

## **What is Life?**

**Five characteristics of life:**

**All living things:**

- 1. are made up of one or more units called CELLS**
- 2. reproduce**
- 3. grow and develop**
- 4. obtain and use energy**
- 5. respond to the environment**

- ☺ Earth's crust contains 90 naturally occurring chemical elements**
- ☺ Only 11 of these are common in living organisms**
- ☺ Just 4 of these elements make up 96.3% of the total weight of the human body**

**CAN YOU GUESS WHAT THEY ARE??????????**

**Carbon  
Nitrogen  
Oxygen  
Hydrogen**

**These 4 elements make up practically all the chemical compounds in living things!!**

## **Inorganic compounds**

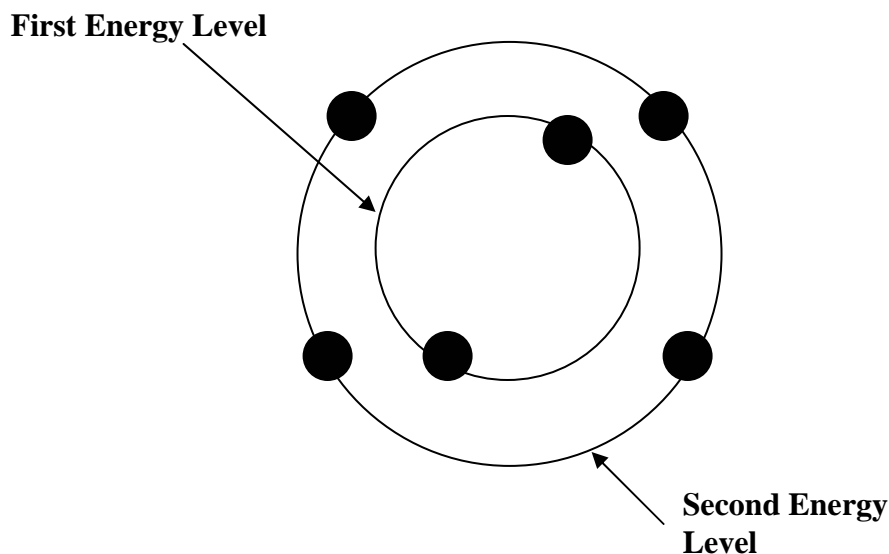
**→ Primarily those compounds that do not contain carbon**

## **Organic compounds**

**→ Carbon containing compounds**

## **WHY IS CARBON SO SPECIAL????????????**

**★ Its ability to form covalent bonds that are strong and stable**



**★ Four of its 8 positions in its outermost energy level are filled**

**★ This means it can form four single covalent bonds**

✪ Forms bonds with oxygen, nitrogen, phosphorous, and sulfur atoms

✪ Bonds easily with other atoms

✪ Can form **VERY LONG** chains by bonding to other carbon atoms

**What is POLYMERIZATION?**

➔ Chemical process where large compounds are “built” by joining together smaller compounds

Many carbon based molecules are formed this way

**WHAT DO WE CALL THESE SMALLER COMPOUNDS????**

Monomers  
(MONO means one!)

Monomers join together to form POLYMERS.  
(Poly means many!)

Some polymers are SO LARGE we call them

MACROMOLECULES  
(Macro means BIG!!)

**The number of possible organic compounds is almost limitless.**

**We can classify most of them, though, into 4 groups:**

 **Carbohydrates**

 **Lipids**

 **Proteins**

 **Nucleic Acids**

## **CARBOHYDRATES**

**⊗ Molecules we often call sugars and starches**

**⊗ Made up of carbon, hydrogen, and oxygen**

**⊗ Two hydrogen atoms for each oxygen atom  
(a ratio just like water!!)**

**⊗ Simplest carbohydrates are called  
MONOSACHARIDES (this means “single sugar”)**

**Examples:**

**Glucose – sugar green plants produce**

**Galactose – found in milk**

**Fructose – sweetest simple sugar, found in fruits**

**The CHEMICAL FORMULA for these three simple sugars is.....  $C_6H_{12}O_6$**

**So what makes each of them different from each other?**

- ➔ **The arrangement of the individual atoms (their structural formula!)**

**So why in the world are sugars so important anyway???**

☺ **They contain a great deal of ENERGY**

☺ **This energy is stored in the bonds that make up the carbohydrate molecules**

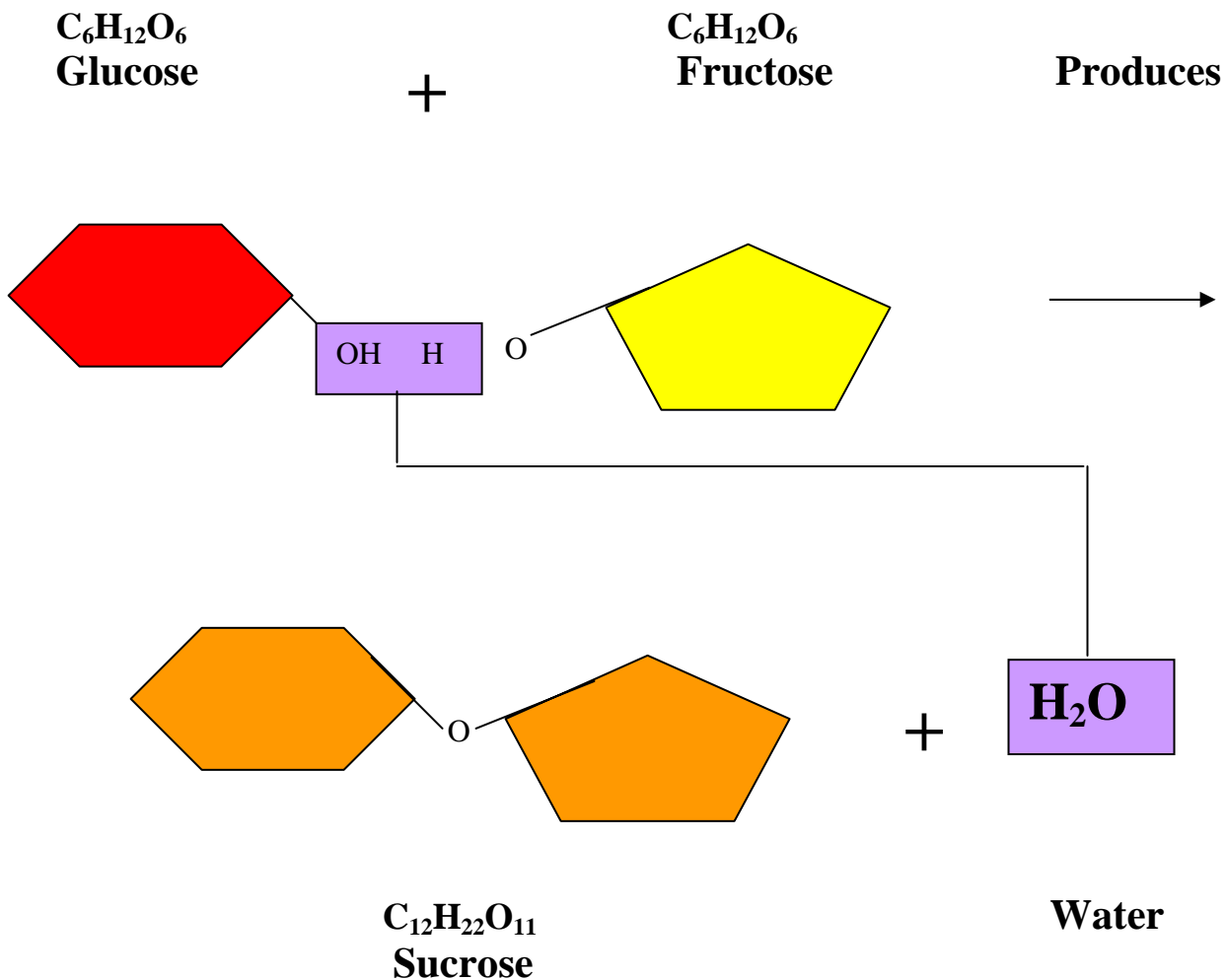
☺ **When the bonds are broken, the energy is released**

☺ **Nearly ALL organisms use glucose as one of their basic energy sources**

**What happens when we join together two MONOSACCHARIDES???**

**A DISACCHARIDE is born!  
(double sugar)**

During this **CHEMICAL REACTION**, an **–OH** from one monosaccharide combines with an **H** from another monosaccharide and a molecule of water is also formed.



This reaction is called → **Dehydration synthesis**

**Dehydration – loss of water**  
**Synthesis – “putting together”**

## **Examples of DISAACHARIDES**

- **Table sugar (sucrose)**
- **Maltose (malt sugar)**
- **Lactose (milk sugar)**

## **POLYSAACHARIDES**

**Very LARGE molecules can be formed by joining together MANY monosaccharides – these molecules are called POLYSAACHARIDES**

- ☺ **Living things store excess sugar (energy) in the form of polysaccharides**
- ☺ **An important polysaccharide is STARCH**
- ☺ **Plants store excess sugar in the form of starch**
- ☺ **Starch is a VERY LARGE molecule formed by joining together hundreds of glucose molecules**
- ☺ **Another important polysaccharide is GLYCOGEN – its HUGMONGOUS...REALLY BIG...**
- ☺ **Animals (including us) store glycogen in the liver and muscles**
- ☺ **And another polysaccharide is CELLULOSE**
- ☺ **Cellulose is found in plants**
- ☺ **Gives plants strength and rigidity**
- ☺ **Major component of wood-our paper is made primarily of cellulose**