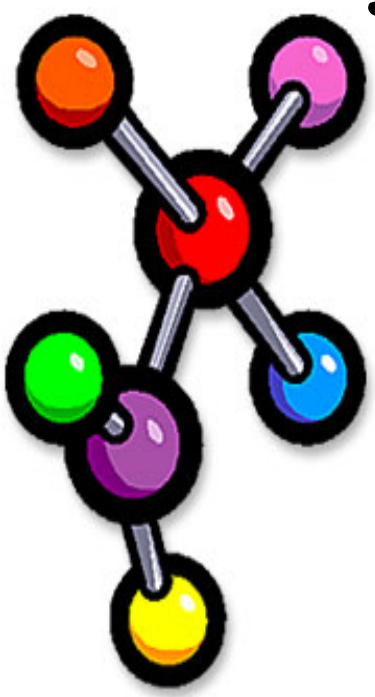
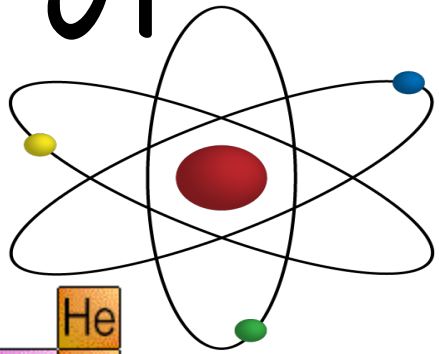


The Nature of Matter

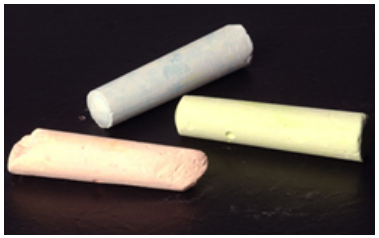


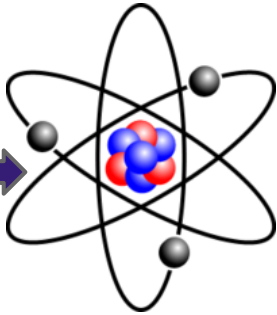
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub						

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

what three subatomic particles make up atoms?

Democritus (~2500 years ago)



There had to be a limit to where you could no longer break something into smaller parts… He called the smallest fragment an **atom!**

what three subatomic particles make up atoms?

"Atomos" = "unable to cut"

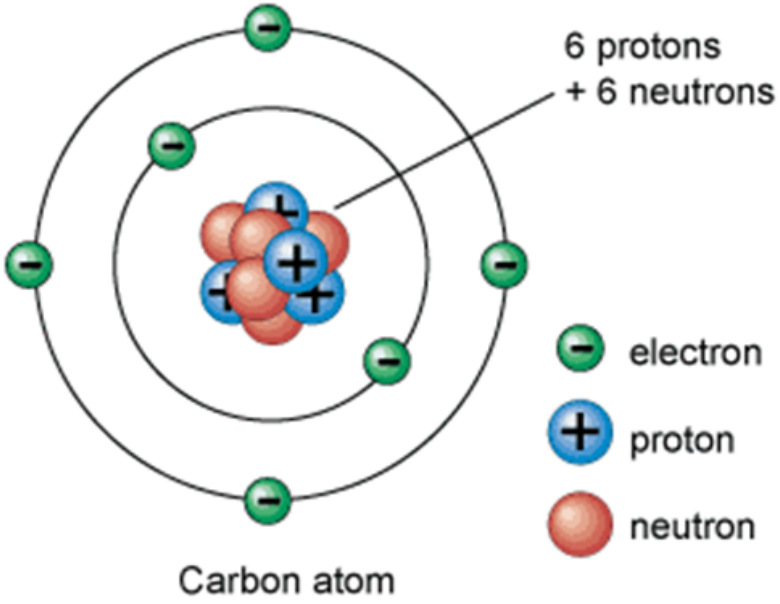
How do we define an atom?

-The basic unit of matter.

- Atoms are incredibly small!

what three subatomic particles make up atoms?

Even though atoms are extremely small, they are made up of even smaller *subatomic* particles!



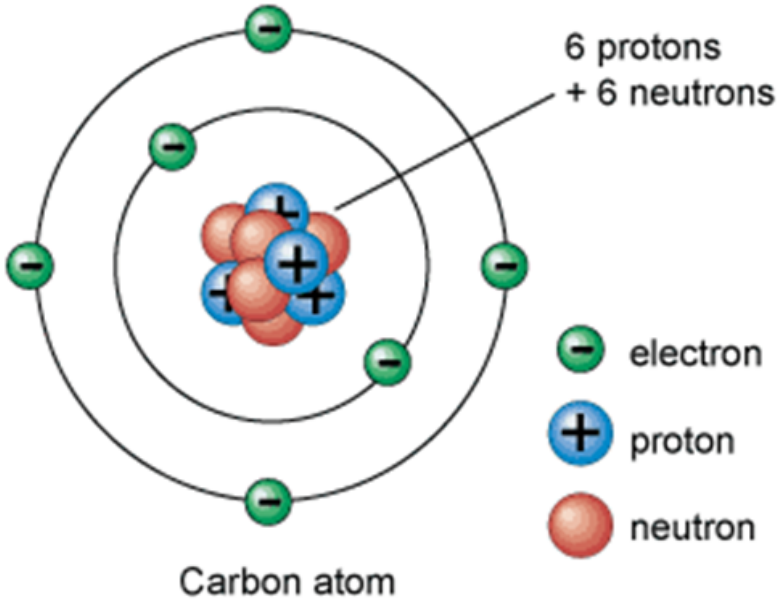
what three subatomic particles make up atoms?

Nucleus of an Atom:

Protons = (+)

Neutrons = (0)

*both protons and neutrons have the same mass, and are held together by strong forces.



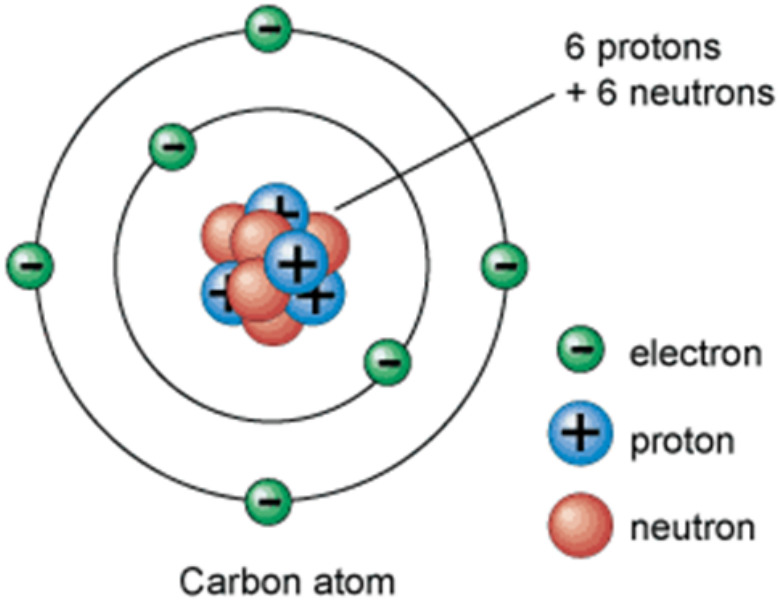
what three subatomic particles make up atoms?

Surrounding the Nucleus:

Electrons = (-) charge

*Has a much smaller mass than protons.

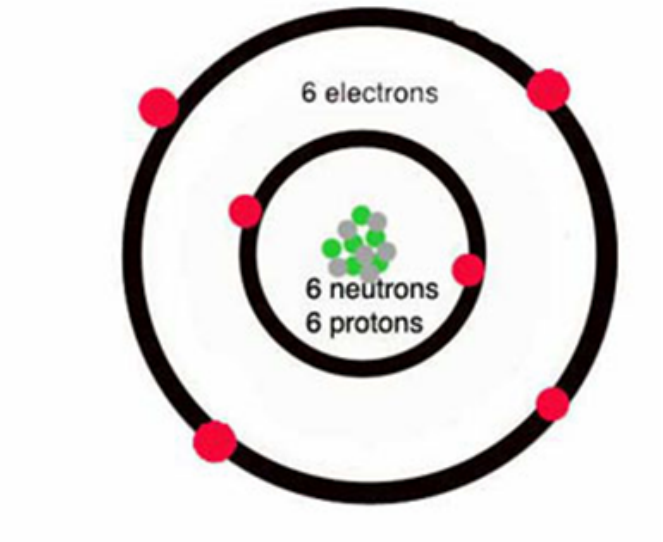
*Always in constant motion in the space around the nucleus.

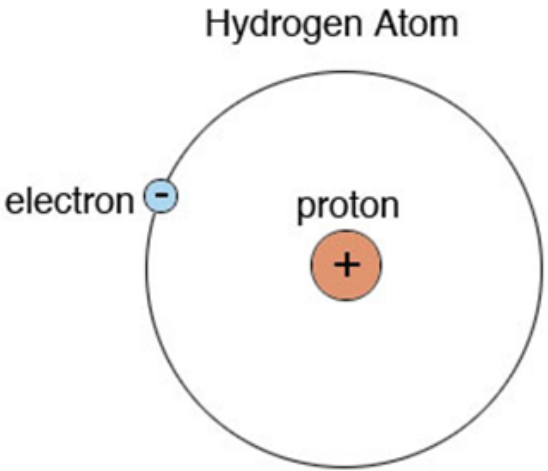


what three subatomic particles make up atoms?

The number of electrons and protons are always equal.

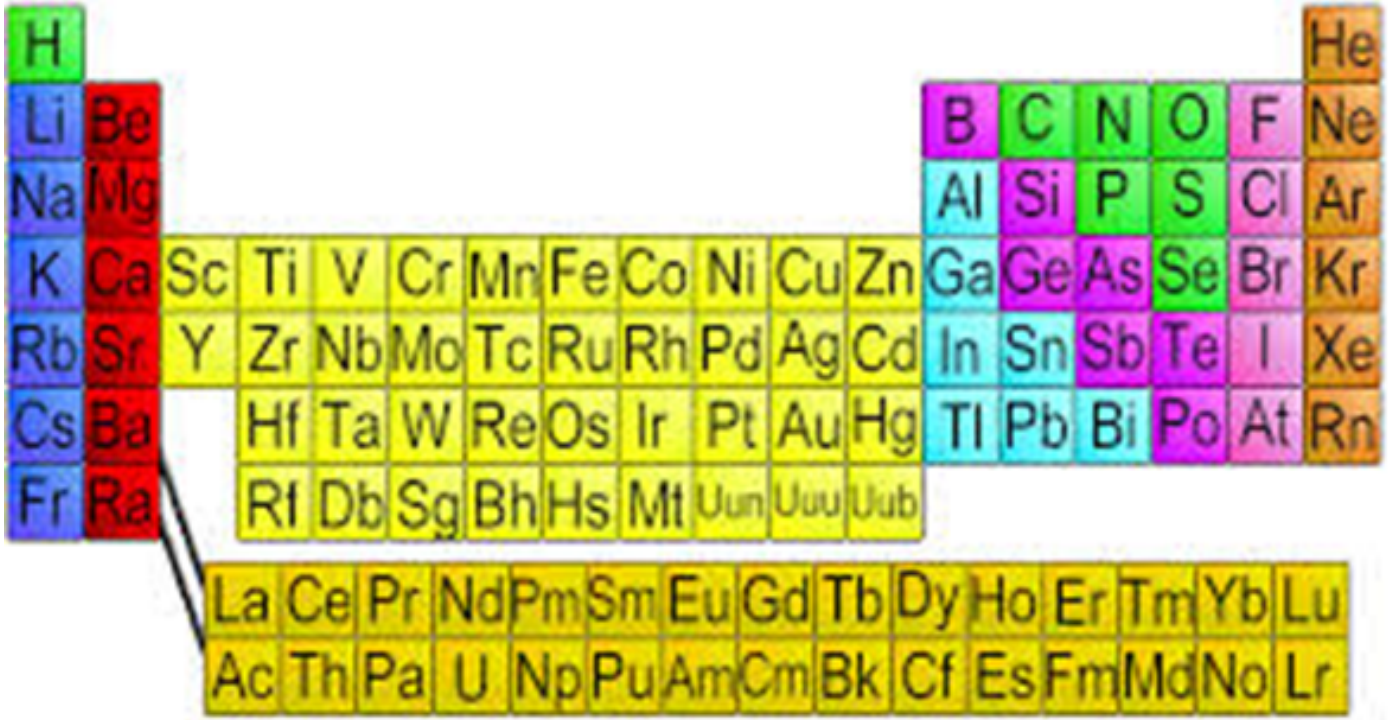
- their positive and negative charges balance out, so atoms themselves are electrically neutral!





what are elements?

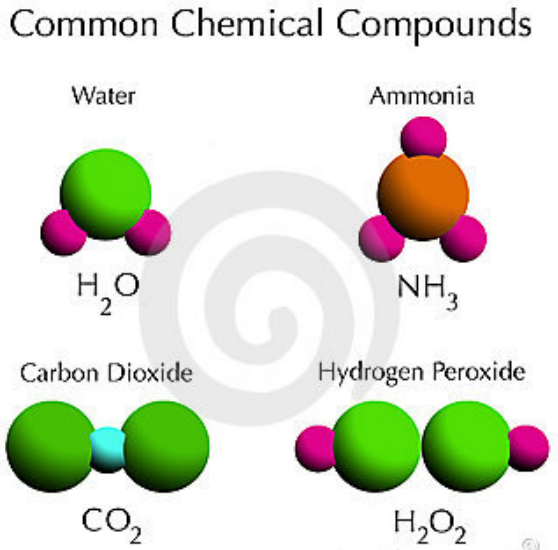
An element is a pure substance that consists entirely of one type of atom.



what do elements make up?

In nature, most elements are found combined with other elements.

A chemical compound is a substance formed by the chemical combination of two or more elements in definite proportions.



what do elements make up?

We use chemical/molecular formulas to show the composition of compounds.

H_2O Water

NaCl Salt

$C_{12}H_{22}O_{11}$ Sugar

what do elements make up?

The physical and chemical properties of compounds are usually very different from the elements that make them up.

Hydrogen and Oxygen

-gases at room temp, but combine explosively to from liquid water.

Sodium and Chlorine

- silver-colored metal you can cut with a knife.
- Chlorine - poisonous yellow-green gas used during WWI

what do elements make up?

what do elements make up?

Chemical bonds hold the atoms of different compounds together.

- Ionic bonding
- covalent bonding

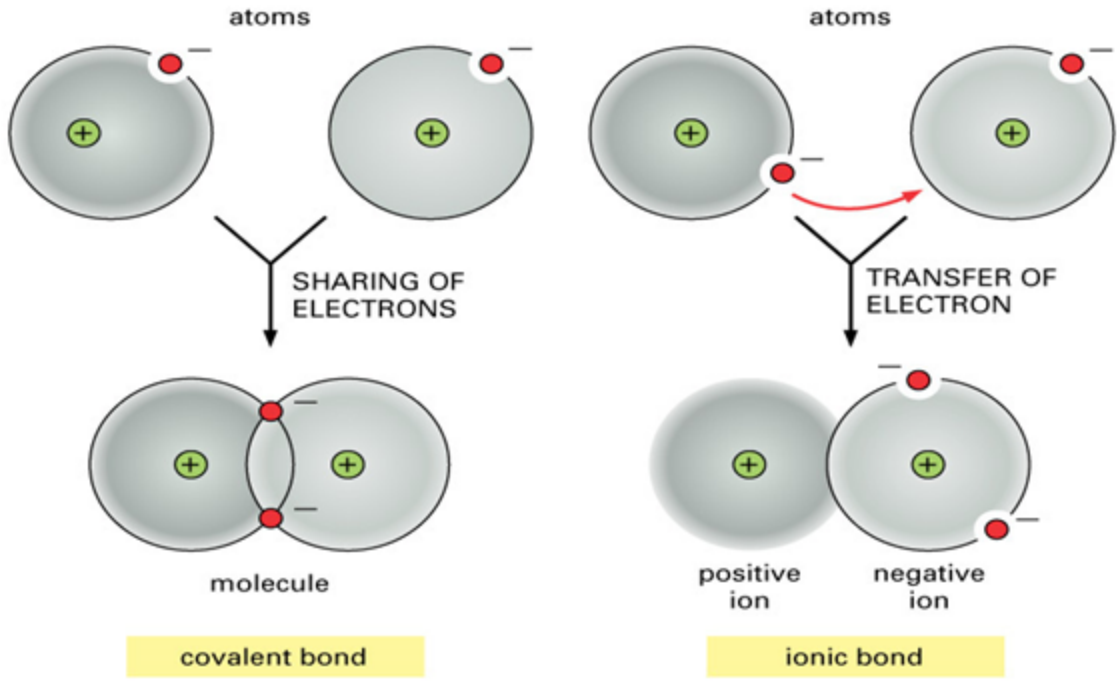
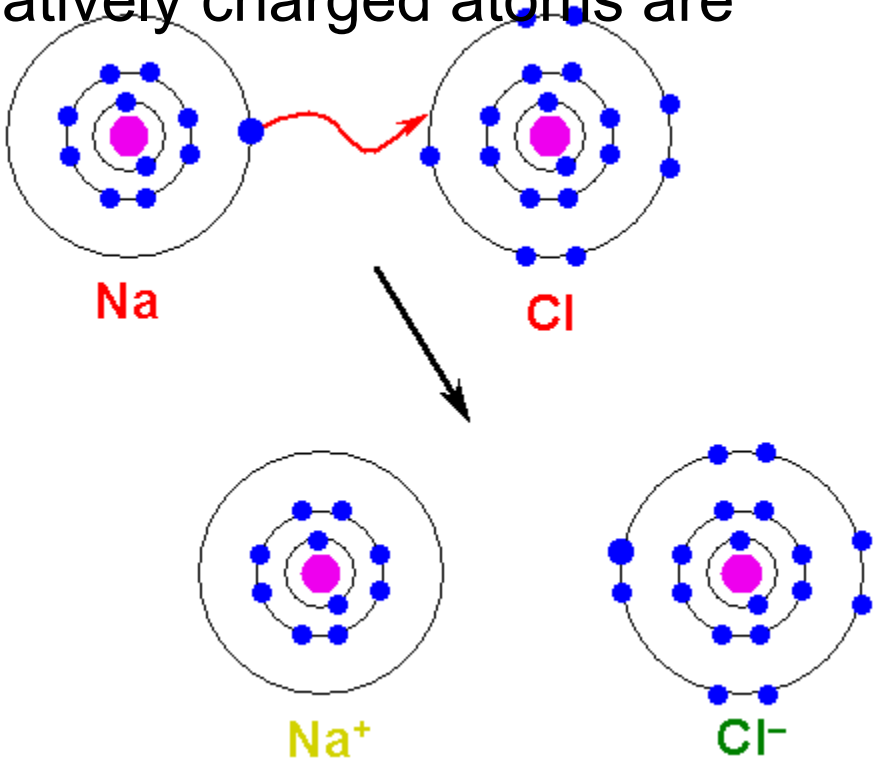


Figure 2.6 Essential Cell Biology, 2/e. (© 2004 Garland Science)

What do elements make up?

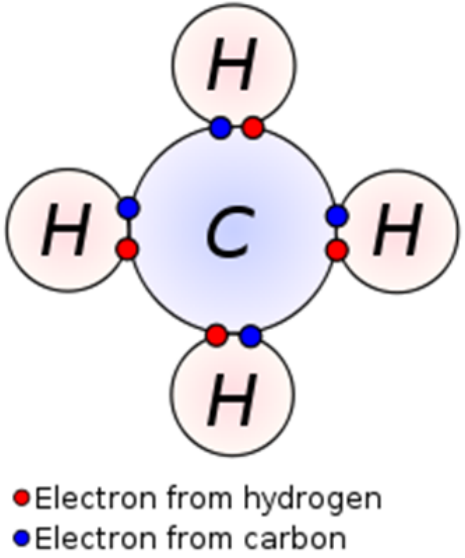
- Ionic bonds
  - The positively and negatively charged atoms are called ions.

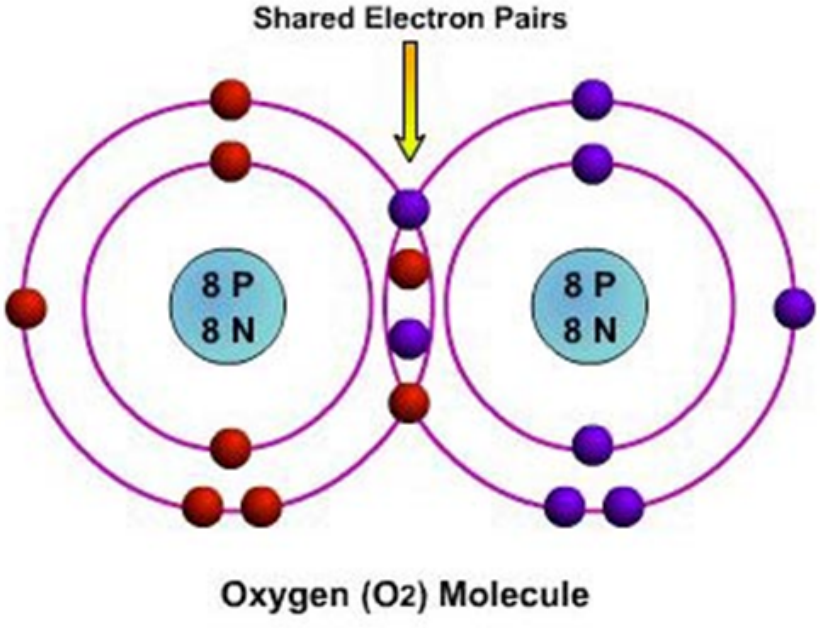
Oppositely charged ions attract!



what do elements make up?

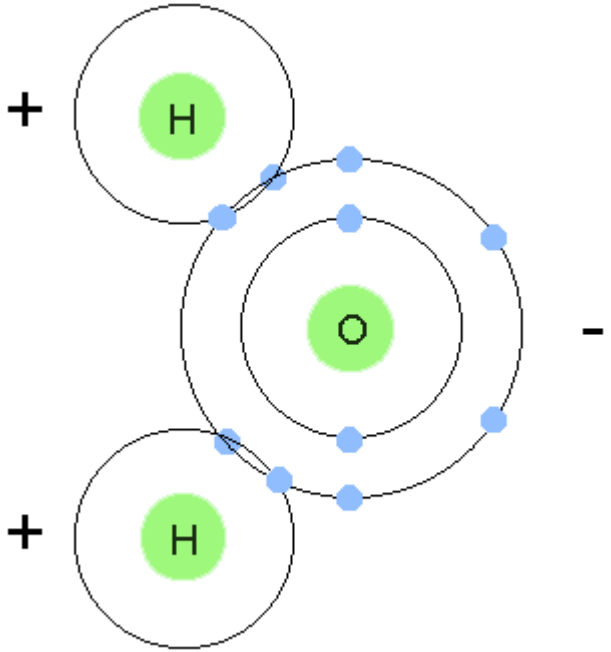
- Covalent bonds
  - the electrons are shared.
  - this means the shared electrons travels around the nuclei of both atoms.





what do elements make up?

- Covalent bonds
  - When atoms join by covalent bonds, molecules from!



Representing Molecules

Molecular Formulas

Shows which atoms and how many are in a molecule.

H_2O

Structural Formulas

Shows how atoms are arranged in a molecule.