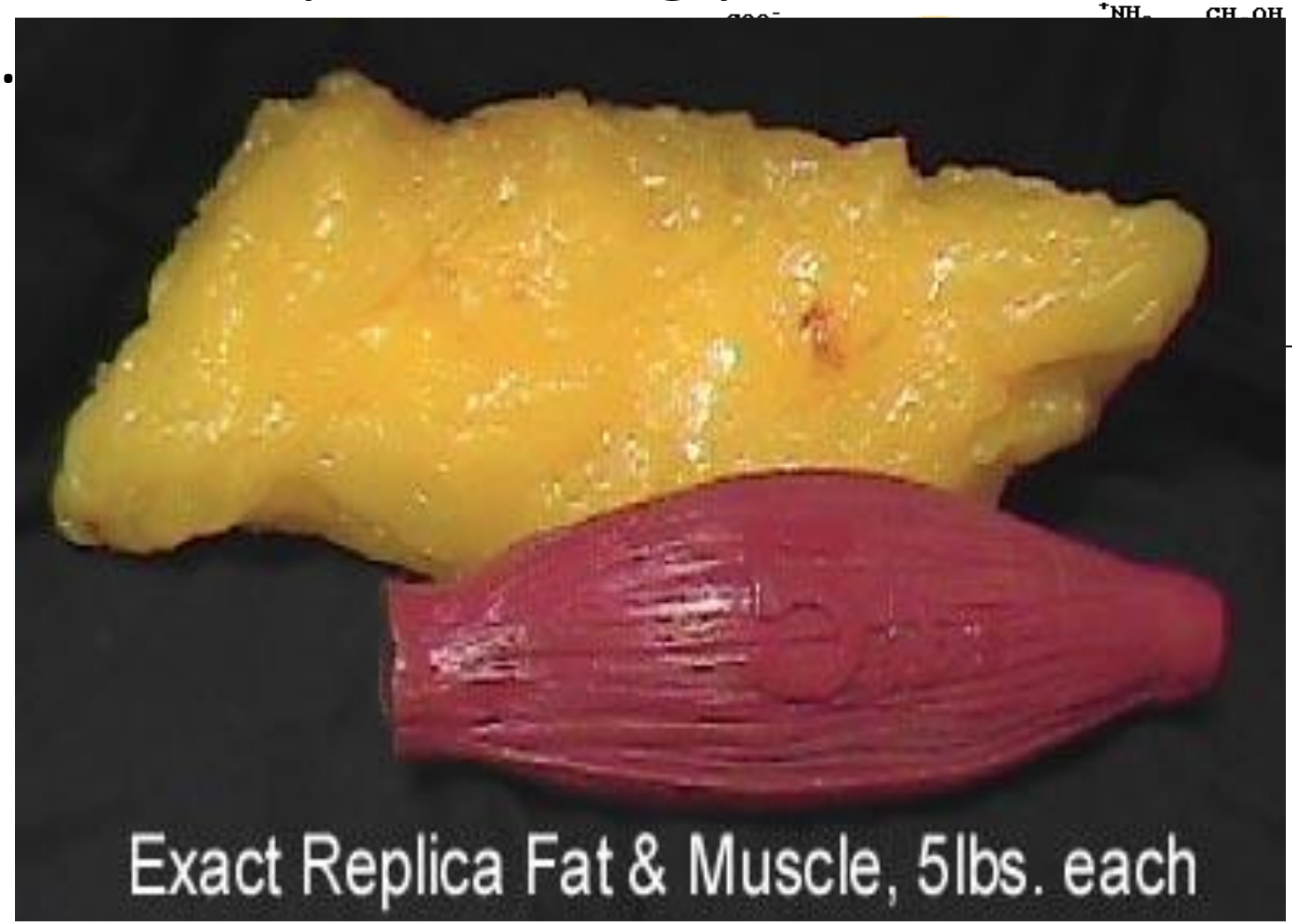
Foods high in simple carbs are fruits, milk, candy, deserts, white flour

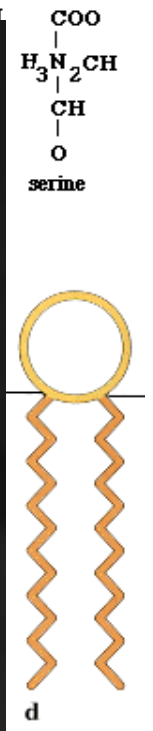
Complex carbohydrates

Foods high in complex carbs are bread, pasta, rice, beans, cereals,

2. Lipids/Fats are mostly C and H atoms and do not dissolve in water.

Lipids are composed of a glycerol attached to fatty acids.





2. Fats (Lipids)

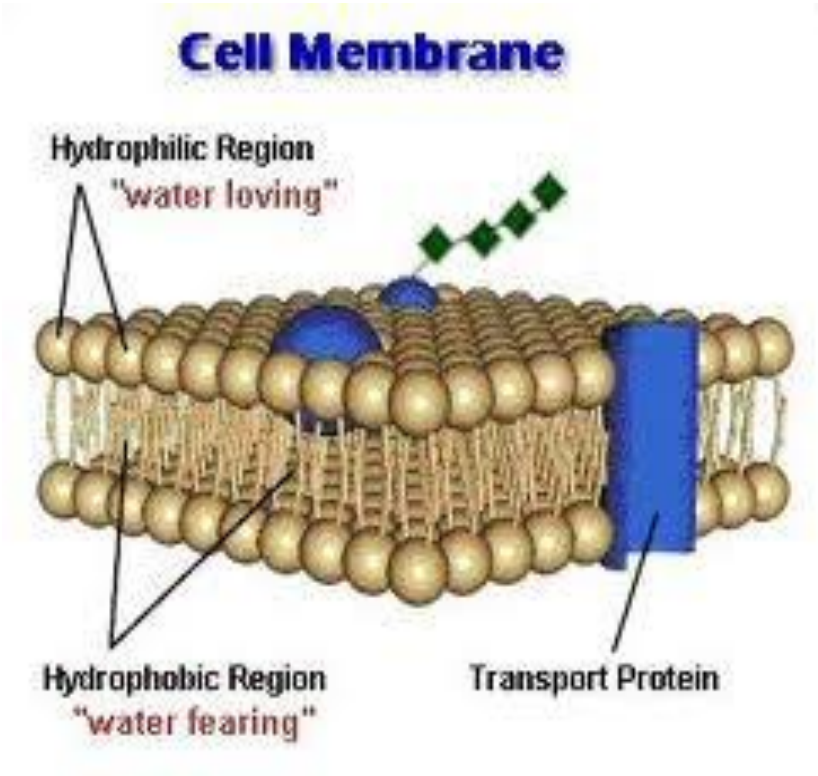
Lipids are used for:

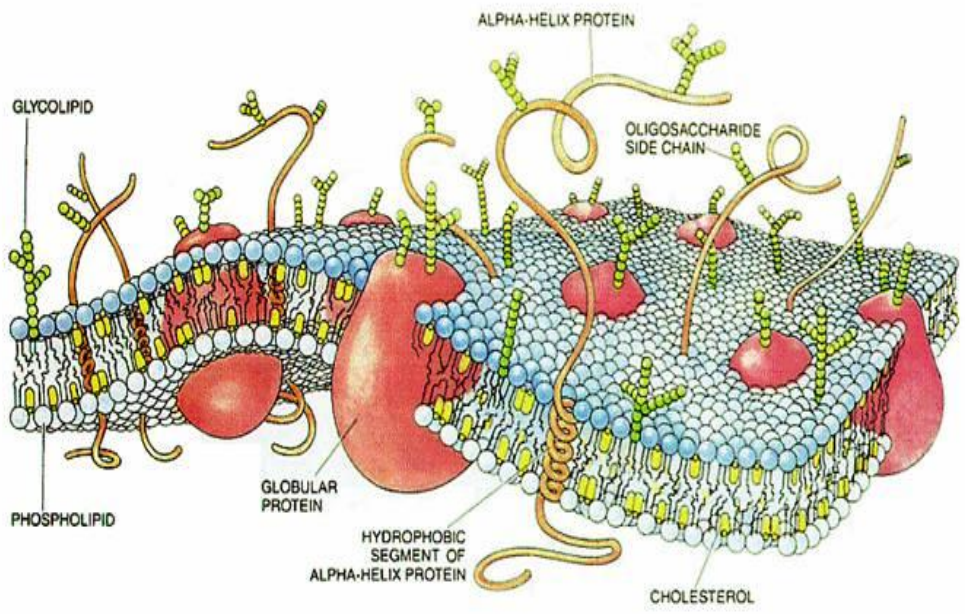
- Protect parts of our body (cushion)

2. Fats (Lipids)

CNS regulation
Satiety signals

Lipids are also the main component of the cell membrane!



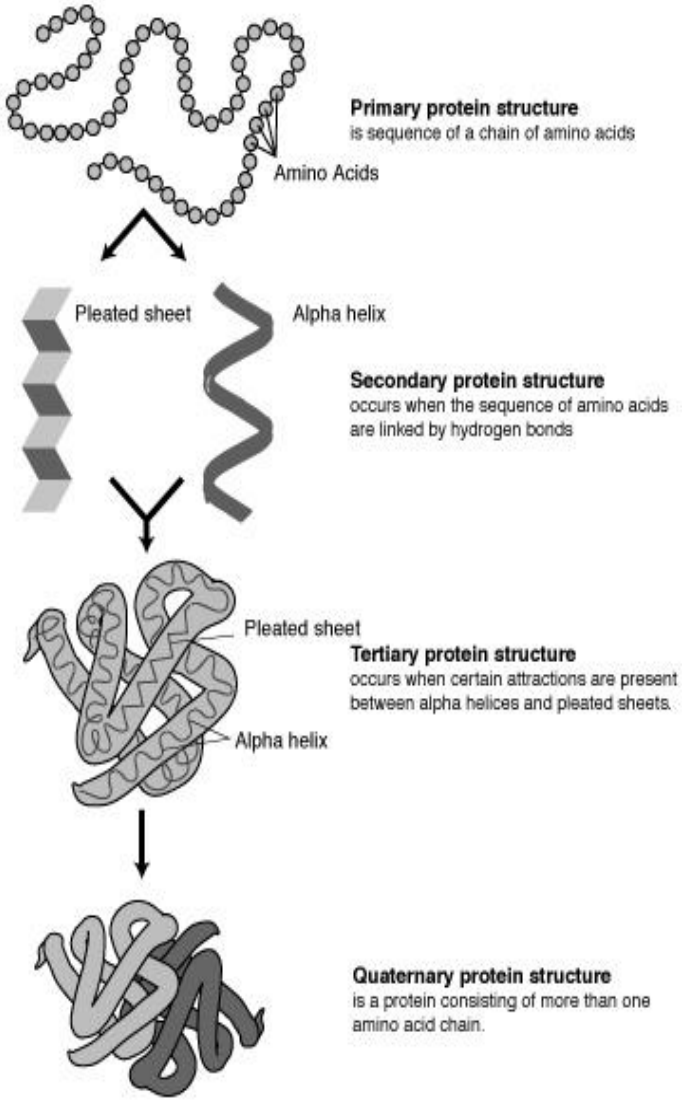


The cell membrane is also called the – phospholipid bilayer!

Foods high in fats are butter, whole milk, oils (anything fried in oil), fatty meat

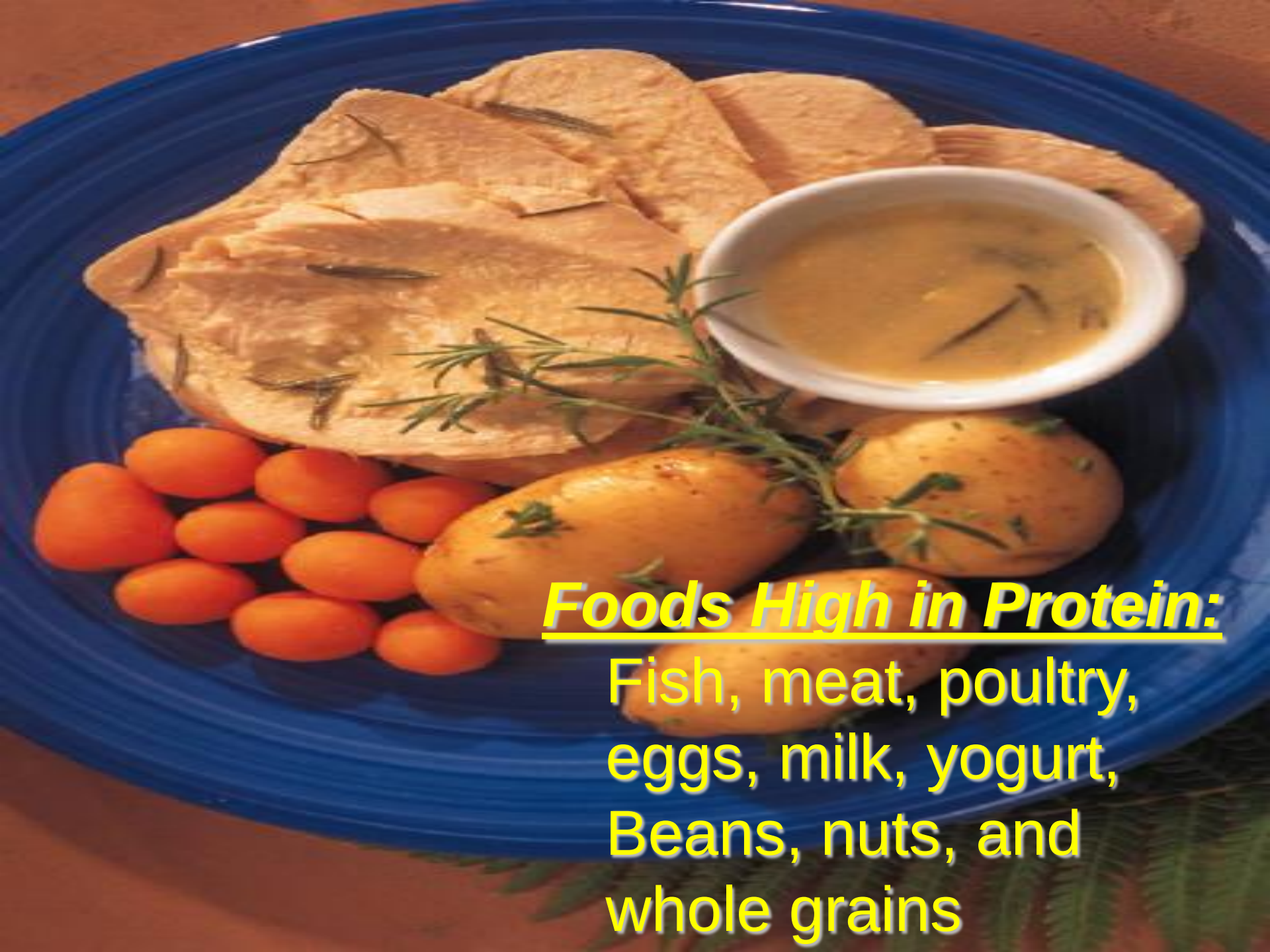
3. Protein

- Make body parts like muscle, bones, hair, etc
- Help control cell functions.
- Can be used for energy (but not the main source)



3. Protein

- When you put amino acids together in chains you form protein



Foods High in Protein:

Fish, meat, poultry, eggs, milk, yogurt, Beans, nuts, and whole grains

3. <u>Enzymes</u> “ase” = special proteins that control reactions and cell processes

For example:

Sucrase helps break down [redacted]

Lactase helps break down [redacted]

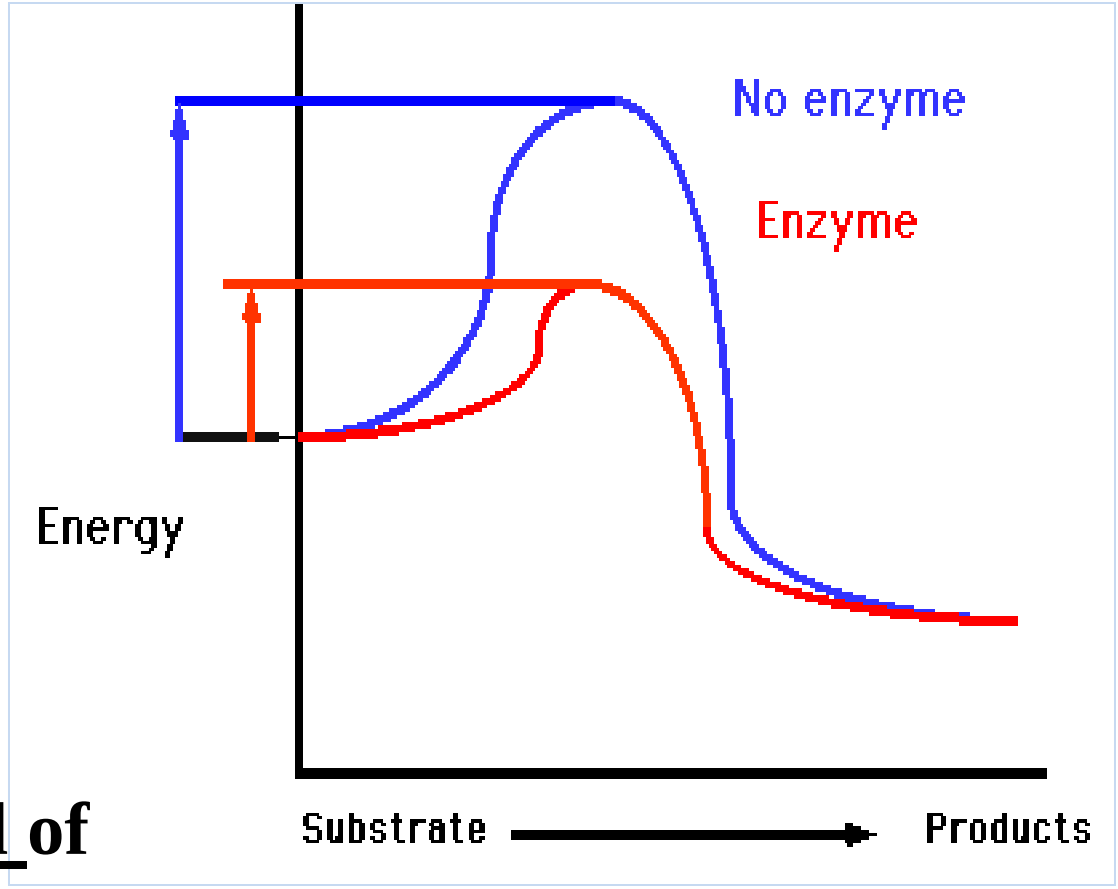
Lipase breaks down [redacted] (fats)

DNA polymerase helps **make** [redacted]

Think of an enzyme like your friend at a party, he helps you hook up faster. He **brings you together** with people you like **faster** than if you went alone.

Enzymes help make reactions happen without using as much energy.

AKA: Lowering the Activation Energy

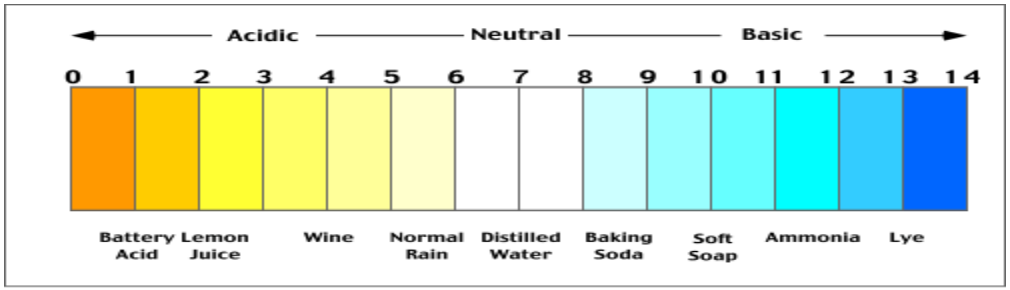


This increases the <u>speed</u> of the reaction by bringing the substrates together faster

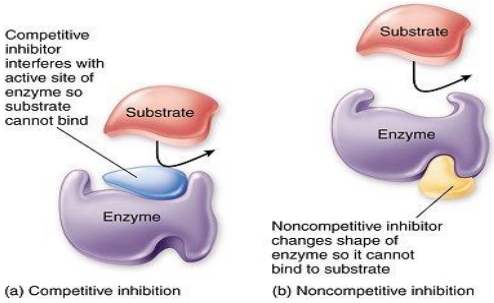
Things that affect the way an Enzyme works

- **Temperature**

- **pH**



- **Inhibitors** (blockers or Activators bring molecules together faster)

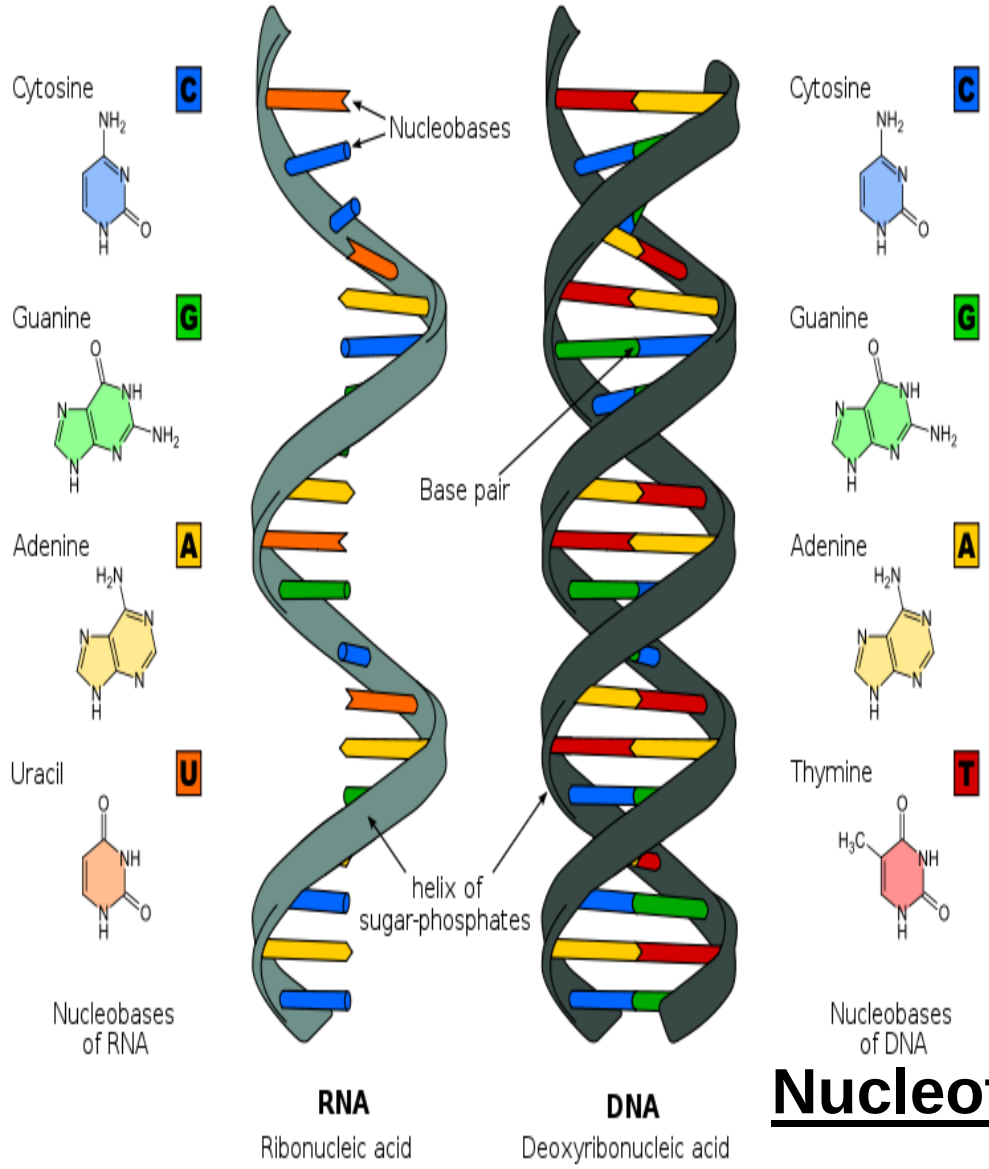


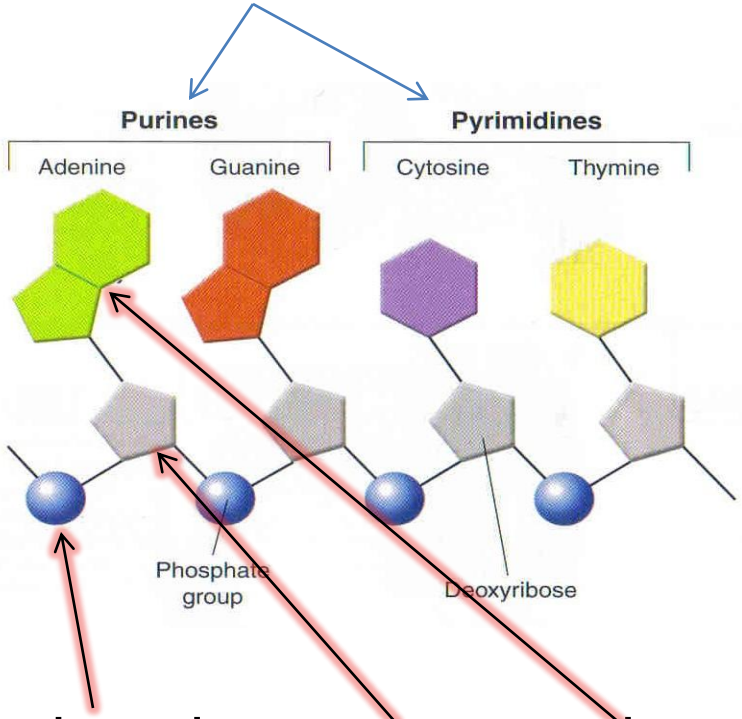
- **Enzyme Cofactors**– chemical components that affect how an enzyme works

4. Nucleic Acids

Nucleic Acid can be D**NA** or R**NA**.
(**NA**=Nucleic acid)

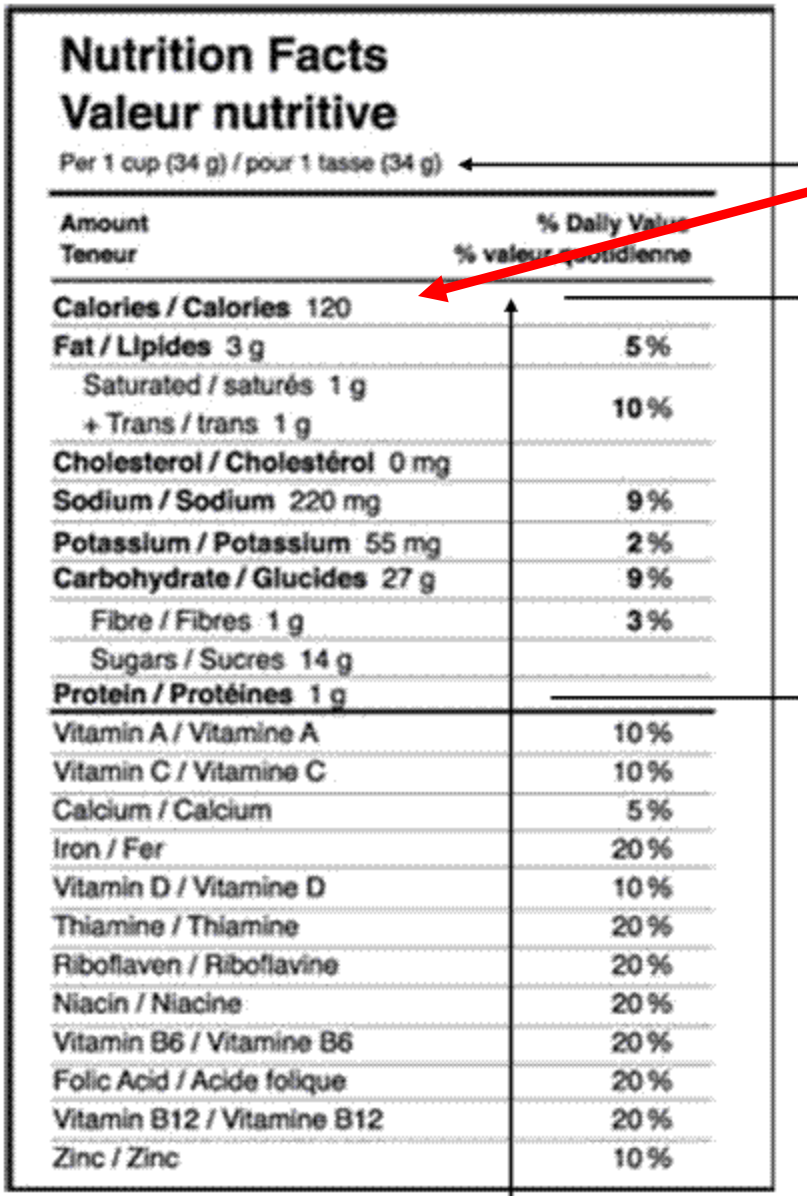
Nucleic acids are made up of smaller pieces called NUCLEOTIDES





Nucleotide = phosphate + sugar + base

5. Calories



Nutrition Facts
Valeur nutritive

Per 1 cup (34 g) / pour 1 tasse (34 g)

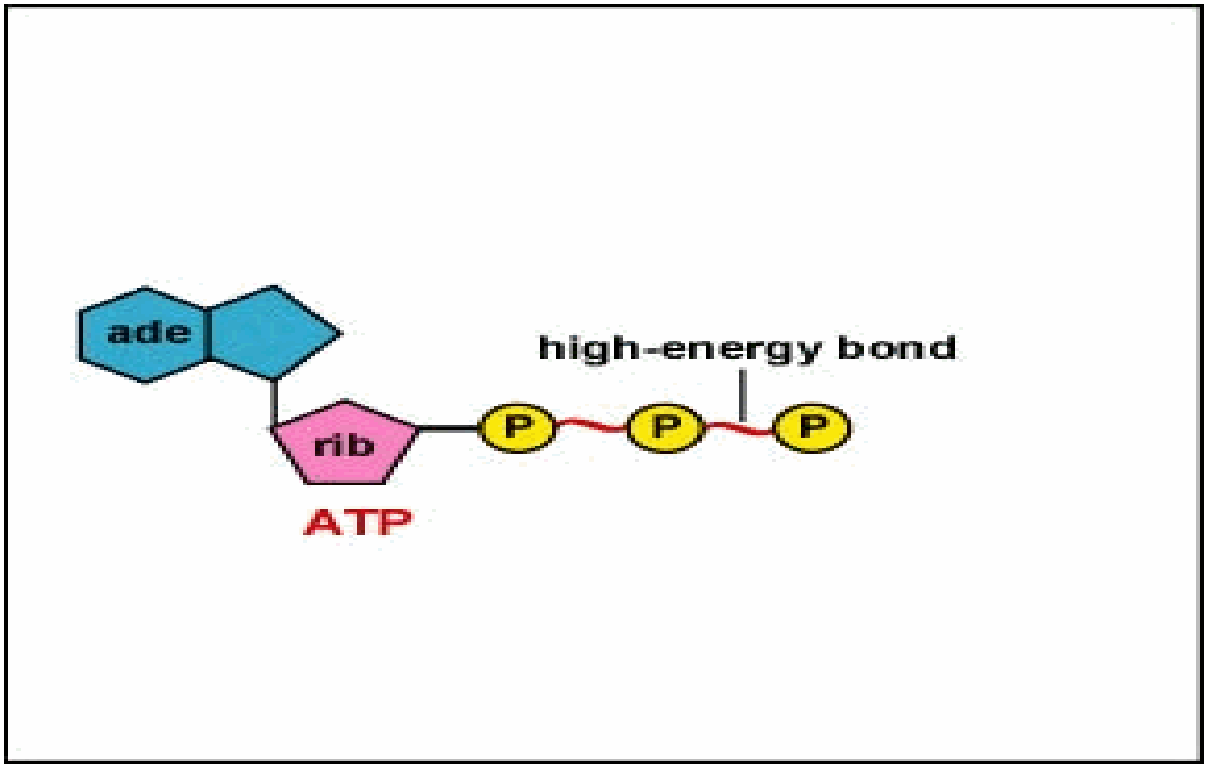
Amount / Teneur	% Daily Value / % valeur quotidienne
Calories / Calories 120	
Fat / Lipides 3 g	5 %
Saturated / saturés 1 g + Trans / trans 1 g	10 %
Cholesterol / Cholestérol 0 mg	
Sodium / Sodium 220 mg	9 %
Potassium / Potassium 55 mg	2 %
Carbohydrate / Glucides 27 g	9 %
Fibre / Fibres 1 g	3 %
Sugars / Sucres 14 g	
Protein / Protéines 1 g	
Vitamin A / Vitamine A	10 %
Vitamin C / Vitamine C	10 %
Calcium / Calcium	5 %
Iron / Fer	20 %
Vitamin D / Vitamine D	10 %
Thiamine / Thiamine	20 %
Riboflaven / Riboflavine	20 %
Niacin / Niacine	20 %
Vitamin B6 / Vitamine B6	20 %
Folic Acid / Acide folique	20 %
Vitamin B12 / Vitamine B12	20 %
Zinc / Zinc	10 %

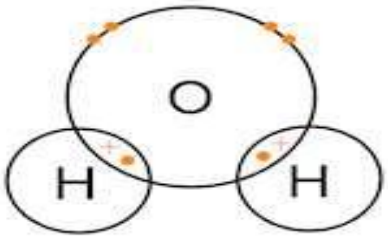
- Calories are units of energy.
- They measure the amount of energy in the food we eat
- Carbohydrates, Proteins, and Fats all have calories

  (Fats have the most)
- The average person needs around 2000 Calories a day (If you eat more than that your body may store the rest as fat)

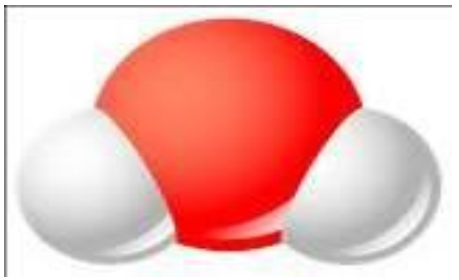
6. ATP Adenosine TriPhosphate

- Our food is changed into **energy our cells can use** called **ATP**





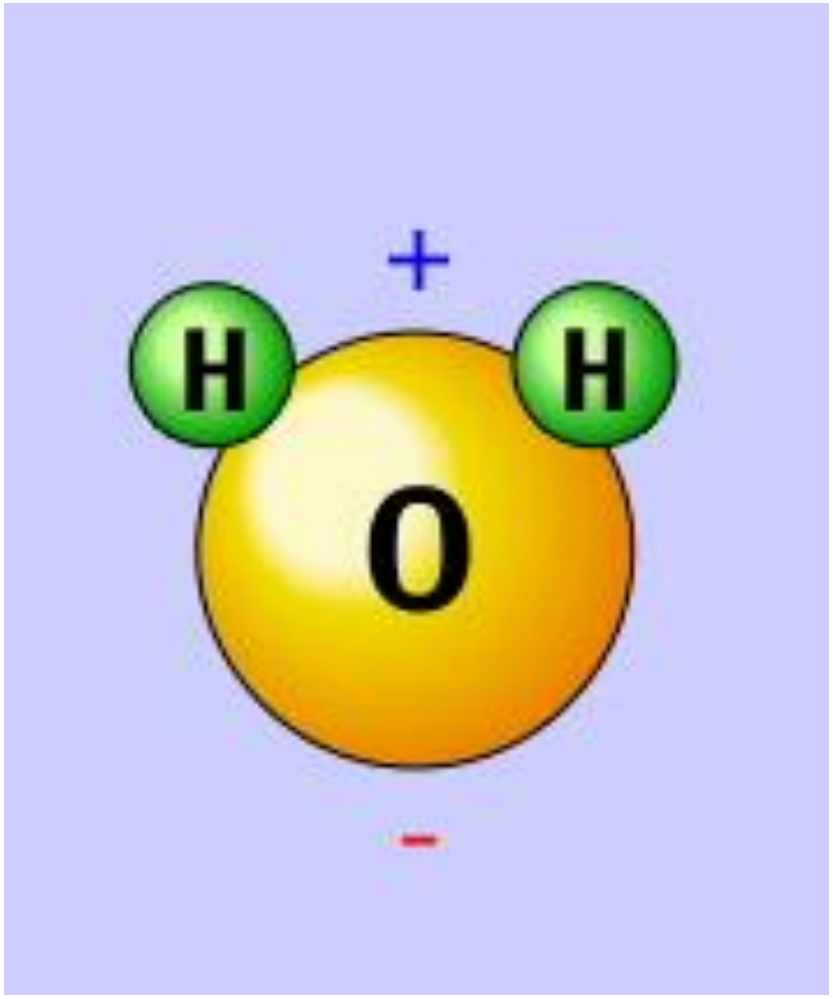
7. Water



- Water is the **universal solvent** (it can dissolve almost anything)

- Water is **polar**

Water has a positive + and a negative side –



Your body needs water!! In fact around 60% of your body is water and over 70% of your brain!

You can survive without food longer than without water.

8. Vitamins and Minerals

- Vitamins and Minerals are also necessary for your body (but in small amounts)
- You can get all of these by eating a well balanced diet!!!!