WS 3.1 *Name:_____p._____*

1a. Fill in the masses and charges of the following subatomic particles. (OK to round to the nearest whole numbers.)

Subatomic Particle:	**Mass (amu*)**	**Charge**
proton	_____	_____
neutron	_____	_____
electron	_____	_____

* 1 atomic mass unit (amu) = 1.66×10^{-24} grams.

1b. Which of the above particles are in the nucleus of the atom?_____

2. Isotope definitions:

"variants of a particular chemical element which differ in neutron number. All isotopes of a given chemical element have the same number of protons in each atom." –Wikipedia

"forms of the same atom that differ only in their number of neutrons." –khanacademy.org

"atoms of the same element that differ in mass number" –Brown and Lemay. *Chemistry: The Central Science,* 3rd edition.

a. how are isotopes of a given element the same? (circle the answer(s))
number of neutrons *number of protons* *atomic mass*

b. How are isotopes of a a given element different?

number of neutrons *number of protons* *atomic mass*

3. Determine the number of protons, neutrons, and electrons for the most common isotope of each element:

Atom:	**# of protons**	**#of neutrons**	**# of electrons**
F	_____	_____	_____
Ar	_____	_____	_____
Au	_____	_____	_____

4. Fill out this chart. Do NOT assume that the type of atom shown is the most common isotope of that element.

Isotope	*Symbol*	*Atomic #*	*Mass #*	*# of protons*	*# of neutrons*	*# of electrons*
Ra-222	_____	_____	_____	_____	_____	_____
_____	_____	_____	18	_____	10	_____
_____	_____	_____	_____	82	126	_____
U-235	_____	_____	_____	_____	_____	_____
_____	_____	_____	131	_____	78	_____
H-3	_____	_____	_____	_____	_____	_____
Pu-	_____	_____	_____	_____	145	_____

5. Write symbols (like in the "symbol" column, above) for the following:

a. A zinc atom with a mass of 66 amu_____

b. An atom with 5 protons and 5 neutrons. _____

c. An atom with 82 neutrons and a mass of 136 amu. _____

d. A copper atom with 36 neutrons_____

6. Chlorine has two naturally occurring isotopes. 75.77% of chlorine atoms have a mass of 34.9689 amu. The remainder of chlorine atoms have a mass of 36.9659 amu.

a. Write the symbol for each isotope of chlorine: _____ _____

b. How many protons are in each isotope? _____ _____

c. How many neutrons are in each isotope? _____ _____

d. Calculate the "natural abundance" of chlorine's more massive isotope.

e. Calculate the atomic mass of chlorine, based on a weighted average.

7. Consider the following data for Strontium (Sr), which has four naturally occurring isotopes:

Isotope	Mass (amu)	Natural Abundance
^{84}Sr	83.9134	0.56%
_____	85.9093	9.86%
_____	86.9089	7.00%
_____	87.9056	_____

a. Fill in the blanks in the above chart.
b. Calculate the average atomic mass of this element.

8. Boron has two isotopes. 19.9% of Boron atoms have a mass of 10.012936 amu, and the remainder of Boron atoms have a mass of 11.009305 amu.
a. Determine the natural abundance of Boron-11.
b. Calculate the atomic mass of boron.

c. How many protons and neutrons are in B-10? p_____ n_____

d. How many protons and neutrons are in B-11? p_____ n_____

9. Write symbols (like in the "symbol" column in #4) for the following:

a. An atom that has 19 protons and 20 neutrons_____

b. An atom with a mass of 31 amu and 16 neutrons. _____

c. The most common isotope of bromine _____

d. An atom that has 143 neutrons, and a mass number of 235. _____