CHAPTER 5 REVIEW-ANSWERS!!!

1. Complete the following table for atoms and ions

Symbol	Atomic Number	Mass Number	Protons	Neutrons	Electrons
$^{38}_{18}Ar$	18	38	18	20	18
$^{18}_{8}O$	8	18	8	10	8
$^{36}_{16}S^{2-}$	16	36	16	20	18
X^{-}	17	37	17	20	18
Mg^{2+}	12	26	12	14	10

2. Calculate the average atomic mass of nickel that has five naturally occurring isotopes

Isotope	Mass of Atom in amu	% Abundance in Nature
Nickel-58	57.9353 amu	67.88%
Nickel-60	58.9332 amu	26.23%
Nickel-61	60.9310 amu	1.19%
Nickel-62	61.9283 amu	3.66%
Nickel-64	63.9280 amu	1.08%

Mass = (0.6788)(57.9353) + (0.2623)(58.9332) + (0.0119)(60.9310) + (0.0366)(61.9283) + (0.0108)(63.9280)

Mass = 39.33 + 15.46 + 0.725 + 2.27 + 0.6904

Mass = 58.47 u

3. What is the average atomic mass of bromine?

Isotope	Mass of Atom in amu	% Abundance in Nature
Bromine-79	78.918336 amu	50.69%
Bromine-81	80.916289 amu	49.31%

79.90 amu

4. Naturally occurring indium consists of two isotopes

Atomic mass of indium	114.82 amu
Isotopic mass of indium-113	112.9043 amu
Isotopic mass of indium-114	114.9041 amu

Indium-113	Indium-115	Avg
112.9043 u	114.9041 u	114.82 u
x	y	100%

Equation 1: 112.9043x + 114.9041y = 114.82
Equation 2: x + y = 1

112.9043x + 114.9041(1-x) = 114.82
112.9043x + 114.9041 - 114.9041x = 114.82
0.0841 = 1.9998x
0.04205 = x
y=1-x = 1 - 0.04205 = 0.95794

Indium - 113 = 4.2054%
Indium - 115 = 95.794%

5. Calculate the actual atomic mass of Cu-65

Atomic mass of copper	63.546 amu	100%
Isotopic mass of copper-63	62.9298 amu	69.09%
Isotopic mass of copper-65	x amu	30.91%

(0.6909 x 62.9298) + (0.3091 x X)= 63.546

solve for X
43.478 + 0.3091X=63.546
0.3091X=20.0678
X=64.923

6. Compare the similarities and differences between Rutherford's and Bohr's theories of the atom.

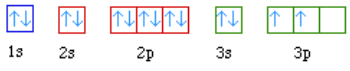
Both Rutherford's and Bohr's models of the atom have a nucleus, which is an extremely small, dense region in the center of the atom, that contains most of the atom's mass and all of its positive charge. Both models have negatively charged electrons orbiting the nucleus. The difference is that Bohr's model specifies the exact path of the electrons. According to Bohr, electrons travel in energy levels. The energy of the electron is quantized – the electron can only exist at specific allowable energy levels. Rutherford's model did not specify the path taken by the electron.

7. Compare the similarities and differences between Bohr's model and the Quantum Mechanical model of the atom.

Both Bohr's model and the Quantum Mechanical model of the atom have a nucleus, which is an extremely small, dense region in the center of the atom that contains most of the atom's mass and all of its positive charge. Both models have electrons whose energy is quantized. Bohr thought that he could describe the exact path taken by an electron, but the Quantum Mechanical model states that we cannot specify the exact path of the electron, only the region where an electron is most likely to be found. This region is called an orbital. Additionally, there is more than one type of orbital.

8. Write the electron configuration and draw the orbital diagram for the following:

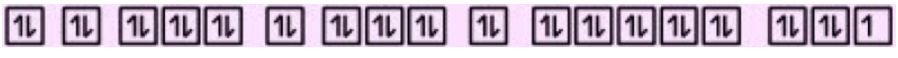
a. Si: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$



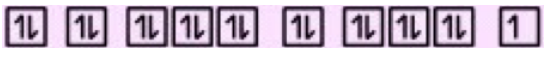
Orbital diagram for silicon

b. Cr: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$

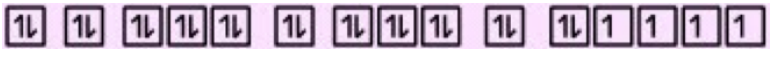
c. Br: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^5$



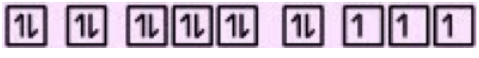
d. K: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$



e. Fe: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$



f. P: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$



9. Write the core notation and # of valence electrons for the following:

   a. P^{3-}: [Ne] $3s^2\ 3p^6$

      8 e^-

   b. Mg^{2+}: [He] $2s^2\ 2p^6$

      8 e^-

   c. Br^{1-}: [Ar] $4s^2\ 3d^{10}\ 4p^6$

      18 e^-

   d. As^{3+}: [Ar] $4s^2\ 3d^{10}$

      12 e^-

   e. Te^{2-}: [Kr] $5s^2\ 4d^{10}\ 5p^6$

      18 e^-

   f. Li^+: $1s^2\ 2s^2$

      4 e^-