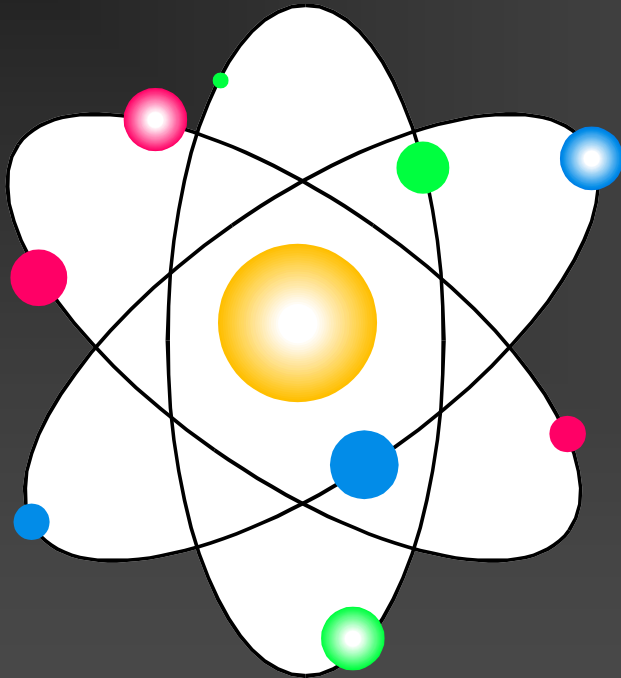


# ATOMIC STRUCTURE





# ATOMIC STRUCTURE

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Subatomic Particles  
Nucleons

# ATOMS

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- Atoms are the building blocks of all matter.
- 3 major particles make up an atom in two areas:
- 1. Nucleus
  - protons
  - neutrons
- 2. Electron cloud
  - electrons

# CHARACTERISTICS THAT DIFFERENTIATE PARTICLES

- 1. **Mass** – masses of protons and neutrons are almost equal. Mass of electron is 1837 times smaller than of a proton or neutron. Most of an atoms mass is in the nucleus.
- 2. **Electrical charge** –
  - **Proton** = 1 unit of positive charge
  - **Neutron** = no charge
  - **Electron** = 1 unit of negative charge

In an electrically neutral atom, units of positive charge must equal units of negative charge.

If they are not equal, an *ion* is formed.

# SUBATOMIC PARTICLES

■ <i>Name</i>	<i>symbol</i>	<i>charge</i>	<i>mass</i>
■ Proton	$p^+$	+1	$1.67 \times 10^{-24}$
■ Neutron	$n^0$	0	$1.67 \times 10^{-24}$
■ Electron	$e^-$	-1	$9.11 \times 10^{-28}$

# ATOMIC NUMBER

The **atomic number** is the number of **protons** (also the number of electrons in a neutral atom).

- **Z** is the symbol for the atomic number.

- This is the *identity* of the element.

- ${}_Z X$

- ${}_1\text{H}$ ,  ${}_6\text{C}$ ,  ${}_{20}\text{Ca}$ ,  ${}_{12}\text{Mg}$

# MASS NUMBER

- The **Mass Number** is the sum of protons and neutrons.
- The symbol is **A**.
- ${}^A X$   
 ${}^1\text{H}$ ,  ${}^{12}\text{C}$ ,  ${}^{40}\text{Ca}$ ,  ${}^{24}\text{Mg}$

# NUMBER OF NEUTRONS

- To find the number of neutrons, subtract the atomic number from the mass number.
- $A - Z$
- ${}^1_1\text{H} = \text{no neutrons}$
- ${}^{12}_6\text{C} = 6 \text{ neutrons}$
- ${}^{35}_{17}\text{Cl} = 18 \text{ neutrons}$

# ISOTOPES

- *Isotopes* have different numbers of neutrons but same number of protons in the same element.
- $^{12}_6\text{C}$   $^{13}_6\text{C}$   $^{14}_6\text{C}$  Three isotopes of carbon

# IONS

- These are atoms that have gained or lost electrons when combining to form compounds.
- The charge symbol is written in the upper right corner of the element symbol.



# COMPLETE SYMBOL

- Contains the mass number, atomic number and the symbol;



# QUARKS

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- **Quarks** are the particles that makeup protons and neutrons.

Ups, downs, top, bottom, charmed and strange.

Other particles also found in nucleus:

- mesons, leptons, omegas, baryons.
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# AVERAGE ATOMIC MASS

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- Elements are found in a variety of isotopes. There are different forms of the same element because they can have different numbers of neutrons. This will cause their masses to be different.
- The average atomic mass is the weighted average of all the isotopes of an element.

# AVERAGE ATOMIC MASS

- A sample of carbon has 98.6 % C-12, 0.44% C-13 and 0.96% C-14. What is the average atomic mass?
  - $.986 \times 12 = 11.832$
  - $.0044 \times 13 = .0572$
  - $.0096 \times 14 = \underline{.1344}$
- 12.0236

# LAW OF MULTIPLE PROPORTIONS

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- If two or more different compounds are formed from the same two elements, the ratio of the masses is a small whole number.

# LAW OF DEFINITE PROPORTIONS

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- THE ELEMENTS THAT FORM A COMPOUND ALWAYS COMBINE IN THE SAME PROPORTION BY MASS.