

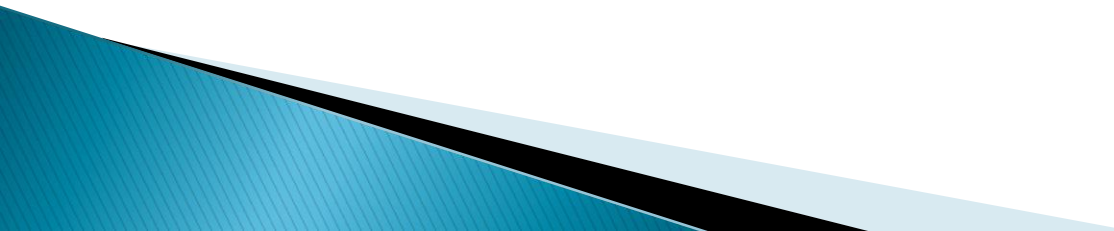
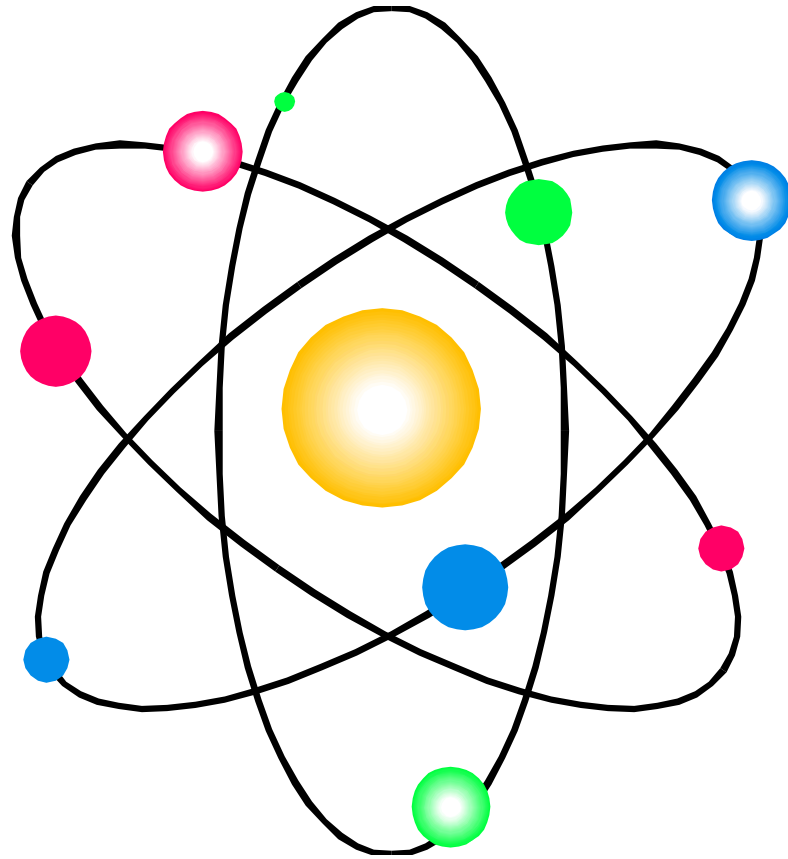
Atoms and Elements

The Atom

Atomic Number

Mass Number/Atomic Mass

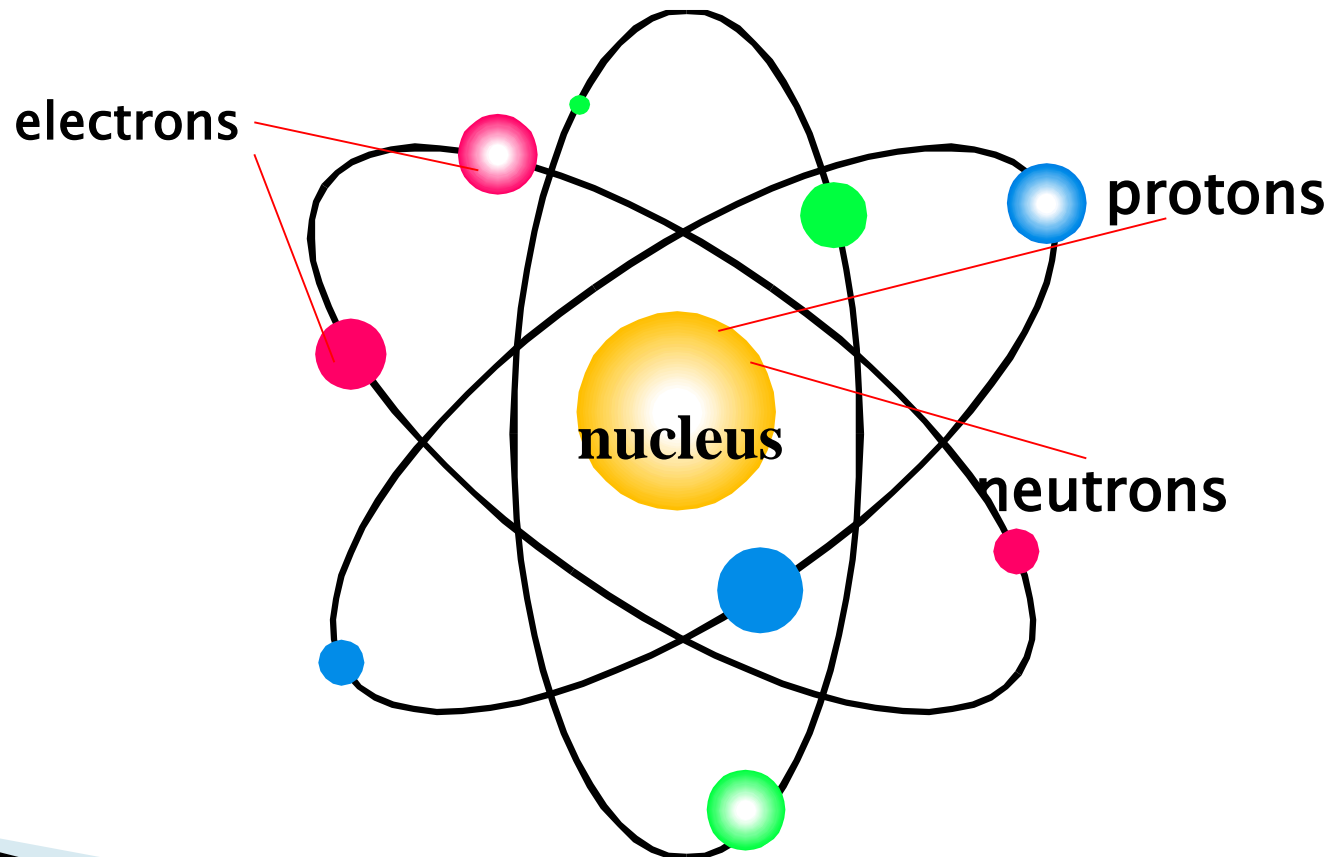
Isotopes



Subatomic Particles

Particle	Symbol	Charge	Relative Mass
Electron	e^-	$1-$	0
Proton	p^+	$1+$	1
Neutron	n	0	1

Location of Subatomic Particles



Atomic Number

**The number of protons
in one atom of an element**

Atomic Number on the Periodic Table

Atomic Number



11

Symbol



Na

The identity of an element is determined by the number of protons

11 protons



11

Sodium



Na

Learning Check

What is the number of protons for the following elements:

1. Nitrogen

A) 5 protons B) 7 protons C) 14 protons

2. Sulfur

A) 32 protons B) 16 protons C) 6 protons

3. Barium

A) 137 protons B) 81 protons C) 56 protons

Number of Electrons

The net charge on an atom is zero.

Therefore:

- Number of protons = Number of electrons
- **Atomic number = Number of electrons**

Mass Number

The sum of the **protons and neutrons**
in an isotope of an atom

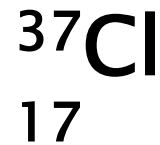
Isotopes

Atoms of an element having different numbers of neutrons →
different mass numbers

Isotopes of chlorine



Cl-35



Cl-37

#s of Subatomic Particles from Isotope Symbols

16
O
8

8 p⁺
8 n
8 e⁻

31
P
15

15 p⁺
16 n
15 e⁻

65
Zn
30

30 p⁺
35 n
30 e⁻

Atomic Mass on the Periodic Table

Atomic Number



11

Symbol



Na

Atomic Mass



22.99

Atomic Mass on the Periodic Table

Atomic mass is the **weighted average** of all the atomic masses of the isotopes of that atom as found in nature.

For example: If $\text{Cl-35} = 75.5\%$
 $\text{Cl-37} = 24.5\%$

Then $(0.755 \times 35) + (0.244 \times 37)$
 $= 26.43 + 9.03 = 35.46$
 $=$ **atomic mass of chlorine**

Learning Check

Naturally occurring carbon consists of three isotopes, ^{12}C , ^{13}C , and ^{14}C . State the number of protons, neutrons, and electrons in each of these carbon atoms.

^{12}C

6

^{13}C

6

^{14}C

6

#p

#n

#e

Learning Check

An atom of zinc has a mass number of 65.

1. Number of protons in the zinc atom

A) 30

B) 35

C) 65

2. Number of neutrons in the zinc atom

A) 30

B) 35

C) 65

3. What is the mass number of a zinc isotope with 37 neutrons?

A) 37

B) 65

C) 67

Learning Check

Write the isotope symbols for atoms with the following:

1. 8 p⁺, 8 n, 8 e⁻

2. 17p⁺, 20n, 17e⁻

3. 47p⁺, 60 n, 47 e⁻
