

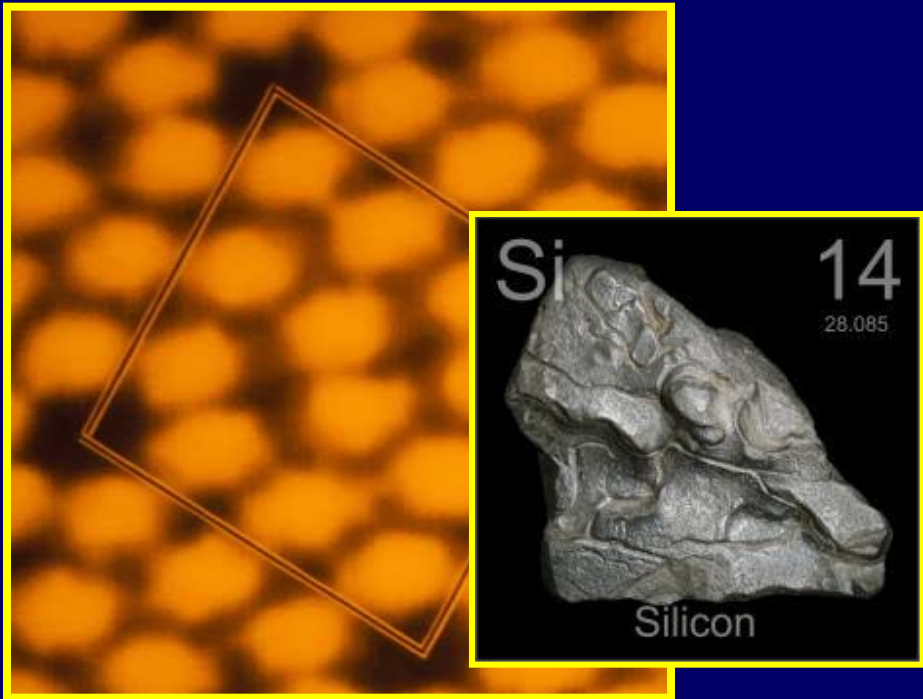
Biochemistry



Clarifying Objective 4.1.1

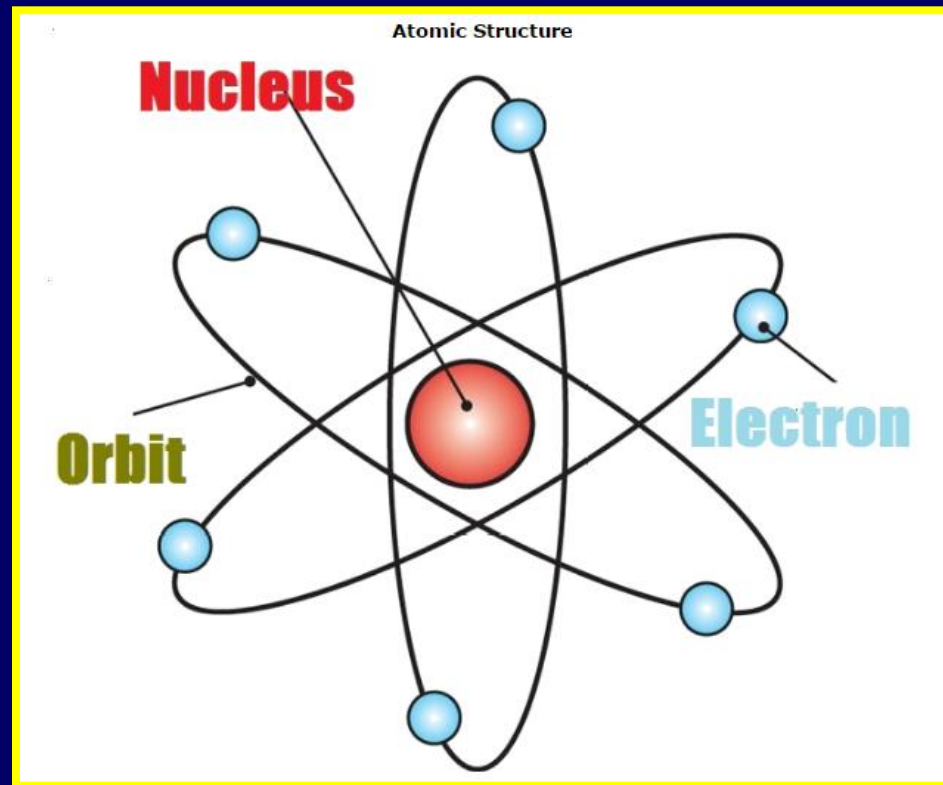
Compare the structure and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids).

Everything in the universe is made of matter

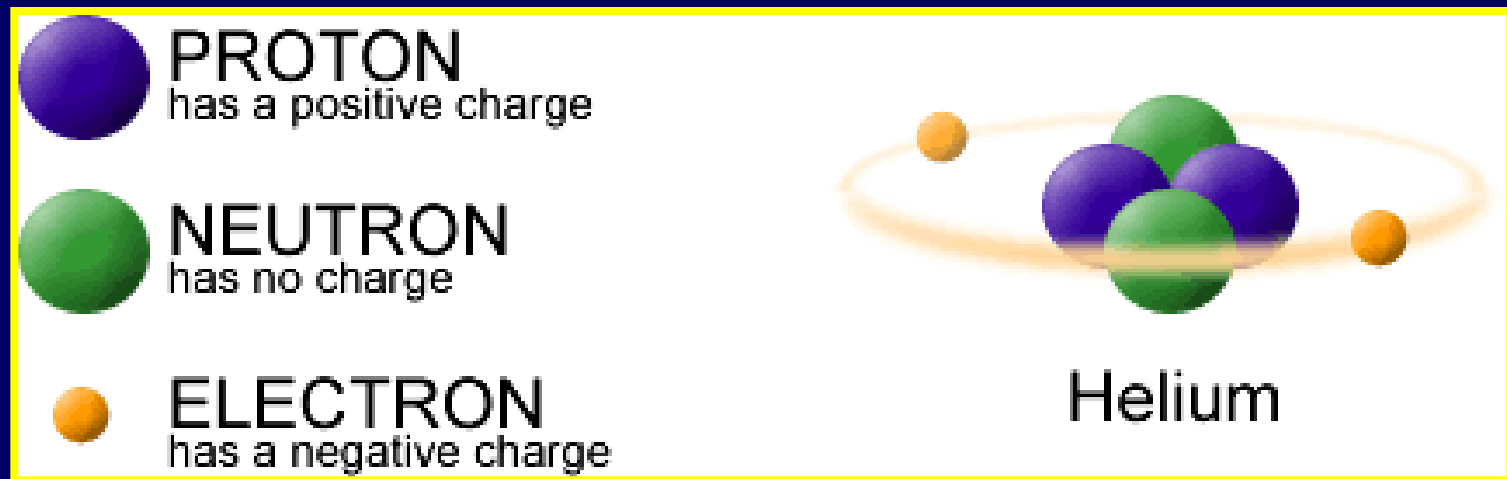


The smallest units of matter are called atoms

All atoms consist of a centrally located nucleus with orbiting electrons



Inside the nucleus of each atom, are positively charged protons and neutrally charged neutrons.

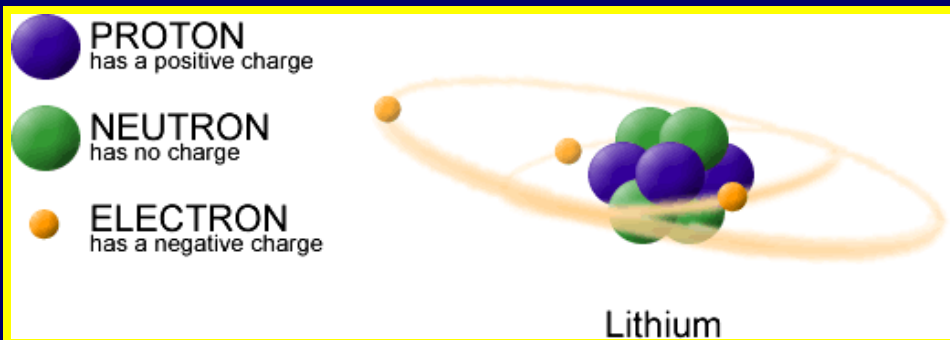
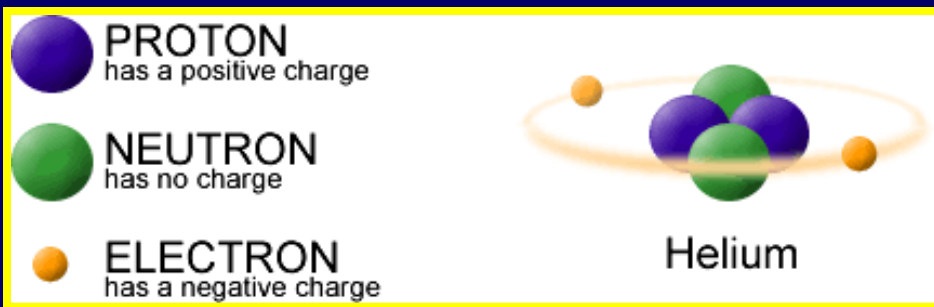
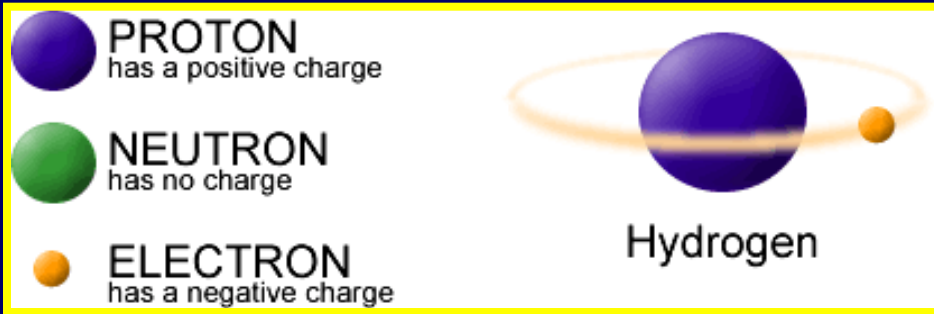


The orbiting electrons have a negative charge.

Different types of atoms contain different numbers of protons.

Each different type of atom is called an element.

The number of protons determines which element the atom will be.



All of the known elements are listed on the periodic table

Periodic Table of the Elements

		IA										IIA										IIIB										IVB										VB										VIB										VIIB										VII										IIB										IB										I										IIA										III										IVA										VA										VIA										VIIA										0									
1	2	H										He																																																																																																																																																																									
3	4	Li										Be										B										C										N										O										F										Ne																																																																																																													
11	12	Na										Mg										Al										Si										P										S										Cl										Ar																																																																																																													
19	20	K										Ca										Sc										Ti										V										Cr										Mn										Fe										Co										Ni										Cu										Zn										Ga										Ge										As										Se										Br										Kr									
37	38	Rb										Sr										Y										Zr										Nb										Mo										Tc										Ru										Rh										Pd										Ag										Cd										In										Sn										Sb										Te										I										Xe									
55	56	Cs										Ba										*La										Hf										Ta										W										Re										Os										Ir										Pt										Au										Hg										Tl										Pb										Bi										Po										At										Rn									
87	88	Fr										Ra										+Ac										Rf										Ha										Sg										Ns										Hs										Mt										110										111										112										113																																																											

* Lanthanide Series	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
+ Actinide Series	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Each element is represented by an abbreviation called a chemical symbol

H

N

C

Hydrogen

Nitrogen

Carbon

P

O

Phosphorus

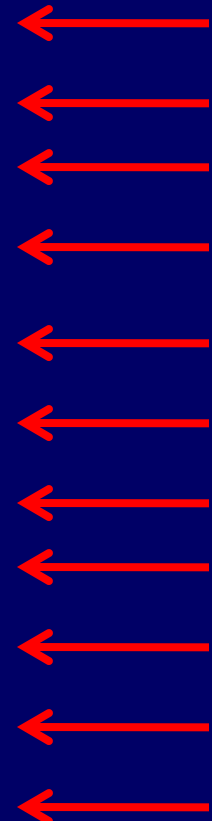
Oxygen

Of all the elements, only about 25 are essential to living organisms

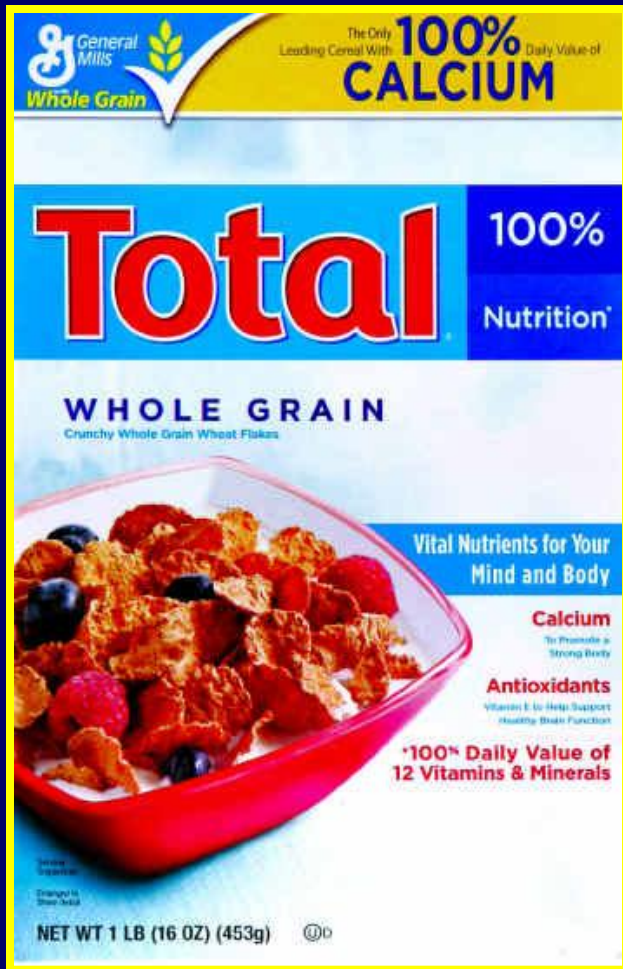
Element	% by mass in human body	Element	% by mass in human body
Oxygen	65%	Iron	trace
Carbon	18.5%	Zinc	trace
Hydrogen	9.5%	Copper	trace
Nitrogen	3.3%	Iodine	trace
Calcium	1.5%	Manganese	trace
Phosphorus	1.0%	Boron	trace
Potassium	0.4%	Chromium	trace
Sulfur	0.3%	Molybdenum	trace
Sodium	0.2%	Cobalt	trace
Chlorine	0.2%	Selenium	trace
Magnesium	0.1%	Fluorine	trace

Essential elements that occur in very small amounts are called trace elements

Element	% by mass in human body	Element	% by mass in human body
Oxygen	65%	Iron	trace
Carbon	18.5%	Zinc	trace
Hydrogen	9.5%	Copper	trace
Nitrogen	3.3%	Iodine	trace
Calcium	1.5%	Manganese	trace
Phosphorus	1.0%	Boron	trace
Potassium	0.4%	Chromium	trace
Sulfur	0.3%	Molybdenum	trace
Sodium	0.2%	Cobalt	trace
Chlorine	0.2%	Selenium	trace
Magnesium	0.1%	Fluorine	trace



Plants absorb trace elements through their roots, while animals get trace elements from their food.



Nutrition Facts

Serving Size: 3/4 cup (30g)

Amount Per Serving

Calories 100 Calories from Fat 4

% Daily Value*

Total Fat 0.5 g **1%**

Saturated Fat 0.12 g **1%**

Trans Fat 0 g

Cholesterol 0 mg **0%**

Sodium 189.9 mg **8%**

Potassium 90 mg **3%**

Total Carbohydrate 23.15 g **8%**

Dietary Fiber 2.7 g **11%**

Sugars 5 g

Sugar Alcohols

Protein 2 g

Vitamin A 500.1 IU 10%

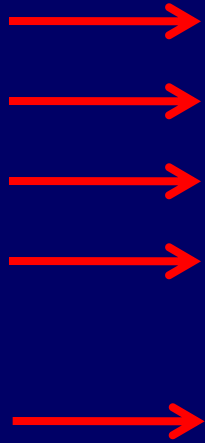
Vitamin C 60 mg 100%

Calcium 999.9 mg 100%

Iron 18 mg 100%



Five elements make up 97% of the mass of a human: Carbon, Hydrogen, Oxygen, Nitrogen and Phosphorus..



Element	% by mass in human body	Element	% by mass in human body
Oxygen	65%	Iron	trace
Carbon	18.5%	Zinc	trace
Hydrogen	9.5%	Copper	trace
Nitrogen	3.3%	Iodine	trace
Calcium	1.5%	Manganese	trace
Phosphorus	1.0%	Boron	trace
Potassium	0.4%	Chromium	trace
Sulfur	0.3%	Molybdenum	trace
Sodium	0.2%	Cobalt	trace
Chlorine	0.2%	Selenium	trace
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Inorganic Versus Organic

Organic molecules always contain carbon, hydrogen, and oxygen combined together.



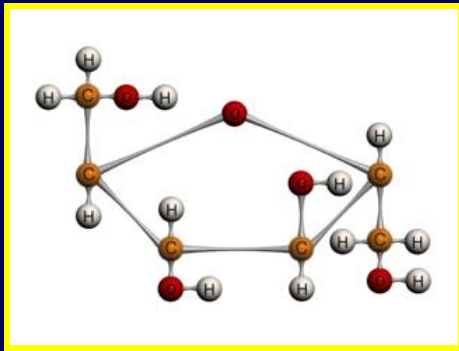
Inorganic molecules do not contain carbon, hydrogen, and oxygen combined together

Macromolecules are large organic molecules that make up all living organisms

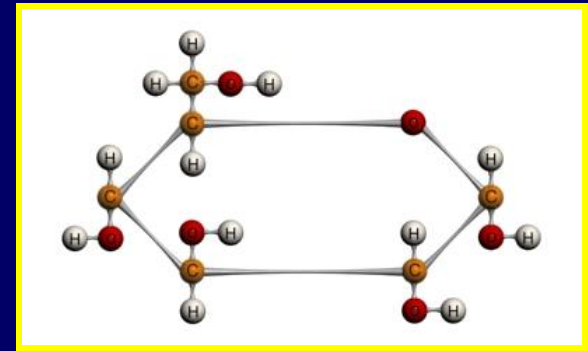
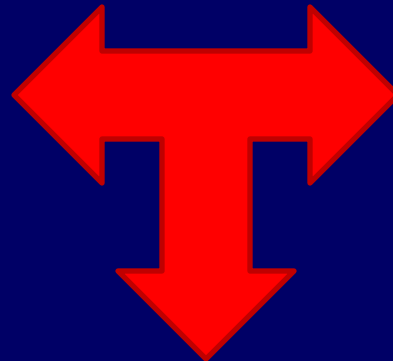
Four Groups of Macromolecules

1. Carbohydrates – Sugars and starches
2. Lipids – Fats and Oils
3. Proteins – Enzymes and Many Others
4. Nucleic Acids – DNA and RNA

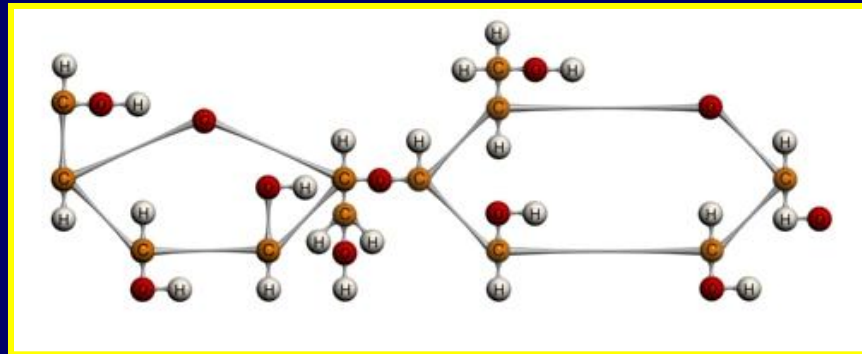
Each macromolecules is called a polymer which is a molecule made up of many smaller subunits called monomers



Fructose



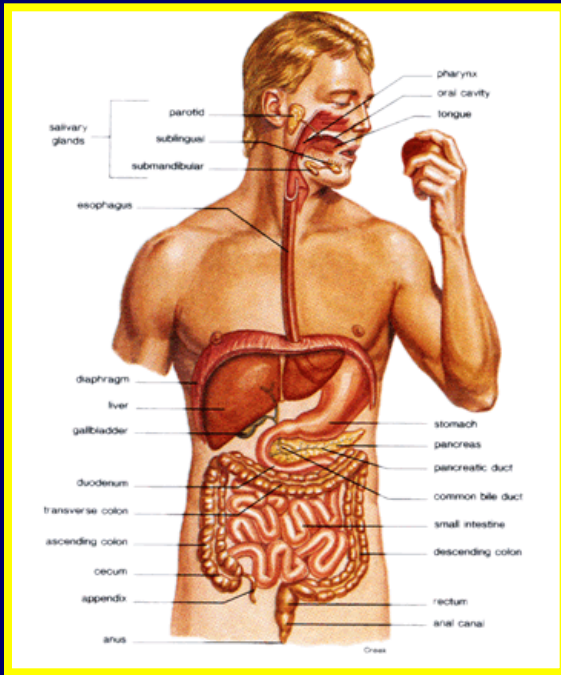
Glucose



Sucrose

Digestion

During digestion the polymers, from our food, are broken down into monomers.



The monomers are then absorbed by the blood stream and carried to cells in the body

In the cells, the monomers are assembled back into polymers

Each of the four macromolecule groups has a very specific monomer

Polymer

Monomer

Carbohydrate Monosaccharides

Lipids..... Fatty Acids

Proteins Amino Acids

Nucleic Acids Nucleotides