Name: _____ Date: _____ Period: _____

Problem Set - Atomic Mass

*Directions: Answer the following questions on a separate sheet on paper. Show all your work. No work = no grade!!! Remember to round atomic masses taken off the periodic table to **one** decimal!!!*

1. Consider one individual unit of the compound Na_2CO_3.
- **a)** How many oxygen atoms?
- **b)** How many carbon atoms?
- **c)** How many sodium atoms?
- **d)** How many total atoms compose it?

2. Consider one individual unit of the compound $Al_2(SO_4)_3$.
- **a)** How many oxygen atoms?
- **b)** How many sulfur atoms?
- **c)** How many aluminum atoms?
- **d)** How many total atoms compose it?

3. What atoms are 4.087 times heavier than oxygen atoms?

4. Zinc atoms are 2.843 times heavier than what other atoms?

5. Calculate the mass, in amu, of 15 gold atoms.

6. How many atoms would be contained in a sample of lead that is 1.177×10^{39} amu?

7. 1.200 g of a certain compound contains 0.707 g of sodium. Identify the other element if there are 2 atoms of sodium for each atom of the other element.

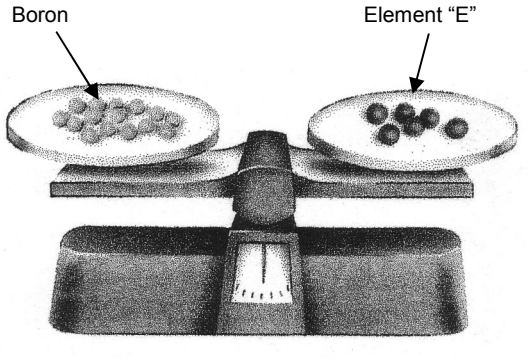
8. A certain compound contains an unknown element (call it X) and oxygen. When 1.000 g of this compound was decomposed, 0.744 g of element X and 0.256 g of oxygen were measured. Assuming that each individual unit of the compound contains 2 atoms of X and 3 atoms of oxygen, identify which element X is.

9. How many carbon atoms would have a total mass of 6.25×10^{5} amu?

10. Calculate the mass, in amu, of one individual unit of each of the following compounds.
- **a)** K_2SO_4
- **b)** $BaSO_4$
- **c)** $Al_2(SO_4)_3$
- **d)** $(NH_4)_2SO_4$

11. Calculate the percentage of sulfur, by mass, in each of the compounds in the preceding question.

12. An imaginary atomic balance is shown below. Fifteen atoms of boron on the left side of the balance are being balanced by six atom of an unknown element E on the right side.
- **a)** What is the atomic mass of element E?
- **b)** What is the identity of element E?



13. Calculate the percent composition by mass of each element in the compound $BaCl_2$

14. Calculate the percent composition by mass of each element in the compound $Mg(NO_3)_2$.

Pb 7:

Na_2X

$m_T = 1.200\,g$

1. Find m_X

$m_{2Na} = 0.707\,g \longrightarrow m_{Na} = 0.354\,g$

$m_X = 0.493\,g = 1.200\,g - 0.707\,g$

$\frac{0.493\,g}{0.354\,g} = 1.39$ find Ratio

So X is 1.39 heavier than Na

Conclusion:

X is Sulfur

Na_2S

Atomic Mass: $m_{Na} = 23.0$ amu

$m_X = 1.39 \times 23.0 = 32.1$ amu

Pb 10: $Al_2(SO_4)_3$

Al	2×27.0 amu =	54.0	amu
S	3×32.1 amu =	96.3	amu
O	12×16.0 amu =	192	amu
		342.3	amu

342 amu

Pb 8:

X_2O_3

$m_T = 1.000\,g$

$0.744\,g = m_{2X}$

$0.256 = m_{3O}$

$\longrightarrow m_X = \frac{0.744}{2} = 0.372$

$\longrightarrow m_O = \frac{0.256}{3} = 0.085$

Ratio $\frac{0.372}{0.085} = 4.38$

$m_X = 4.38 \times 16.0 = 70.1$ amu

Gallium

Pb1 Na_2CO_3

Na	2
C	1
O	3
Total	6

Pb2 $Al_2(SO_4)_3$

Al	2
S	3
O	12
Total	17

(3) $m_O = 16.0$ amu

$m_X = 16.0 \times 4.087 = 65.4$ amu

$\Rightarrow$ Zinc

(4) $m_{Zn} = 65.4$ amu

$m_X = \frac{65.4}{2.843} = 23.0$ amu $\Rightarrow$ Na Sodium

(5) $15 \times 198.0 = 2970$ amu

$m_{Au} = 198.0$ amu

(6) $m_{Pb} = 207.2$ amu

$m_T = 1.177\ 10^{39}$ amu

$\frac{m_T}{m_{Pb}} = \#$ atoms $= 5.68\ 10^{36}$