

## Atoms and the Periodic Table Study Guide

### Atomic Structure:

- \_\_\_\_\_: the smallest particle that has the properties of an element.
- From the early \_\_\_\_\_ concept of the atom to the modern atomic theory, scientists have built on and modified existing \_\_\_\_\_.

### Atom Basics:

- Atoms are composed of a positively charged nucleus surrounded by an electron cloud.
- \_\_\_\_\_ (99% of atom's mass): uncharged neutrons and positively charged protons.
- \_\_\_\_\_: negatively charged electrons in constant motion creating a "cloud" like a fan.

### DEMOCRITUS:

- In \_\_\_\_\_, this Greek philosopher suggested that the universe was made of \_\_\_\_\_.
- "Atom" - Greek word meaning "\_\_\_\_\_"

### JOHN DALTON:

Dalton's Atomic Theory:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

### THOMPSON:

- As it turns out, the atom can be divided into \_\_\_\_\_.
- **Thompson** and **Millikan** are given credit for the first discoveries relating to \_\_\_\_\_.

### RUTHERFORD:

- **Rutherford** discovered the \_\_\_\_\_.

### NIELS BOHR:

- In 1913, this Danish scientist suggested that electrons \_\_\_\_\_.
- In Bohr's model, electrons are placed in different \_\_\_\_\_ based on their \_\_\_\_\_.

## MODERN ATOMIC MODEL:

- By \_\_\_\_\_, Bohr's model of the atom no longer explained all observations. Bohr was correct about \_\_\_\_\_, but wrong about \_\_\_\_\_.
- Electrons occupy the \_\_\_\_\_ levels available.
- Energy \_\_\_\_\_ as distance from the nucleus \_\_\_\_\_.
- Electrons move in patterns of " \_\_\_\_\_ " around the nucleus.
- It is impossible to know both an electrons \_\_\_\_\_ and \_\_\_\_\_ at any moment in time.

## VALENCE ELECTRONS:

- Electrons in the outermost energy level are called \_\_\_\_\_.
- Valence electrons determine how an atom will \_\_\_\_\_.
- Atoms with equal numbers of valence electrons have \_\_\_\_\_.

## DMITRI MENDELEEV: 1834-1907

\_\_\_\_\_ : created first periodic table of elements.

Arranged elements in order of increasing \_\_\_\_\_.

## ORGANIZATION OF THE PERIODIC TABLE:

PERIODICITY: regular variations (or patterns) of properties with increasing atomic number. Both chemical and physical properties vary in a periodic (repeating) pattern.

- \_\_\_\_\_ : horizontal row of elements on P.T.
- \_\_\_\_\_ : vertical column of elements on P.T.

## PERIODIC KEY:



# protons =

# electrons =

# neutrons =

## DETERMINING # OF PROTONS, NEUTRONS, AND ELECTRONS FROM CHEMICAL SYMBOLS:

### Example 1:

# protons = \_\_\_\_\_

# electrons = \_\_\_\_\_

# neutrons = \_\_\_\_\_



### Example 2:

# protons = \_\_\_\_\_

# electrons = \_\_\_\_\_

# neutrons = \_\_\_\_\_



## ISOTOPEs

- Isotopes are atoms that have the same # of \_\_\_\_\_, but a different # of \_\_\_\_\_.
- Example: Carbon-12 vs. Carbon-14  
 $^{12}\text{C}$  Mass # = \_\_\_\_; Atomic # = \_\_\_\_ (\_\_\_\_P, \_\_\_\_E, \_\_\_\_N)  
 $^{14}\text{C}$  Mass # = \_\_\_\_; Atomic # = \_\_\_\_ (\_\_\_\_P, \_\_\_\_E, \_\_\_\_N)

## IONS

- \_\_\_\_\_: the process of adding or removing electrons from an atom or group of atoms.
- An \_\_\_\_\_ has a net \_\_\_\_\_.
- Cation: ion with a \_\_\_\_\_ charge. Ex: \_\_\_\_\_
- Anion: ion with a \_\_\_\_\_ charge. Ex: \_\_\_\_\_

### Notes: Electron Configurations

- The quantum mechanical model of the atom predicts energy levels for electrons; it is concerned with the probability, or likelihood, of finding an electron in a certain position.

**Electron configurations:** (write out the COMPLETE configuration)

helium:

boron:

neon:

aluminum:

uranium:

**Abbreviated electron configurations:** an abbreviated form of the electron configuration (NOBLE GAS config).

helium:

$\text{N}^{3-}$ :

boron:

$\text{Se}^{2-}$ :

aluminum:

$\text{Mg}^{2+}$ :

## Notes: Periodic Groups and Trends

### PERIODIC GROUPS:

#### Alkali Metals

- Group \_\_\_\_\_ on the periodic table.
- \_\_\_\_\_
- \_\_\_\_\_
- Readily combine with \_\_\_\_\_
- Tendency to \_\_\_\_\_

#### Alkaline Earth Metals

- Group \_\_\_\_\_ on the periodic table.
- Abundant metals \_\_\_\_\_
- Not as reactive as \_\_\_\_\_
- Higher \_\_\_\_\_ and \_\_\_\_\_ than alkali metals

#### Transition Metals

- Groups \_\_\_\_\_ on the periodic table.
- Important for living organisms

#### Halogens

- Group \_\_\_\_\_ on the periodic table.
- " \_\_\_\_\_ " combines with groups \_\_\_\_ and \_\_\_\_ to form salts (ionic bonds)

#### Noble Gases

- Group \_\_\_\_\_ on the periodic table.
- \_\_\_\_\_
- \_\_\_\_\_

#### Lanthanides

- Part of the " \_\_\_\_\_ "
- \_\_\_\_\_
- \_\_\_\_\_ readily in air
- React slowly with \_\_\_\_\_

#### Actinides

- \_\_\_\_\_
- Part of the " \_\_\_\_\_ "