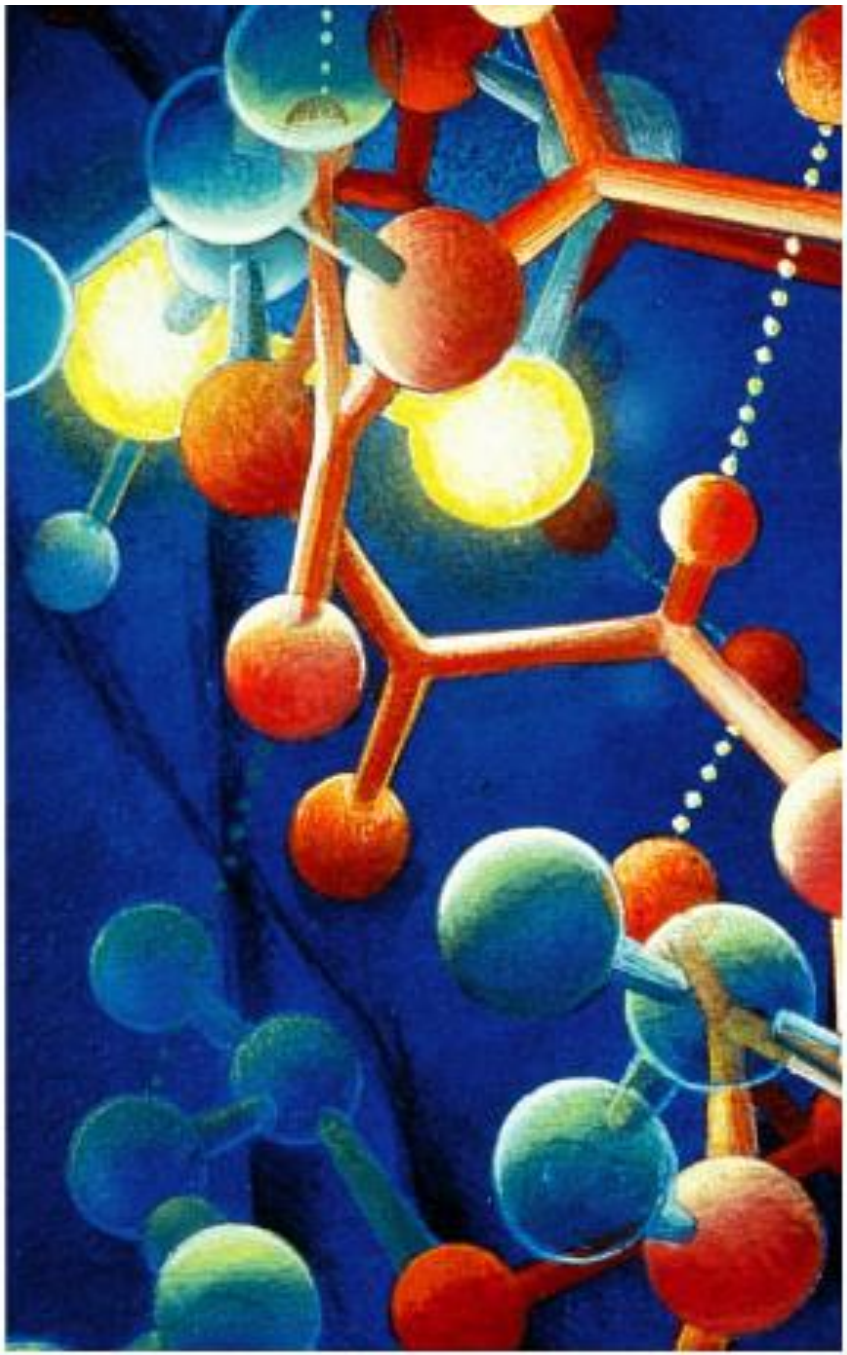


The Chemistry of Life

Organic and Inorganic molecules

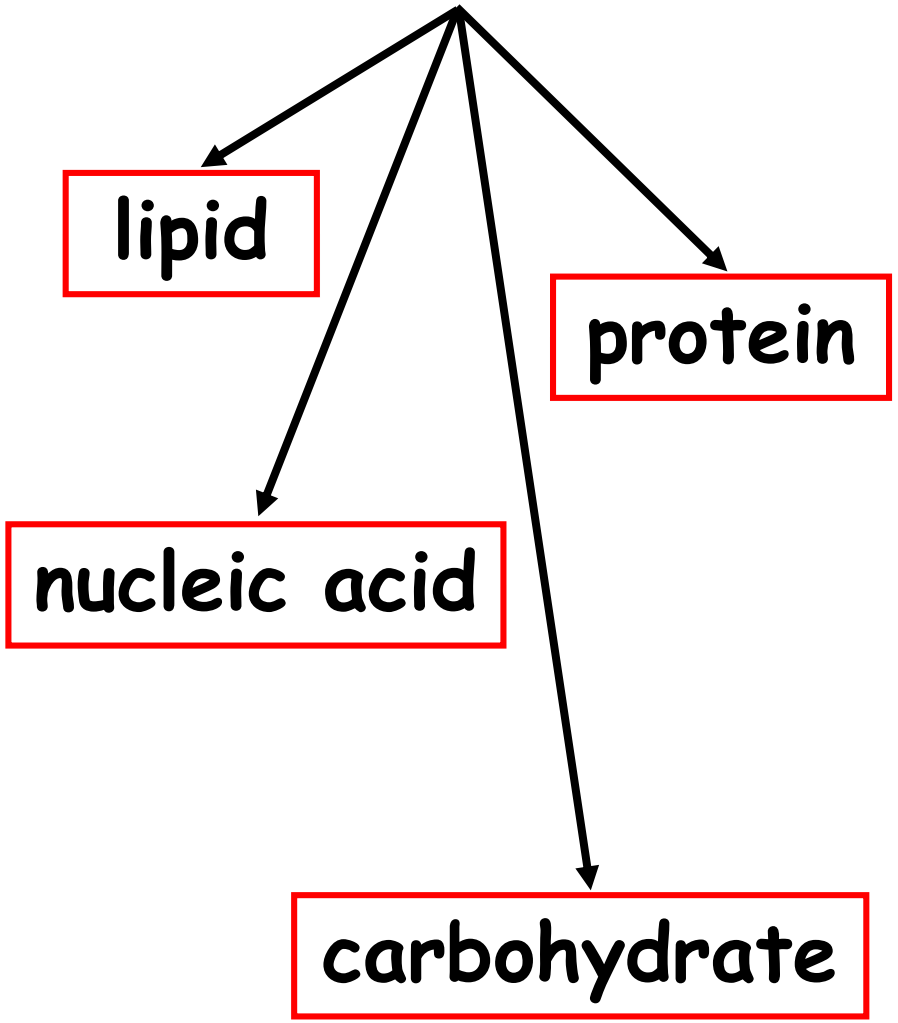
Organic Molecules

ORGANIC compounds contain a carbon-hydrogen bond ($C_6H_{12}O_6$)

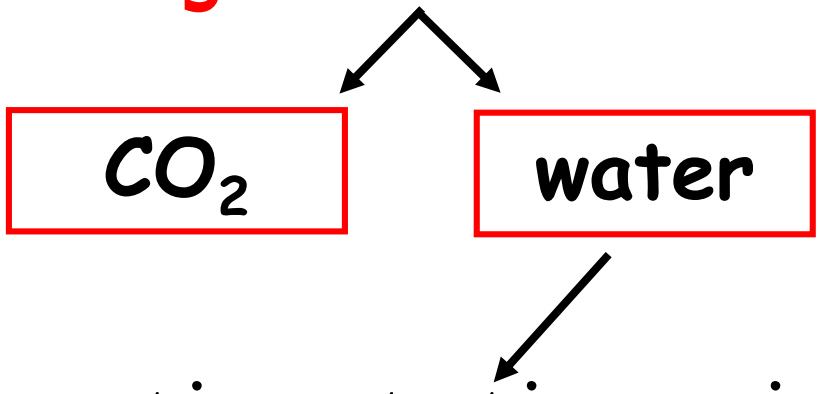
Inorganic Molecules

INORGANIC compounds do not contain a carbon-hydrogen bonds (CO_2, H_2O)

Organic Molecules



Inorganic Molecules



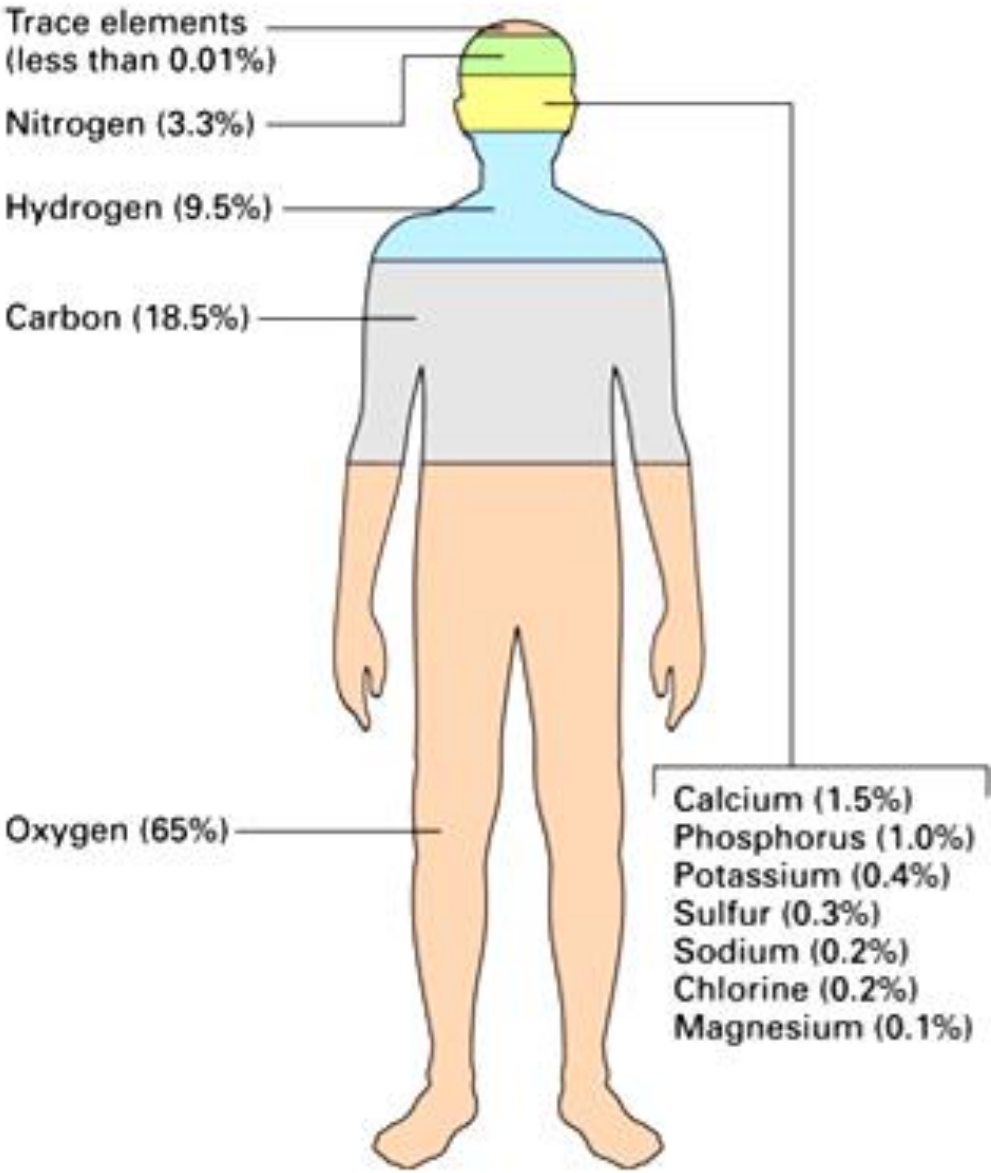
most important inorganic compound in living things

Why is water so important?

- **Approximately 70% of the body is made of water**
- **most cellular processes take place in water solutions**
- **excellent solvent (substances dissolve in water)**

Elements of Life

- 96% of living organisms is made of:
  - carbon (C)
  - oxygen (O)
  - hydrogen (H)
  - nitrogen (N)

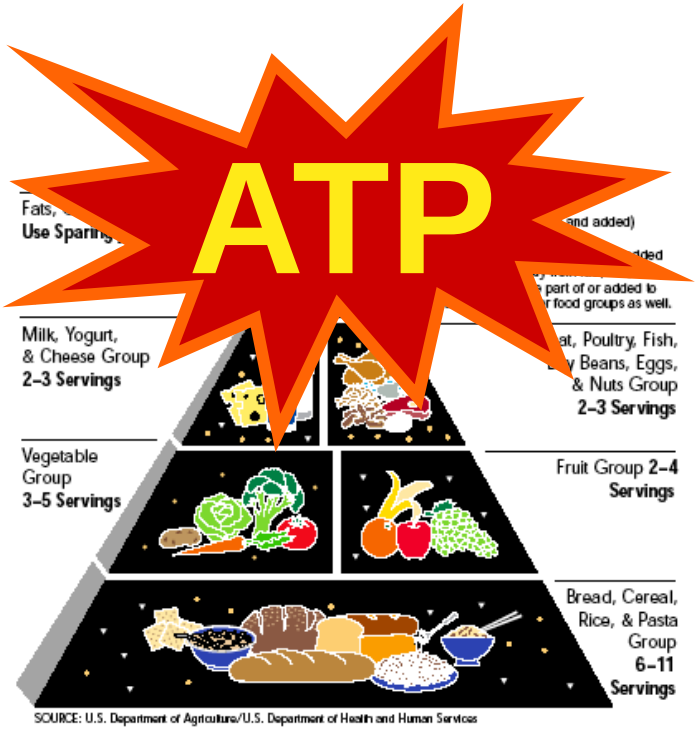


What are organisms made of?

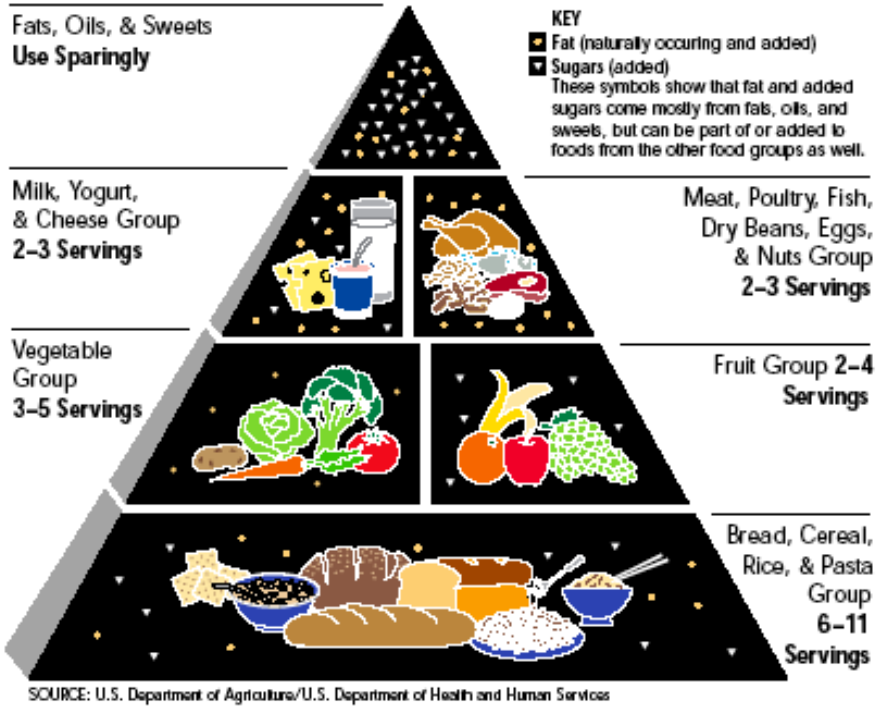
- Carbohydrates
- Lipids
- Proteins
- Nucleic Acids

Why do we eat?

- **We eat to take in more of these chemicals**
  - **Food for building materials**
    - **to make more of us (cells)**
    - **for growth**
    - **for repair**
  - **Food to make energy**
    - **calories**
    - **to make ATP**

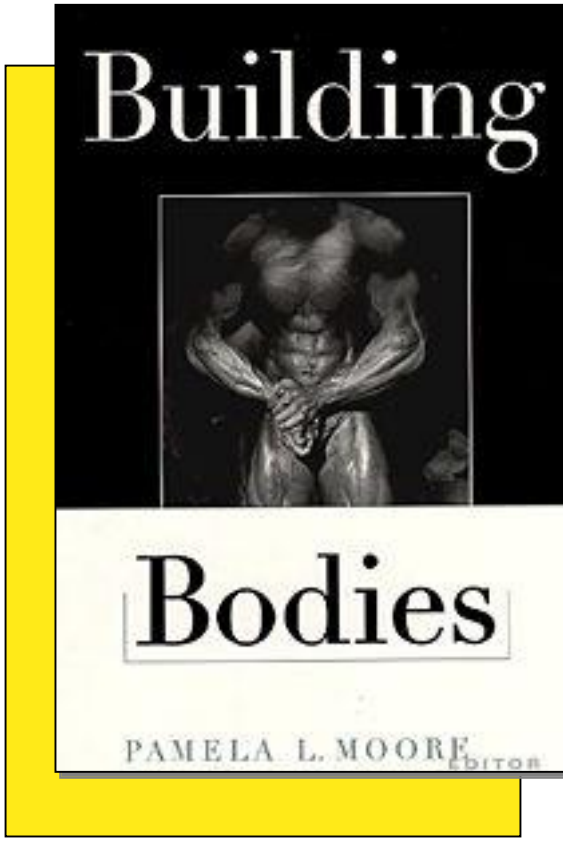


- **Foods give organisms more <u>building blocks</u> & <u>more energy</u>**
  (for building & running their bodies)
  - **carbohydrates**
  - **proteins**
  - **fats**
  - **nucleic acids**
  - **vitamins**
  - **minerals, salts**
  - **water**



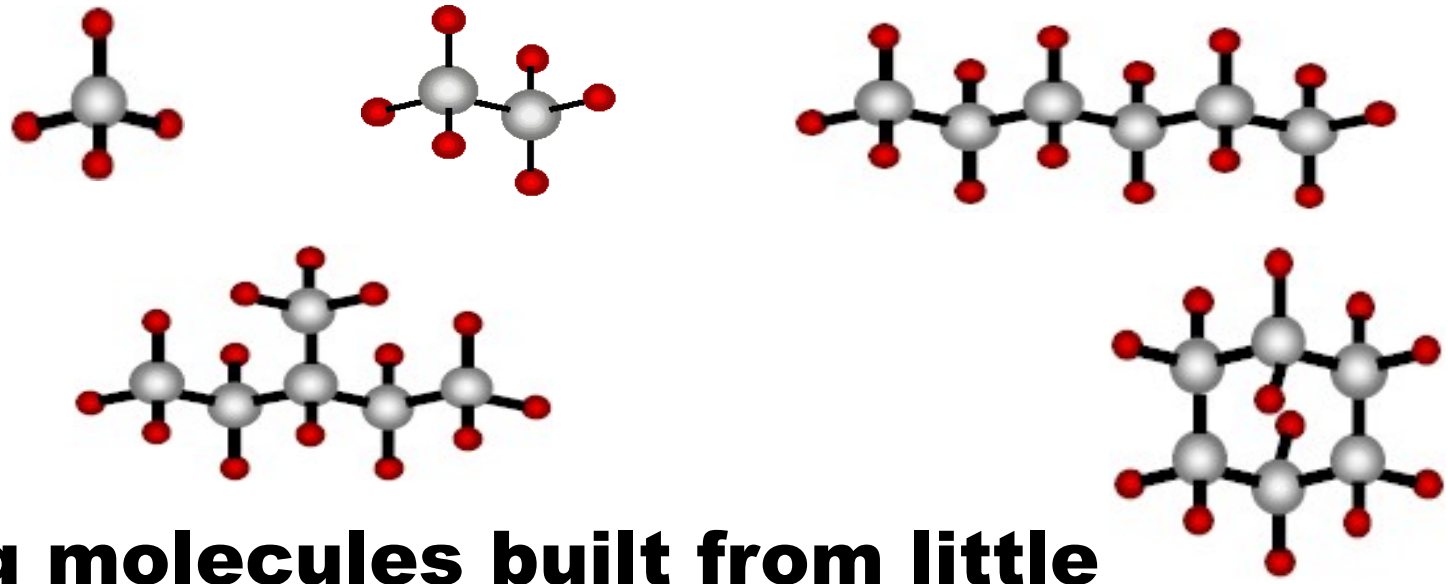
How do we make these molecules?

We build them!



Building large molecules of life

- **Chain together smaller molecules**
  - **building block molecules = monomers**
    - **Monomers are also called subunits**



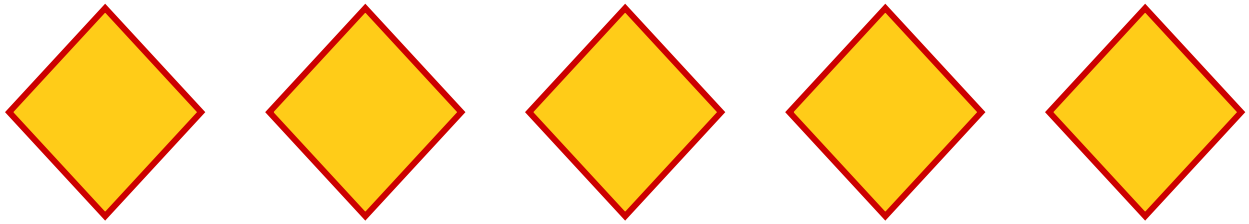
- **Big molecules built from little molecules**
  - **polymers**

Let's use some analogies . . .

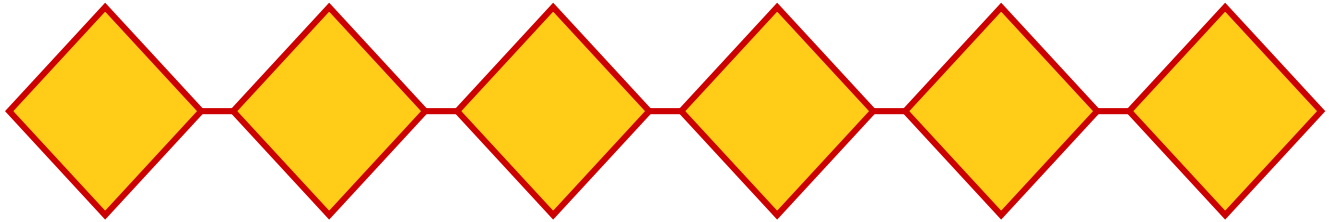
- If the polymer is the floor in this room, the monomer is _____
- If the polymer is a brick wall, the monomer is _____
- If the monomer is a link in a chain, the polymer is _____
- If the monomer is a fence board, the polymer is _____

Building large organic molecules

- **Small molecules =monomer (building blocks)**



- **Bond them together = polymers**



Building important polymers

Carbohydrates = built from sugars (saccharides)

sugar – sugar – sugar – sugar – sugar – sugar

Proteins = built from amino acids

amino acid – amino acid – amino acid – amino acid – amino acid – amino acid

The order of the amino acids is important! It decides what protein is made.

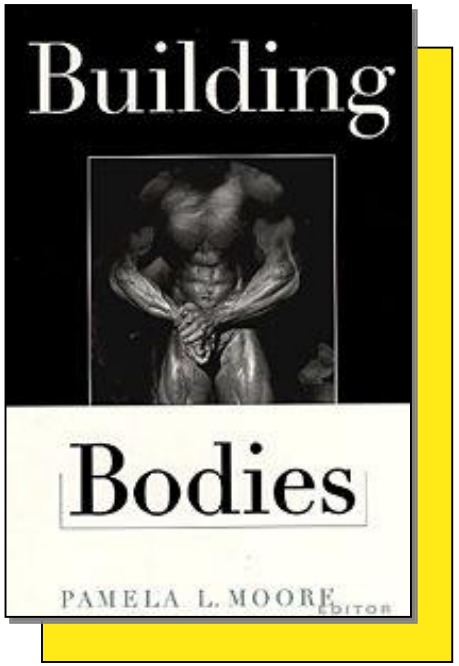
Nucleic acids (DNA) = built from nucleotides

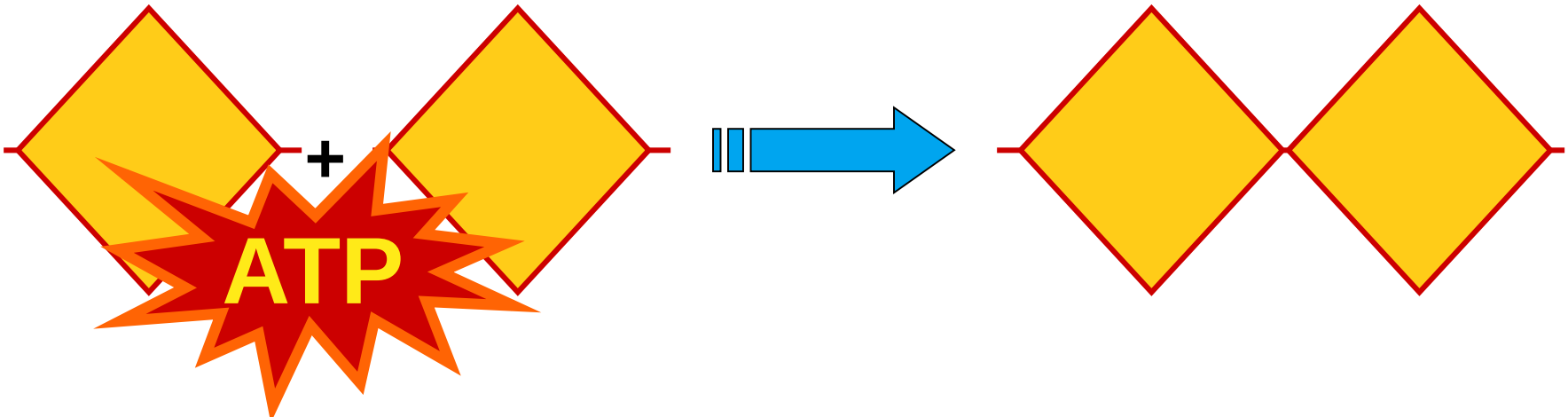
nucleotide – nucleotide – nucleotide – nucleotide

The order of the nucleotides is important! It decides what gene is made.

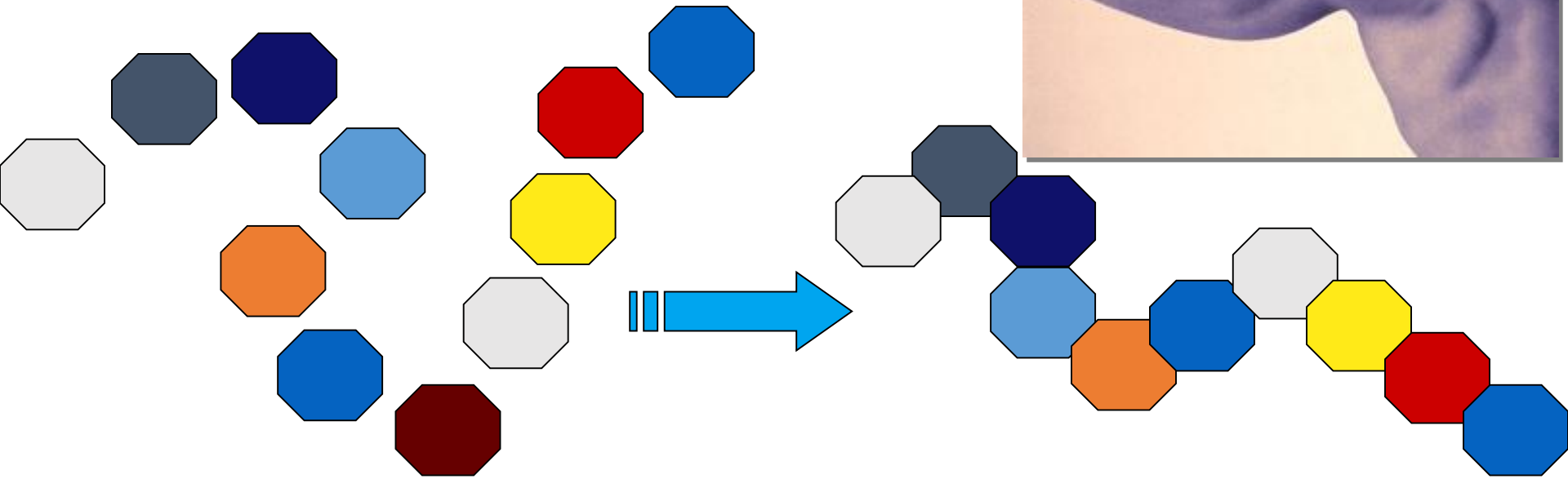
How to build large molecules

- **Synthesis = to make or build**
  - **building cells & bodies**
    - **repair**
    - **growth**
    - **reproduction**





Example of synthesis



amino acids **protein**

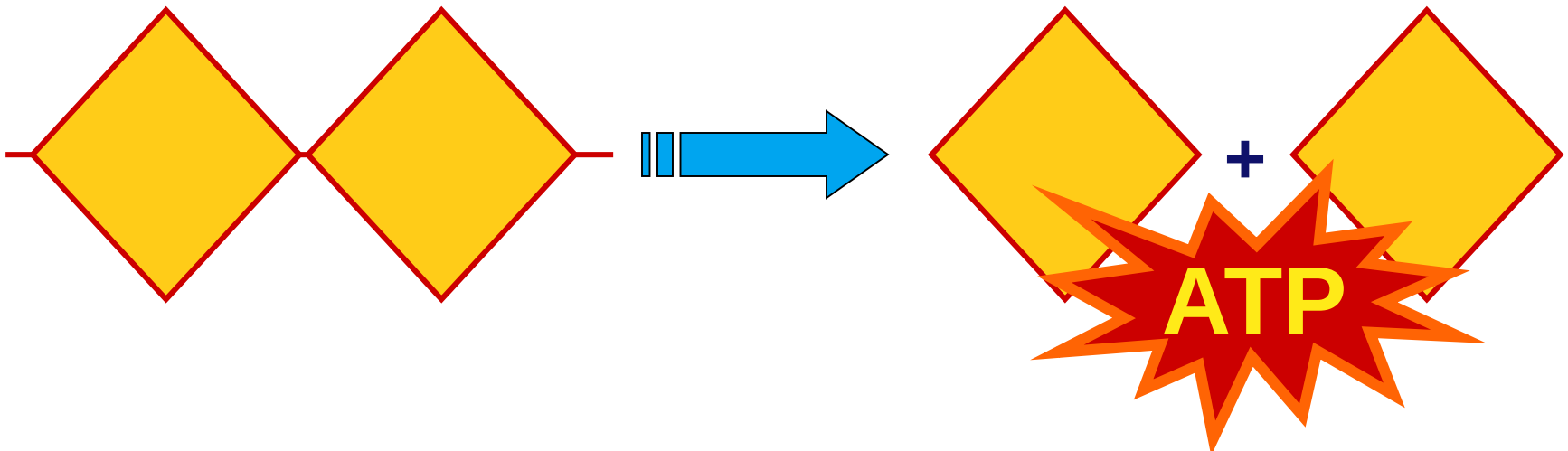
- Proteins are synthesized by bonding amino acids

amino acids = building block

protein = polymer

How to take large molecules apart

- **Digestion = Breakdown or apart**
  - **getting raw materials**
    - **for synthesis & growth**
  - **making energy (ATP)**
    - **for synthesis, growth & everyday functions**



Example of digestion

starch

ATP ATP ATP ATP ATP ATP ATP

glucose

- Starch is digested to glucose

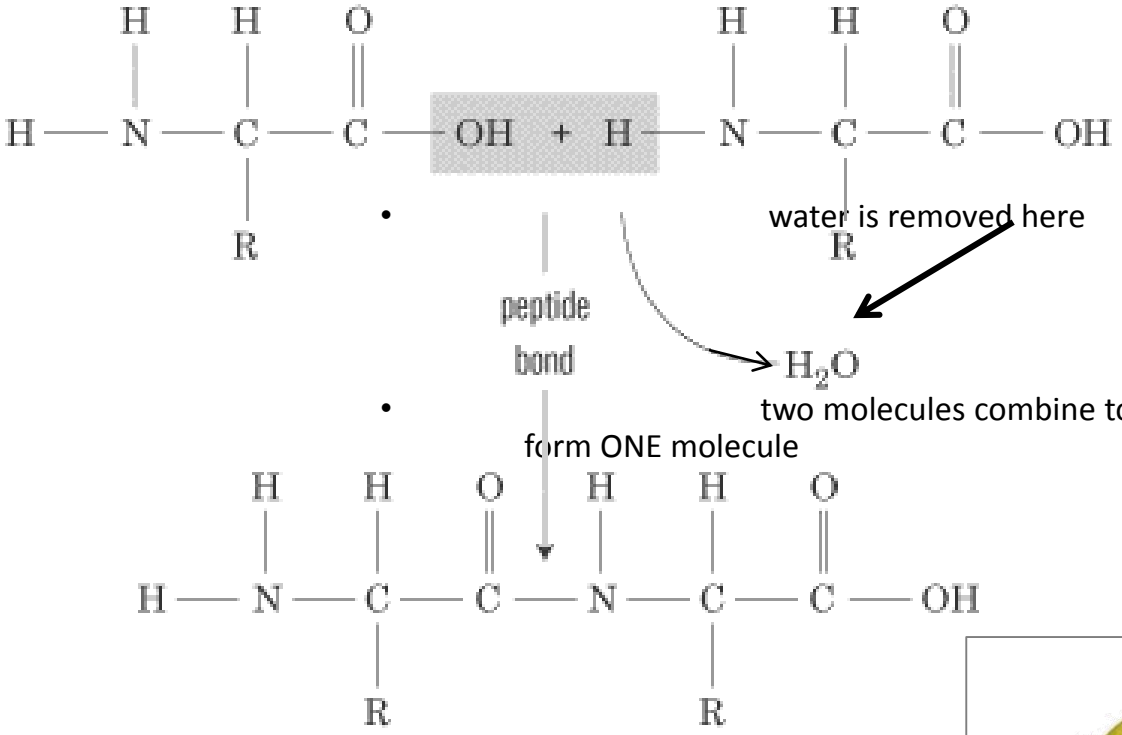
- Dehydration Synthesis – Water removed to make a new molecule

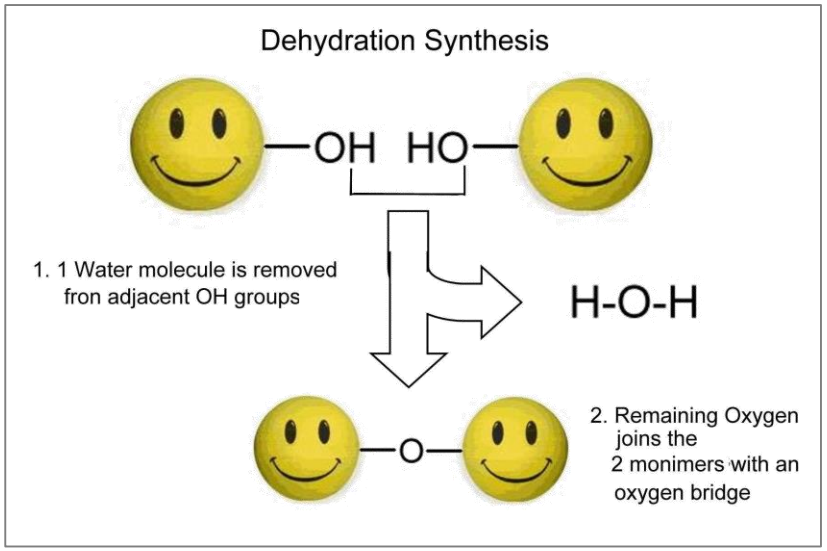
- Hydrolysis – the splitting of a polymer by adding water

Re-cap:

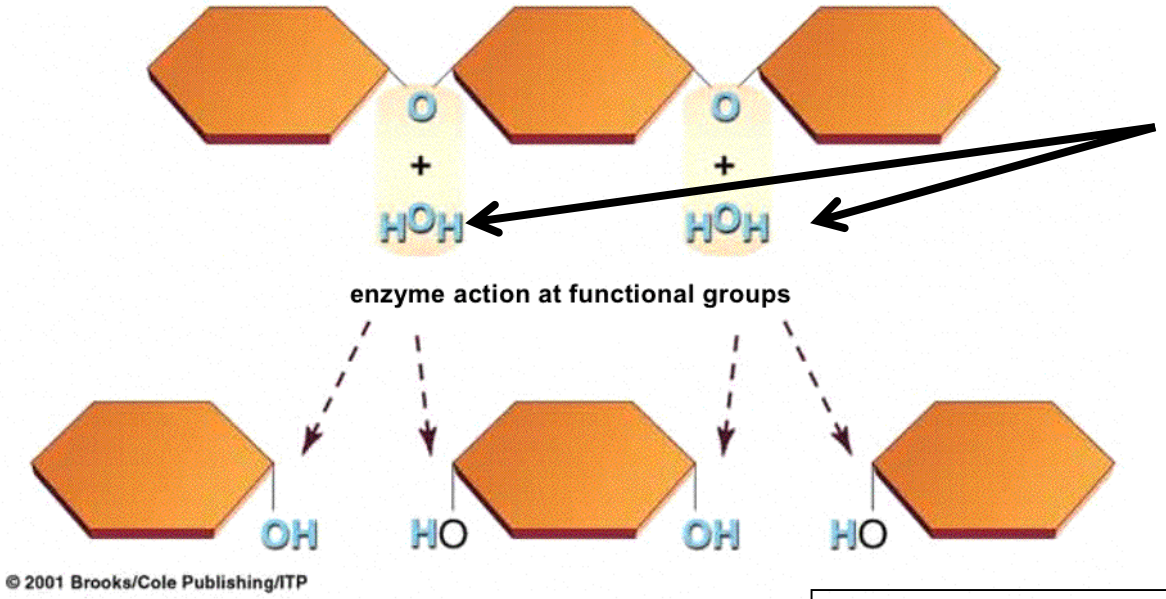
- If we _____ water, we build a molecule
- If we _____ water, we break a molecule

- Which is smaller? The monomer or the polymer?


peptide bond
water is removed here
H_2O
two molecules combine to form ONE molecule


Dehydration Synthesis
OH HO
1. 1 Water molecule is removed fron adjacent OH groups
H-O-H
O
2. Remaining Oxygen joins the 2 monimers with an oxygen bridge

Hydrolysis



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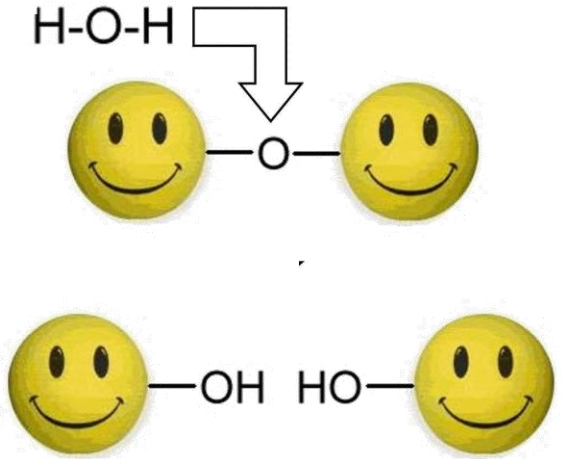
1. Water molecule is inserted into oxygen bridge, breaking bond.

Hydrolysis



Metabolism -

- Chemical processes necessary for maintaining life.

Anabolism – Synthesizing (building) materials to sustain life.

Constructive metabolism

Catabolism – Breaking down substances to release energy needed to sustain life.

Destructive metabolism

Molecules of Life

- There are 4 molecules essential to life:
  - Carbohydrates
  - Lipids
  - Proteins
  - Nucleic acids

- Together they are considered “molecules of life”
  - Macromolecule
  - Biomolecule
  - Life substance


Any
Questions?