Atoms, Molecules and Ions Practice Problems

Name: _____

Date: _____ Period: _____

1. How many protons, neutrons, and electrons are present in $^{90}_{38}Sr$?

2. Recalling that the mass of an element listed on the periodic table is a weighted average, in nature, boron occurs as two isotopes B-10 (mass = 10.013u) and B-11 (mass = 11.009u). Which of these two isotopes occurs in the greater abundance and why?

3. A sample of an oxide of tin with the formula SnO consists of 0.742g of tin and 0.100g of oxygen. A sample of a second oxide of tin consists of 0.555g of tin and 0.150g of oxygen. What is the formula of this second oxide? What law does this example illustrate? Who came up with this law?

4. Explain the difference between an element with Z = 31 and A = 68.926u and one with Z = 31 and A = 70.925? Write the full symbology for these two atoms.

5. What is the element that contains 15 protons, 16 neutrons and 18 electrons? Is it an ion? If so, is it a cation (positive charge) or an anion (negative charge)? What is its charge?

6. Which subatomic particle has a charge of 0 and an atomic mass of 1u?

7. In a reaction between nitrogen and oxygen, it is determined that 5.00g of nitrogen reacts exactly with 11.42g of oxygen to produce 16.42g of the compound.
a) What will happen if 5.00g of nitrogen is reacted with 15.00g of oxygen?

b) What will happen if 2.00g of nitrogen is reacted with 11.42g of oxygen?

c) How much nitrogen will react with 20.00g of oxygen?

d) What if it is found that under certain conditions 10.00g of nitrogen will react exactly with 11.42g of oxygen? What can you conclude from this?

8. A blue solid called azulene is thought to be a pure compound. Analyses of three samples of the material yield the following results:

	Mass of Sample	Mass of Carbon	Mass of Hydrogen
1.	1.000g	0.937g	0.0629g
2.	0.244g	0.229g	0.0153g
3.	0.100g	0.094g	0.0063g

Could the material be a pure compound? Explain.

9. Write the atomic symbol for the element
a) that has 12 each of protons, neutrons and electrons.

b) whose ion has the following properties: a 2- charge, 12.5% more electrons than protons, 16 neutrons.

c) whose mass number is 115 and has 30% more neutrons than protons.

10. Determine which experiment was used to find the following:
    a. The nucleus of the atom.
    b. The charge to mass ratio of the electron.
    c. The charge on the electron.

11. List the order in which subatomic particles (protons, neutrons and electrons) were discovered.

12. On the periodic table, cobalt has a mass of 58.93u and nickel (which comes after cobalt), has a mass of only 58.69u. Are these elements misplaced given that values should increase as you work your way across and down the periodic table?

13. A given element has a mass 5.81 times that of C-12. Give the atomic mass, the name, and the symbol of the element.

14. Give the group, period and classification (metal, nonmetal, metalloid) for the following elements:
    a. Al
    b. Br
    c. Sc
    d. Cs

15. Define the term molecule and decide whether Li_2O (lithium oxide) fits this description.

16. For which type(s) of compounds do you need to use prefixes such as mono, di, tri, etc.?

17. What is the difference between SO_3^{2-} and SO_3?

18. Name the following compounds:
    a. Mg_3N_2
    b. HNO_3
    c. Cu_2SO_4
    d. Br_2O_3
    e. $Mg(OH)_2$
    f. $LiHCO_3$

19. Write formulas for the following compounds:
    a. Carbonic acid
    b. Potassium perchlorate
    c. Sulfur tetrachloride
    d. Tin(IV)nitrate
    e. Cuprous oxide
    f. Phosphoric acid

20. Explain the difference between nitrite, nitrate and nitride.

21. How many total protons, neutrons and electrons are there in the compound $Sr(ClO_3)_2$?

22. Using X and M to represent a cation and anion respectively, write the general formula for an ionic compound formed from the combination of an alkaline earth metal and a group VA nonmetal.

23. Who was the first person credited with producing a workable periodic table. Cite a strength and a weakness of that first table.