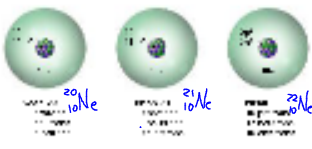


Ch 4  
Sec 4.3  
Characteristics of Atoms

- Atomic Number
  - \* Represents the number of Protons in the nucleus of the atom.
  - \* Identifies the element
  - \* Because the atom is electrically neutral, the atomic # also identifies the number of electrons in the atom.
- Mass of an atom.
  - \* The mass of an atom is the sum of the Protons + Neutrons in the nucleus. (mass number)
  - mass number = # protons + # neutrons
  - \* Not all atoms of the same element have the same mass number.
  - \* Isotopes - Atoms of the same element w/ a different mass number
  - \* All elements have Isotopes.



- Hydrogen has three Isotopes
  - $^1_1\text{H}$     $^2_1\text{H}$     $^3_1\text{H}$
  - Hydrogen   Deuterium   Tritium
- \* Isotopes of the same element have the same chemical behavior.

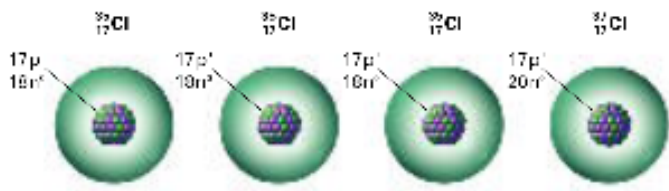
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### Atomic Mass

- Weighted Average of the mass numbers for all isotopes of an element.

$$^1_1\text{H} \quad ^2_1\text{H} \quad ^3_1\text{H} \Rightarrow 1.00794$$

- Based on the most abundant Isotope.



Total number of protons in three $^{35}\text{Cl}$ atoms and one $^{37}\text{Cl}$ atom $(17 + 17 + 17 + 17)$	Total number of neutrons in three $^{35}\text{Cl}$ atoms and one $^{37}\text{Cl}$ atom $(18 + 18 + 18 + 20)$
$50 + 74 = 124$	
$\frac{124}{4} = 31$	
Weighted Average Mass of a Chlorine Atom	

Sep 21-8:50 AM

### Calculating Atomic Mass

Element X has two natural isotopes. The isotope with a mass of 10.012 amu ( $^{10}\text{X}$ ) has a relative abundance of 19.91%. The isotope with a mass of 11.009 amu ( $^{11}\text{X}$ ) has a relative abundance of 80.09%. Calculate the atomic mass of this element.

**1 Analyze** List the knowns and the unknown.

#### Knowns

- isotope  $^{10}\text{X}$ :  
mass = 10.012 amu  
relative abundance = 19.91% = 0.1991
- isotope  $^{11}\text{X}$ :  
mass = 11.009 amu  
relative abundance = 80.09% = 0.8009

#### Unknown

- atomic mass of element X = ?

The mass each isotope contributes to the element's atomic mass can be calculated by multiplying the isotope's mass by its relative abundance. The atomic mass of the element is the sum of these products.

$$\begin{array}{r}
 \text{X-10} \qquad \qquad \qquad \text{X-11} \\
 10(19.91\%) \qquad \qquad 11(80.09\%) \\
 1.991 \qquad + \qquad 8.809 \\
 \qquad \qquad \qquad \qquad \qquad 10.80
 \end{array}$$

Sep 24-12:41 PM