# Matter & Atomic Structure

Chapter 3 Section 1

## What is matter?

- Anything that has mass and volume
- Found as a solid, liquid or gas
- Made of elements
  - Element - simplest form of matter
  - Identified by chemical symbol
    - Can be one, two or three letters
    - First letter is always capital
- H = hydrogen  Na= sodium
- Li = lithium  O= oxygen

## Elements are made of atoms

- Atom - the smallest part of an element that has all the characteristics of that element
- Structure of atom

| **part** | **location** | **charge** | **mass** |
|---|---|---|---|
| proton | nucleus | + | 1 amu |
| neutron | nucleus | neutral | 1 amu |
| electron | in orbit | - | 1/1836 amu |

## Atom facts

- Periodic Table lists all known atoms
  - 92 naturally occurring
  - Others produced in labs
- Atomic # = # of protons in an atom
- Mass # = # protons + # neutrons
- For an atom to be neutral (typical) the # of protons and electrons will be equal

## Energy Levels

- The area in an atom where an electron can be found
- Aka electron cloud
- Electrons will occupy the lowest energy levels
- There are up to 7 energy levels
- Valance - the outermost energy level of a given atom

| | |
|---|---|
| k | 2 |
| l | 8 |
| m | 18 |
| n | 32 |
| o | 32 |
| p | 18 |
| q | 8 |

## Valence electrons

- Outermost electron shell
- Can only hold a maximum of 8 electrons
- Valence determines the atoms physical and chemical properties
- Atoms with similar valence have similar properties
- Determines <u>reactivity of atoms</u>
- Columns in periodic table indicate common valences

## Electrons in Energy Levels

- Elements such as helium (He), neon (Ne), and argon (Ar) are inert, which means that they do not easily combine with other elements.
- This is because they have full outermost energy levels.

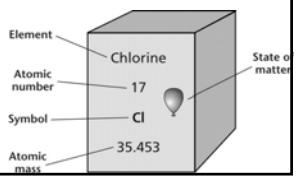
## electron diagrams & Valence

- See examples on white board



## Isotopes

- The number of neutrons in the nuclei of an element's atoms can vary.
- **Isotopes** are atoms of the same element that have different mass numbers and the same chemical properties.
- The **atomic mass** of an element is the average of the mass numbers of the isotopes of an element.






## Isotopes

- The nuclei of some isotopes are unstable and release radiation.
- **Radioactivity** is the spontaneous process through which unstable nuclei emit radiation.

## Radioactivity

- During radioactive decay, a nucleus can lose protons and neutrons, change a proton to a neutron, or change a neutron to a proton.
- Because the number of protons in a nucleus identifies an element, decay changes the identity of an element.

Radioactivity