Name_____

TA Name _____

Lab Section #_____

1. Calculate the number of atoms in each of the following;

a) 196 u N

$$196 \text{ u} \left(\frac{1 \text{ atom N}}{14.0 \text{ u}} \right)$$

$$= 14 \text{ atoms N}$$

b) 3.994 x 10^{-22} g calcium
(mass of Ca atom is 6.657 x 10^{-23} g)

$$3.994 \text{ x } 10^{-22} \text{ g} \left(\frac{1 \text{ atom Ca}}{6.657 \text{ x } 10^{-23} \text{ g}} \right)$$

$$= 6 \text{ atoms Ca}$$

2. Calculate the mass, in grams, of one atom of;

a) boron

$$\left(\frac{10.811 \text{ g B}}{6.02 \text{ x } 10^{23} \text{ atom}} \right)$$

$$= 1.80 \text{ x } 10^{-23} \text{ g}$$

b) lead

$$\left(\frac{207.2 \text{ g Pb}}{6.02 \text{ x } 10^{23} \text{ atom}} \right)$$

$$= 3.44 \text{ x } 10^{-22} \text{ g}$$

3. How many atoms in each of the following;

a) 12.011 g carbon

$$12.011 \text{ g} \left(\frac{6.02 \text{ x } 10^{23} \text{ C atoms}}{12.011 \text{ g}} \right)$$

$$= 6.02 \text{ x } 10^{23} \text{ atoms}$$

b) 65.39 g Zn

$$65.39 \text{ g} \left(\frac{6.02 \text{ x } 10^{23} \text{ Zn atoms}}{65.39 \text{ g}} \right)$$

$$= 6.02 \text{ x } 10^{23} \text{ atoms}$$

c) 36.033 g carbon

$$36.033 \text{ g} \left(\frac{6.02 \text{ x } 10^{23} \text{ C atoms}}{12.011 \text{ g}} \right)$$

$$= 1.81 \text{ x } 10^{24} \text{ C atoms}$$

d) 21.8 g Zn

$$21.8 \text{ g} \left(\frac{6.02 \text{ x } 10^{23} \text{ Zn atoms}}{65.39 \text{ g}} \right)$$

$$= 2.01 \text{ x } 10^{23} \text{ Zn atoms}$$

e) 4.56 x 10^{-4} g carbon

$$4.56 \text{ x } 10^{-4} \text{ g} \left(\frac{6.02 \text{ x } 10^{23} \text{ C atoms}}{12.011 \text{ g}} \right)$$

$$= 2.29 \text{ x } 10^{19} \text{ C atoms}$$

f) 5.10 x 10^{5} g Zn

$$5.10 \text{ x } 10^{5} \text{ g} \left(\frac{6.02 \text{ x } 10^{23} \text{ Zn atoms}}{65.39 \text{ g}} \right)$$

$$= 4.70 \text{ x } 10^{27} \text{ Zn atoms}$$

4. How many moles in each of the following;
   a) 1.00794 g helium

   $$4.0026 \text{ g} \left(\frac{1 \text{ mol He}}{4.0026 \text{ g}} \right)$$
   = **1 mol of helium**

   b) 32 g oxygen molecules

   $$32 \text{ g} \left(\frac{1 \text{ mol}}{32.0 \text{ g}} \right)$$
   = **1 mol oxygen molecules**

   c) 44.0 g CO_2

   $$44.0 \text{ g} \left(\frac{1 \text{ mol He}}{44.0 \text{ g}} \right)$$
   = **1 mol of carbon dioxide**

   d) 145 g NaCl

   $$145 \text{ g} \left(\frac{1 \text{ mol}}{58.45 \text{ g}} \right)$$
   = **2.48 mol NaCl**
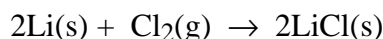
   e) 5.10 x 10^{23} Ar atoms

   $$\textbf{5.10 x } 10^{23} \textbf{ Ar atoms} \left(\frac{1 \text{ mol}}{6.02 \text{ x } 10^{23} \text{ Ar atoms}} \right)$$
   = **0.847 moles Ar**

   b) 8.45 x 10^{22} H_2S molecules

   $$\textbf{8.45 x } 10^{22} \textbf{ } H_2S \textbf{ molecules} \left(\frac{1 \text{ mol}}{6.02 \text{ x } 10^{23} \text{ } H_2S \text{ molecules}} \right)$$
   = **0.140 moles H_2S**

5a. How do you read the following equation?

$$2\text{Li(s)} + \text{Cl}_2\text{(g)} \rightarrow 2\text{LiCl(s)}$$

2 atoms of lithium plus 1 molecule of chlorine react to form two formula units of Lithium chloride

b) How many molecules of chlorine are required to react with 16 atoms of lithium? (show your work)

$$\textbf{16 atoms Li} \left(\frac{1 \text{ molecule Cl}_2}{2 \text{ atom Li}} \right) = \textbf{8 molecules Cl}_2$$

c) How many atoms of lithium will react with 120 molecules of chlorine? (show your work.)

$$\textbf{120 molecule Cl}_2 \left(\frac{2 \text{ atom Li}}{1 \text{ molecule Cl}_2} \right) = \textbf{240 atoms of Li}$$

d) How many formula units of lithium chloride are formed in a)? In b)? (show your work)

$$\textbf{16 atoms Li} \left(\frac{2 \text{ f.u. LiCl}}{2 \text{ atom Li}} \right) = \textbf{16 formula units of LiCl}$$

$$\textbf{120 molecule Cl}_2 \left(\frac{2 \text{ f.u. LiCl}}{1 \text{ molecule Cl}_2} \right) = \textbf{240 formula units of LiCl}$$

e) How many formula unit of lithium chloride can be formed when 24 atoms of lithium are combined with 10 molecules of chlorine? Explain.

$$\textbf{24 atoms of lithium} \left(\frac{1 \text{ molecule Cl}_2}{2 \text{ atom Li}} \right) = \textbf{12 molecules of Cl}_2$$

but there are only 10 molecules of Cl_2 so Cl_2 limits how much LiCl is formed.

$$\textbf{10 molecule Cl}_2 \left(\frac{2 \text{ f.u. LiCl}}{1 \text{ molecule Cl}_2} \right) = \textbf{20 formula units of LiCl}$$