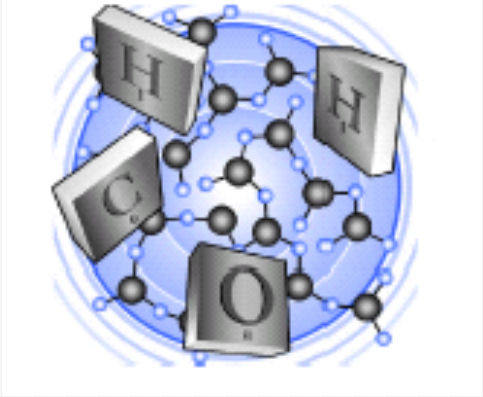
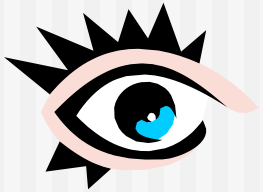
CHAPTER 18
ATOMS AND ELEMENTS



Section 18.1
Atomic Structure

All matter is formed from atoms, either by themselves or combined in molecules.

- Everything that you…

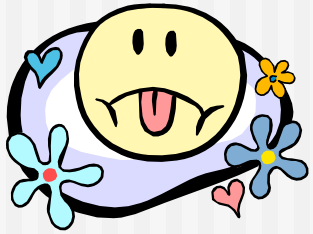


see

hear

touch

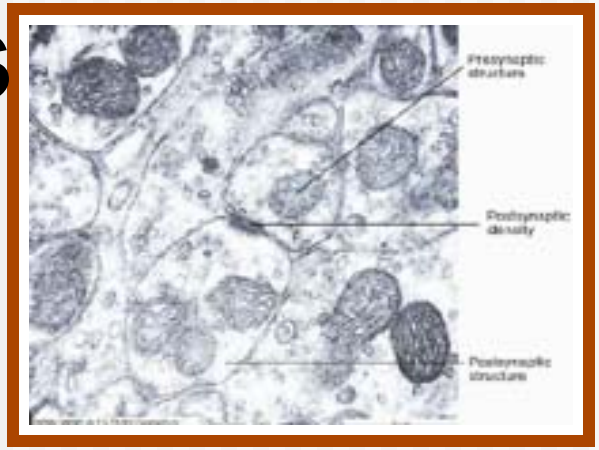
smell



taste

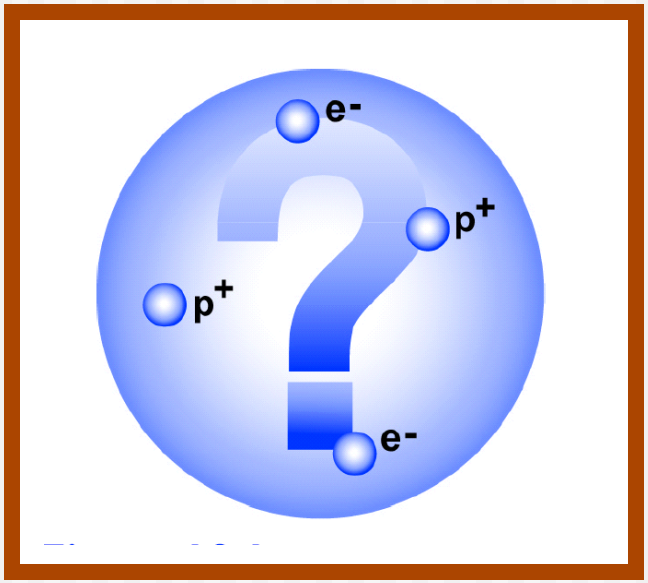
Atoms are tiny.

- 100 trillion atoms are in one body cell.
- A dust speck has many more atoms than that.

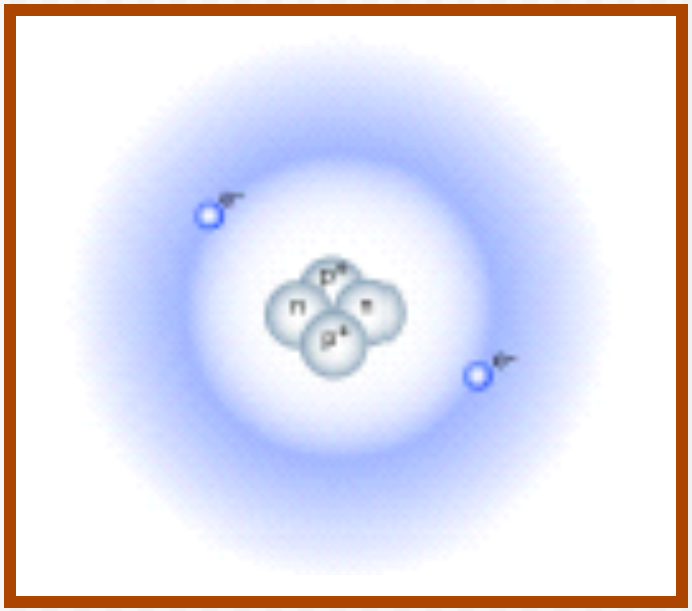


What do you find when you break apart an atom?

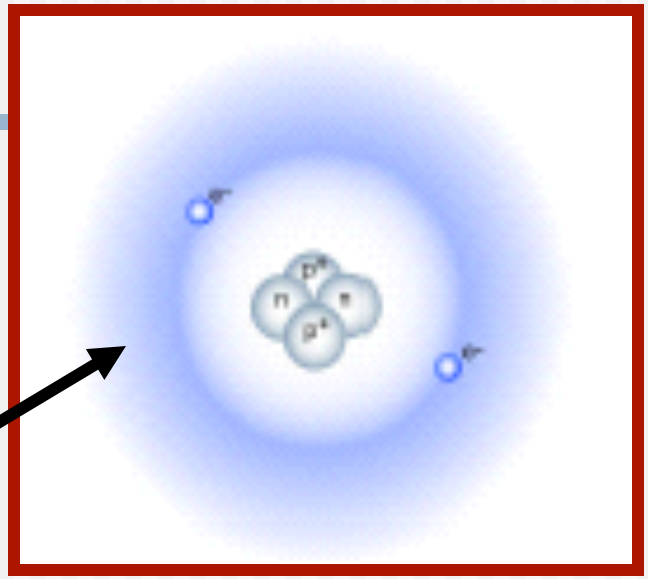
- **Most atoms contain three <u>subatomic</u> particles:**
- **Protons**
- **Neutrons**
- **Electrons**



- **Atom's nucleus contains protons and neutrons.**
- **Electrons move in space around the nucleus.**



Electron's exact location can't be determined at any one time. Shaded area around outside of atom represents places electrons might be.



Subatomic particles have charge and mass.

Particle	*Charge*	*Mass (amu)*
Electron	negative	1/1840
Proton	positive	1
Neutron	neutral	1

How big are atoms?

Particle	Diameter (meters)
atom	10^{-10}
nucleus	10^{-14}
proton	10^{-15}
neutron	10^{-15}
electron	10^{-18}

Greek philosophers proposed an atomic theory around 400 BC.

Atomic theory states that all matter is made of tiny particles called atoms.

Democritus (Greek philosopher) proposed that matter is made of small particles called atoms, from the Greek word ***atomos***, meaning indivisible.

John Dalton's Atomic Theory (1808)

1. Elements made of atoms.
2. Atoms of given element are identical.
3. Atoms of different elements are different.
4. Atoms not changed by chemical reactions.

Dalton's Model, cont.

5. Compounds formed by joining elements.
6. Compounds defined by number, type, and proportion of atoms.

Figure 18.4: *Dalton's model of the atom. He thought atoms were tiny, hard spheres.*

"Billard ball" model

Joseph John Thompson
(1904)

- discovered electrons (negative charge).
- knew that atoms were neutral, so proposed that the atom was positive sphere with negative electrons embedded in it.

Thomson's model

"Watermelon" or "plum pudding" model

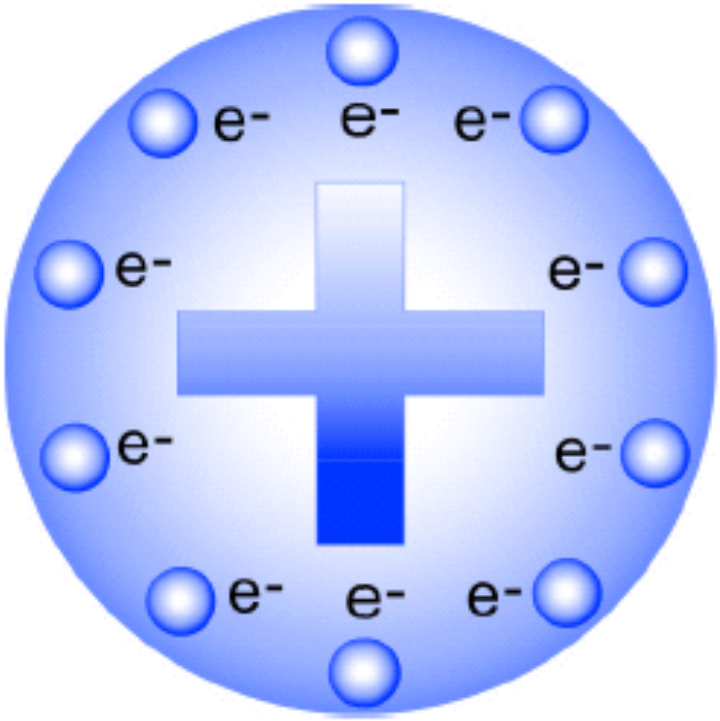


Figure 18.5: *The Thomson model of the atom. The atom is a positive sphere with negative electrons embedded in it. Thomson discovered the electron.*

Ernest Rutherford (1911)

-conducted gold foil experiment.

-hypothesized that atoms are mostly empty space.

-suggested that center had a tiny core called a nucleus.

Niels Bohr (1885-1962) conducted experiments to update Rutherford's model.

Bohr model, cont.

-Said that electrons move around the nucleus in fixed orbits that have a set amount of energy.

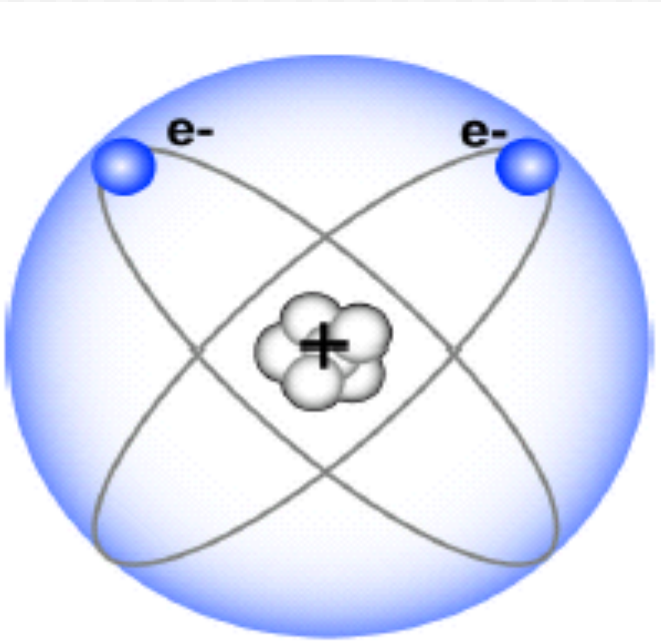


Figure 18.6: *The Bohr model of the atom. Electrons move around the nucleus in fixed orbits.*

"Planetary" model

James Chadwick (1932)

- Discovered neutron

Electron cloud model

- Current model of the atom.
- Cloud represents probable location of an electron.