

INTRODUCTION/ REVIEW OF ATOMIC STRUCTURE

What is matter?

Matter is any substance which:

1. Occupies space (i.e. has volume)
2. Has mass



Is air matter?

Does it occupy space?

YES!

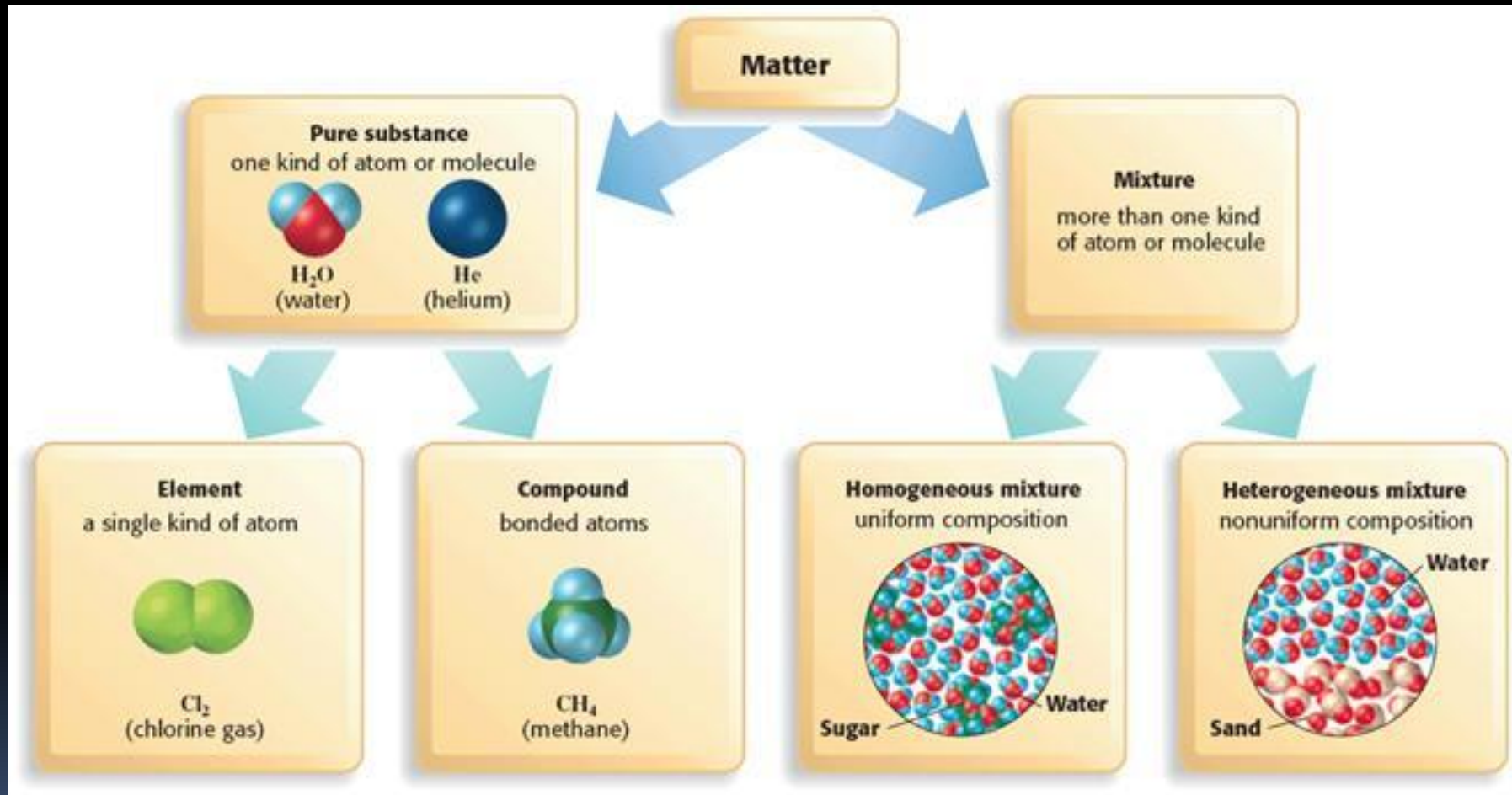


Does it have mass!

Types of Matter

- Matter can be classified as a:
 - a. Pure substance- any material having constant composition; in other words, that has the same properties in any sample you choose and is homogeneous (the same) throughout.
 - b. Mixture- has two or more kinds of particles and thus may have different properties in different samples

Matter Map



Types of Pure Substances

- Pure substances are classified as:
 - Elements- a substance that cannot be separated into two or more substances by ordinary chemical (or physical) means
 - The **atom** is the smallest unit of an element
 - Compounds- a substance which has its own properties but which can be broken down into other substances
 - The **molecule** is the smallest unit of a compound that still retains all of the properties of the compound

What is an atom?

The **atom** is the **basic unit of matter**.
Ultimately all classes of matter can be identified or classified based on the type or types of atom that it contains.

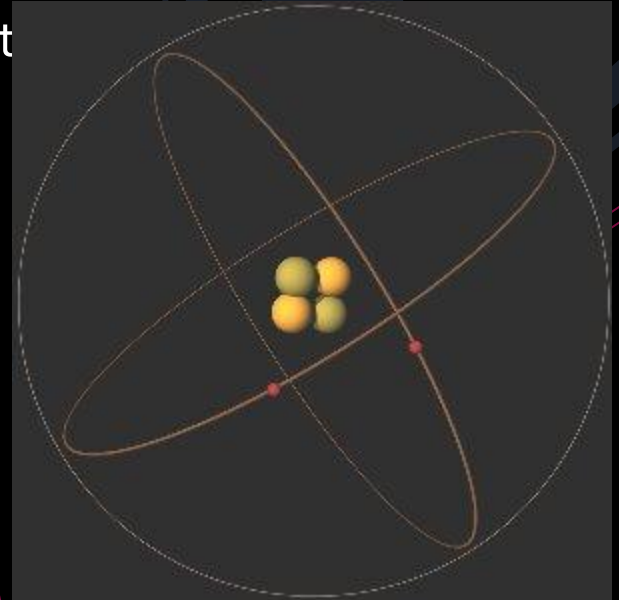
- ❖ The **atom** is the **smallest, indivisible particle of matter** which retains its chemical properties



What makes up an atom?

Atoms are made of three types of subatomic particles ("below the level of the atom")

1. **Protons (p^+)**- a positively charged particle located in the nucleus
2. **Neutrons (n^0)**- a neutral (uncharged) particle located in the nucleus
3. **Electrons (e^-)**- a negatively charged particle located outside the nucleus

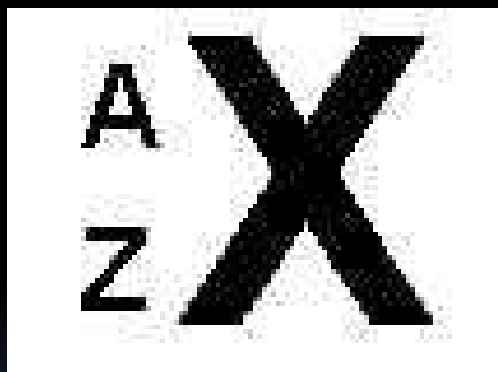


Name	Symbol	Charge	Location	Relative Mass
Proton	p	1+	nucleus	1836
Neutron	n	0	nucleus	1836
Electron	e	1-	area surrounding the nucleus	1

Complete Elemental Symbol

- Every atom can be described completely using an elemental symbol

General:



Example:



- The large "X" represents **the scientific abbreviation given for the symbol**
- The symbol "A", located in the upper left-hand corner, represents the **mass number**
- The symbol "Z", found in the lower left-hand corner, represents the **atomic number**

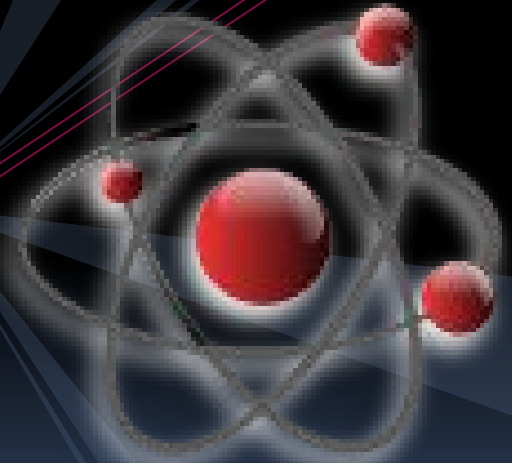
Atomic Number

✓ The atomic number represents the number of **protons** in the nucleus of the element. In the **neutral atom** it also represents the number of **electrons**.

EXTENSIONS:

The atomic number for oxygen is 8; therefore every atom of oxygen has exactly **8 protons in the nucleus**. In the neutral atom, there are also **8 electrons to balance charges**.

Also, if an atom is known to have 15 protons in its nucleus, its atomic number is also 15 and it is **phosphorus**.



Mass Number

✓ The **mass number** represents the **number of particles (neutrons and protons) in the nucleus** of a specific atom; it is given this name because **almost all of the mass** of an atom comes from **the protons and neutrons**.

EXTENSIONS:

If an atom of nitrogen has a mass number of 15 it has **7 protons** (by definition because it is nitrogen – and its atomic # is 7) and **8 neutrons** in its nucleus.

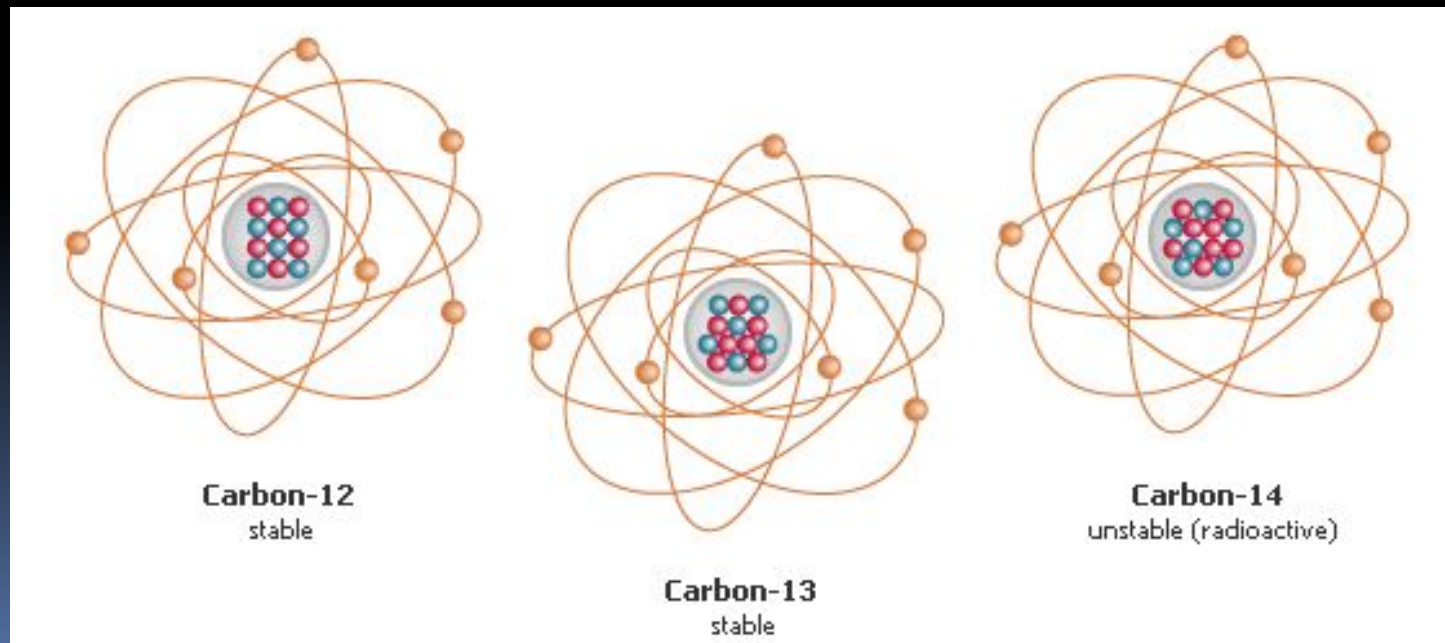
✓ There are 15 particles in the nucleus of which 7 are protons; the other 8 must be neutrons!

✓ So to find the # of neutrons – we subtract the Atomic # from the atomic mass.



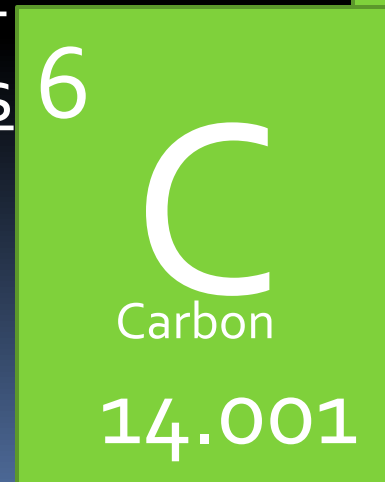
Isotopes:

- For a given element, different atoms **must by definition** have the same number of **protons**, but can have different numbers of **neutrons** (i.e. must have the same **atomic number** but can have different **mass numbers**)
 - These atoms are called **isotopes** ("iso" = the same, "tope" = type or element)



Examples of Isotopes

- Carbon has 3 isotopes.
- This is “normal” Carbon – C₁₂
- 6 protons, 6 electrons, 6 neutrons
- Another isotope of Carbon is C₁₃
- C₁₃ – 6 p, 6 e, 7 neutrons
- The other isotope is C₁₄.
- C₁₄ – 6 p, 6 e, 8 neutrons





Isotopes – do you get them??

- <http://www.youtube.com/watch?v=i6-eih43JZM>



Practice:

Let's try and fill in the table using the elemental symbols given!

	$\begin{matrix} 7 \\ 3 \end{matrix} \text{Li}$	$\begin{matrix} 19 \\ 9 \end{matrix} \text{F}$	$\begin{matrix} 16 \\ 8 \end{matrix} \text{O}$	$\begin{matrix} 136 \\ 56 \end{matrix} \text{Ba}$
# of Protons	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
# of Neutrons (mass number- atomic number)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
# of electrons	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>



How about a little History

<http://www.youtube.com/watch?v=T6UujimddEc&feature=related>