The Mole

Name - _____

1.) You obtain the following results.

$11.1\ g$ of hydrogen gas reacts with $88.9\ g$ of oxygen gas.

$46.7\ g$ of nitrogen gas react with $53.3\ g$ of oxygen gas.

$42.9\ g$ of carbon react with $57.1\ g$ of oxygen gas.

Assuming a mass of "1" for hydrogen, calculate the relative mass of oxygen, nitrogen and carbon. (Don't be surprised if the values you calculate are not what you expect. Not all molecules involve 1:1 ratios, which was a problem for early chemists too).

2.) If $1.0\ L$ of nitrogen gas reacts with $3.0\ L$ of chlorine gas when both gases are at the same temperature and pressure, how many chlorine molecules are present for every nitrogen molecule in the reaction? Suggest a formula for the compound formed and name the compound.

3.) Experimentally it is found that $1.5\ L$ of gaseous sulphur reacts with $3.0\ L$ of gaseous oxygen at the same temperature and pressure. Suggest a possible formula and name the compound formed.

4.) At room temperature and pressure, $250\ mL$ of chlorine gas react completely with $750\ mL$ of fluorine gas. Suggest a possible formula and name for the compound formed in the reaction.

5.) If $1.0\ L$ of unknown gas X contains $3.0 \times 10^{23}\ molecules$ at a certain temperature and pressure, how many molecules are present in $5.0\ L$ of oxygen gas at the same temperature and pressure?

6.) Calculate the molar mass of each of the following.

a.) NO

b.) H_2O

c.) NH_3

d.) CO_2

e.) CH_4

f.) $AgNO_3$

g.) $Ca(OH)_2$

h.) $Al(NO_3)_3$

i.) $FeCl_3$

j.) SnC_2O_4

k.) $Sn(C_2O_4)_2$

l.) $(NH_4)_3PO_4$

m.) CH_3COOH

n.) $CH_3CH_2CH_2CH_3$

o.) $Ni(H_2O)_2(NH_3)_4Cl_2$

p.) $Al_2(SO_4)_3$

7.) Calculate the molar mass of each of the following.

a.) $Co_3(AsO_4)_2 \cdot 8H_2O$

b.) $Pb(C_2H_3O_2)_2 \cdot 3H_2O$

c.) $MgSO_4 \cdot 7H_2O$

d.) $KAl(SO_4)_2 \cdot 12H_2O$