Name: _____   Due: _____

Unit 2 Academic Chemistry Study Guide

Goals & Standards

- I can identify atoms and describe their protons, neutrons, electrons, atomic number, and mass number.
- I can compare atoms, ions, and isotopes.
- I can describe radioactive decay with alpha particles, beta particles, and gamma rays.
- I can write full and shorthand electron configurations.
- I can determine how many valance electrons an atom has.
- I can compare frequency, wavelength, and energy using the electromagnetic spectrum.
- I can utilize the Bohr Model for energy emission calculations.

Practice Problems

1) The element Magnesium has three stable isotopes with the following masses and abundances.

Isotope	Mass (amu)	Abundance
^{24}Mg	23.9850	78.99%
^{25}Mg	24.9858	10.00%
^{26}Mg	25.9826	11.01%

Calculate the average atomic mass of magnesium from these data. Show your work!

2) Use the Bohr Model and complete the table with regards to electron transitions.

Electron Transition	Energy absorbed or emitted?	Type of Electromagnetic Wave	If visible light, what color?
n=4 to n=1			
n=2 to n=5			
n=6 to n=3			

3) Of **x-rays**, **visible light** and **radio waves**:
   a. Which is the longest in wavelength?
   b. Which is the highest in frequency?
   c. Which is the highest in energy?

4) Complete the table:

Radiation	Symbol	Penetrating Ability	Stopped by	Example from Notes
Alpha				
Beta				
Gamma				

5) Find sulfur (S) on the periodic table.
   a. Write out the electron configuration of sulfur which has _____ e⁻.

   b. Write the orbital diagram for sulfur.

   _____   _____   _____ _____ _____   _____   _____ _____ _____
   1s   2s   2p   3s   3p

   c. Explain what stable ion sulfur should form based on its electron configuration.

   d. How many valence electrons does sulfur have? How did you know?

6) What block of the periodic table are the following elements in?

Mg = _____   Fe = _____   U = _____   Ar = _____

7) How many electrons can go into each type of sublevel?   s_____   p _____   d _____   f _____

8) An electron that is in the lowest possible energy level is in the _____ _____
9) What do we mean if we say an electron is "excited"?

10) Write the electron configuration for the following atoms and ions. Identify the element that each ion is isoelectronic (has the same electron configuration) with.
   a. Cl

   b. Br¹⁻   Br¹⁻ is isoelectronic with = _____

   c. Na

   d. Al³⁺   Al³⁺ is isoelectronic with = _____

11) Write the noble gas configuration for each of the following atoms

   a. Mn

   b. Cs

   c. As

   d. Zr

12) Lighting fireworks pushes electrons into a higher energy level. Which of these terms describes the state of these electrons?

    A) Energetic   B) Excited   C) Ground   D) Stable

13) Which of these is correct electron configuration for a neutral atom of fluorine?

    A) $1s^2 2s^2 2p^5$ C) $1s^2 2s^2 sp^4$
    B) $1s^2 2s^2 2p^6$ D) $1s^2 2s^2 2p^6 3p^5$

14) How many protons are found in an atom of calcium?

    A) 6   B) 20   C) 40   D) 3

15) A potassium ion has a charge of 1+. How many electrons does the atom have?

    A) 18   B) 19   C) 20   D) 39

16) The mass of an element is concentrated in the nucleus of the atom and is based on what two subatomic particles?

    A) Protons and electrons
    B) Protons and neutrons
    C) Electrons and neutrons
    D) Neutrinos and proton

17) Which of these is the only difference between isotopes of an element?

    A) The number of electrons   C) The number of neutrons
    B) The number of protons   D) The atomic number

18) An isotope of phosphorus has 15 protons and 17 neutrons. Which of these is the correct name for this isotope?

    A) Phosphorus-32
    B) Phosphorus-15
    C) Phosphorus-17
    D) Phosphorus-2

19) The nuclear equation below represents the alpha decay of 222Rn:

$$^{222}_{86} Rn \rightarrow\, ^{4}_{2} He + X$$

What is the mass number of the element represented by X?

    A) It is 88, because element X gains 2 protons.
    B) It is 218, because element X loses 2 protons and 2 neutrons.
    C) It is 220, because element X loses 2 neutrons.
    D) It is 226, because element X gains 2 protons and 2 neutrons.

20) The half-life of a radioactive isotope is 30 minutes. What is the total amount of 1.00g of sample of the isotope remaining after 2 hours?

    a. 0.500g
    b. 0.0625 g
    c. 0.250g
    d. 0.125g