

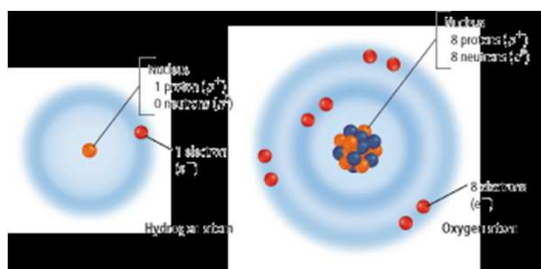
## Atoms, Elements and Compounds

Section 6.1

### Atoms

- Chemistry studies matter – its composition and properties
- Matter – has mass and takes up space
- All organisms in biology are MADE of matter
- Atoms make up all matter
  - So small that billions fit on the head of a pin
  - Made of two parts:
    - Nucleus (center)
    - Electron cloud (outside the nucleus)

### Atoms



### Protons, Electrons and Neutrons

- |   |   |  |
|---|---|--|
| <b>Protons</b> <ul style="list-style-type: none"> <li>- Positive charge</li> <li>- Located in center of the atom (nucleus)</li> <li>- Symbol: <math>p^+</math></li> <li>- Attracted to electrons</li> <li>- Make up part of the atom's mass</li> <li>- Tell the identity of the atom               <ul style="list-style-type: none"> <li>- Number on the periodic table</li> </ul> </li> </ul> | <b>Electrons</b> <ul style="list-style-type: none"> <li>- Negative charge</li> <li>- Located around the nucleus in a "cloud"</li> <li>- Symbol: <math>e^-</math></li> <li>- Attracted to protons</li> <li>- Have very little mass</li> <li>- Are involved with bonding and reactions</li> </ul> | <b>Neutrons</b> <ul style="list-style-type: none"> <li>- No charge</li> <li>- Located in center of the atom (nucleus)</li> <li>- Symbol: <math>n^0</math></li> <li>- No attraction</li> <li>- Make up part of the atom's mass</li> </ul> |
|---|---|--|

## Elements

- Pure substance
- Cannot be broken down into simpler things
- Over 100 known elements
  - 92 occur naturally
  - All others are manmade in a lab
- Have unique names and symbols
- All information is collected on the periodic table of elements

## Periodic Table of Elements

- Organized in rows and columns
  - Rows – periods (7)
  - Columns – groups (18)
- Every block is an element
- Blocks in the same group have similar properties
- Each block gives specific information about the element

## Periodic Table of Elements

Krypton																	
36																	
Kr																	
83.80																	

- Name
  - Always spelled out
  - Named after Greek, Latin, towns, people, etc
- Atomic Number
  - Whole number
  - Equals the number of p+
- Symbol
  - Always starts with a capital letter
- Atomic Mass
  - The mass of the element
  - Equals the p+ + n<sup>0</sup>

## Isotopes

- Atoms of same element have same number of protons and electrons
- **BUT THEY CAN DIFFER IN NEUTRONS!**
- When protons are equal but neutrons are different – **ISOTOPE**
- Changing neutron number can effect stability
  - How happy an atom is
- Unstable atoms = radioactive
  - Nucleus could decay and break apart

## Compounds

- Made of elements combining together
- Chemical formulas show the elements that make up the compound
  - Example: NaCl
  - Sodium and chlorine
  - Compound: sodium chloride (salt)
- Can be broken down by chemical means into the elements they are made of
  - Example: water can be broken into H and O

## Chemical Bonds

- Formed when two more substance combine
  - Force that holds together a compound
- Electrons are directly involved with bonding
- Electrons travel in their cloud in energy levels
  - Each level holds a specific number of e-
  - A level that is not full is unstable
  - To become more stable, e- are lost or attracted to other atoms
  - This forms a **BOND**

## Chemical Bonds

- **Ionic Bonds**
  - To be neutral, an atom must have no charge
  - To be most stable, the outside energy level must be full
  - Atoms can give away or take e- to fill this level up
  - ION – an atom that has gained or lost e-
  - + ion – gives away e-
  - - ion – takes e-
- **Covalent Bonds**
  - Atoms share e- in outermost levels
  - No atom actually gives away or takes an e-
  - No ion is formed
  - Forms a molecule
- **Ex: H+ and O<sup>2-</sup> form water**
- **Ex: Na+ and Cl- form NaCl**

## Lewis Dot Diagram

- A picture that shows the nucleus, energy levels and number of electrons
  - Each energy level holds a certain number of e-
    - 1<sup>st</sup> level – 2
    - 2<sup>nd</sup> level – 8
    - 3<sup>rd</sup> level – 8
    - 4<sup>th</sup> level – 18
  - A neutral atom has the same number of p+ and e-
  - Example: boron
- How many protons?
  - How many electrons?

