

## Unit V. Review Worksheet Answers.

1. Write the name for each of the following compounds

- a. MgO      b. LiOH      c.  $\text{Al}(\text{NO}_3)_3$       d.  $\text{PbCl}_2$       e.  $\text{SF}_6$       f.  $\text{KMnO}_4$       g.  $\text{Ca}(\text{HCO}_3)_2$       h.  $\text{N}_2\text{O}_5$

- a. magnesium oxide      b. lithium hydroxide      c. aluminum nitrate  
d. lead(II) chloride or plumbous chloride      e. sulfur hexafluoride      f. potassium permanganate  
g. calcium hydrogen carbonate or calcium bicarbonate      h. dinitrogen pentaoxide

2. Write the formulas that correspond to each of these names

- a. Calcium perchlorate      b. Ammonium phosphate      c. Phosphorus pentachloride      d. Aluminum oxalate  
e. Chromium(III)phosphate      f. Chlorine dioxide      g. Stannic fluoride      h. Scandium sulfate  
i. Iodine tetrafluoride      j. Carbon tetrachloride      k. Tetraantimony hexaoxide      l. Potassium phosphide

- a.  $\text{Ca}(\text{ClO}_4)_2$       b.  $(\text{NH}_4)_3\text{PO}_4$       c.  $\text{PCl}_5$       d.  $\text{Al}_2(\text{C}_2\text{O}_4)_3$       e.  $\text{CrPO}_4$       f.  $\text{ClO}_2$   
g.  $\text{SnF}_4$       h.  $\text{Sc}_2(\text{SO}_4)_3$       i.  $\text{IF}_4$       j.  $\text{CCl}_4$       k.  $\text{Sb}_4\text{O}_6$       l.  $\text{K}_3\text{P}$

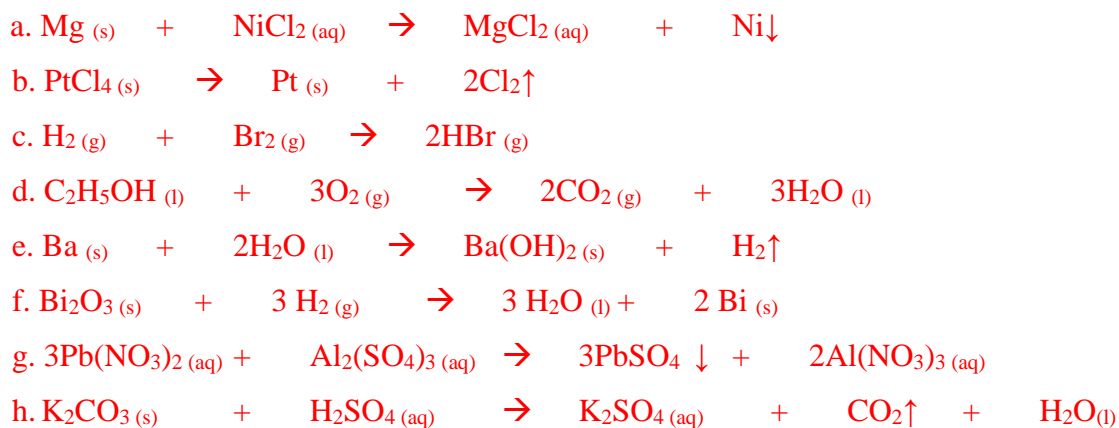
3. Write balanced chemical equations for these reactions, be sure to include all subscripts.

- a. Sodium metals reacts with hydrochloric acid to produce sodium chloride and hydrogen gas  
b. Magnesium metals reacts with chlorine gas to produce magnesium chloride  
c. Copper metal reacts with nitric acid to produce cupric nitrate, nitrogen dioxide, and water  
d. Magnesium oxide reacts with silicon to produce magnesium and silicon dioxide  
e. Aluminum metal reacts with sulfuric acid to produce aluminum sulfate and hydrogen gas  
f. Ferrous chloride reacts with chlorine gas to produce ferric chloride  
g. Potassium chlorate decomposes into potassium chloride and oxygen gas  
h. Ammonium dichromate decomposes into Chromium(III)oxide, water and nitrogen gas

- a.  $2 \text{Na}_{(s)} + 2 \text{HCl}_{(aq)} \rightarrow 2 \text{NaCl}_{(aq)} + \text{H}_{2(g)}$   
b.  $\text{Mg}_{(s)} + \text{Cl}_{2(g)} \rightarrow \text{MgCl}_{2(s)}$   
c.  $\text{Cu}_{(s)} + 4 \text{HNO}_{3(aq)} \rightarrow \text{Cu}(\text{NO}_3)_2_{(aq)} + 2 \text{NO}_2\uparrow + 2 \text{H}_2\text{O}_{(l)}$   
d.  $2 \text{MgO}_{(s)} + \text{Si}_{(g)} \rightarrow 2 \text{Mg}_{(s)} + \text{SiO}_{2(s)}$   
e.  $2 \text{Al}_{(s)} + 3 \text{H}_2\text{SO}_{4(aq)} \rightarrow \text{Al}_2(\text{SO}_4)_3_{(aq)} + 3 \text{H}_2\uparrow$   
f.  $2 \text{FeCl}_{2(s)} + \text{Cl}_{2(g)} \rightarrow 2 \text{FeCl}_{3(s)}$   
g.  $2 \text{KClO}_{3(s)} \rightarrow 2 \text{KCl}_{(s)} + 3 \text{O}_2\uparrow$   
h.  $(\text{NH}_4)_2\text{Cr}_2\text{O}_{7(s)} \rightarrow \text{Cr}_2\text{O}_{3(s)} + 4 \text{H}_2\text{O}_{(l)} + \text{N}_2\uparrow$

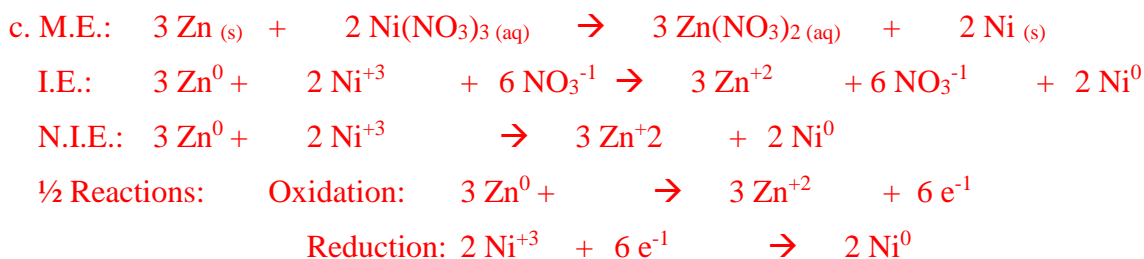
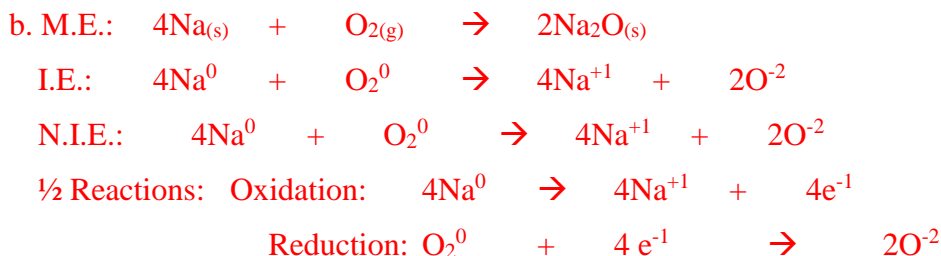
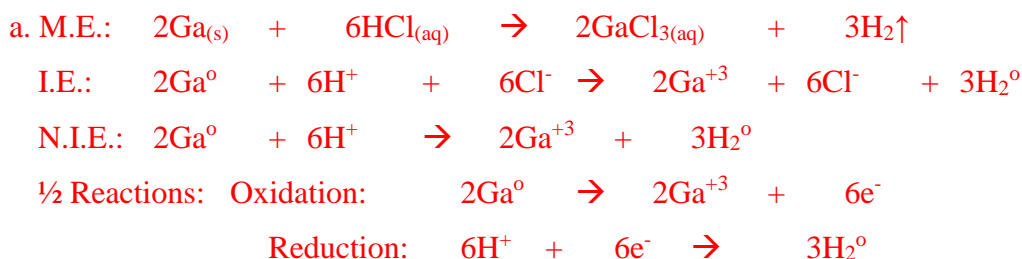
4. Write balanced chemical equations by predicting products. Be sure to include all subscripts

- a. Magnesium metal reacts with a solution of Nickel(II) chloride  
b. Platinum(IV) chloride undergoes decomposition  
c. Hydrogen gas and bromine gas react  
d. Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ) reacts with oxygen gas  
e. Barium metal is placed in water  
f. Bismuth(III) oxide is reacted with hydrogen gas  
g. Plumbous nitrate solution is mixed with aluminum sulfate solution  
h. Solid potassium carbonate is reacted with sulfuric acid



5. Write the molecular, ionic, net ionic, and half reactions for the following reactions

- Gallium metal reacts with a solution of hydrochloric acid
- Sodium metals reacts with oxygen
- Zinc metal is placed in a solution of Nickel(III)nitrate



6. Solve for the following

- The mass of 5.75 mol of butane ( $\text{C}_4\text{H}_{10}$ )
- The moles of oxygen atoms in 1.25 moles of Calcium nitrate
- The mass of  $1.6 \times 10^{-3}$  mol of Sodium sulfate
- The moles of 125 g of Epsom salt, Magnesium sulfate heptahydrate
- The mass of 8.50 L of Carbon dioxide at STP
- The number of molecules in 3.55 g of aspirin ( $\text{C}_9\text{H}_8\text{O}_4$ )
- The number of moles of 40 lb of Treflan (a herbicide),  $\text{C}_{13}\text{H}_{16}\text{N}_2\text{O}_4\text{F}$ . (1 lb = 454 g)

- a. 334 g  $C_4H_{10}$
- b. 7.50 mol O atoms
- c. 0.23 g  $Na_2SO_4$
- d. 0.507 mol  $MgSO_4 \cdot 7H_2O$
- e. 16.7 g  $CO_2$
- f.  $1.19 \times 10^{22}$  molecules  $C_9H_8O_4$
- g. 60 mol Teflon

7. Find the percent composition for the following

- a. Aluminum in Aluminum iodide
- b. Carbon in Propylene ( $C_3H_6$ )
- c. Nitrogen in Ammonium nitrate
- d. Oxygen the mineral Malachite ( $Cu_2(OH)_2CO_3$ )
- e. Water in Cupric sulfate pentahydrate

- a. 6.62% Al
- b. 85.60% C
- c. 35.00% N
- d. 36.18% O
- e. 36.08%  $H_2O$

8. Determine the empirical formula for the following compounds

- a. 15.8% carbon and 84.2% sulfur
- b. 40.0% carbon, 6.7% hydrogen, and 53.5% oxygen
- c. 28.7% K, 1.5% H, 22.8% P, and 47.0% O
- d. 18.5% Na, 25.8% S, 19.3% O (not counting the oxygen atoms in water), and 36.4% water
- e. 69.24 % Ga and 30.76% P

- a.  $CS_2$
- b.  $CH_2O$
- c.  $KH_2PO_4$
- d.  $Na_2S_2O_3 \cdot 5H_2O$
- e. GaP

9. Determine the empirical and molecular formulas for the following

- a. A compound that has a mass of 30 amu and contains 80% C and 20% H
- b. A compound that has a mass of 92.02 g/mol that contains 30.4% N and 69.6% O
- c. Caffeine which contains 49.5% C, 5.15% H, 28.9% N, and 16.5 % O. The molar mass is 195 g
- d. A compound that contains 27.2% N, 3.9% H, and 68.9% Cl and has a molar mass of 51.5 g

- a. EF=  $CH_3$  MF=  $C_2H_6$
- b. EF=  $NO_2$  MF=  $N_2O_4$
- c. EF=  $C_4H_5N_2O$  MF=  $C_8H_{10}N_4O_2$
- d. EF=  $NH_2Cl$  MF=  $NH_2Cl$

10. Using the UNBALANCED chemical equation:  $Ga + HCl \rightarrow GaCl_3 + H_2$ . Solve for the following

\*\* Assume excess of the other reactant

- a. The moles of Gallium chloride that are produced from 2.5 moles of Ga
- b. The mass of gallium atoms needed to react with 5.6 moles of HCl
- c. Grams of Gallium chloride produced from  $1.00 \times 10^{-2}$  moles of HCl.
- d. The liters of hydrogen gas produced (at STP) from 18.75 grams of Gallium metal
- e. The mass of hydrogen molecules from  $4.50 \times 10^{24}$  atoms of gallium metal

- a. 2.5 mol Ga
- b. 130 g Ga
- c. 0.587 g  $GaCl_3$
- d. 9.036 L  $H_2$
- e. 22.6 g  $H_2$

11. Using the UNBALANCED chemical equation:  $K_2CO_3 + HNO_3 \rightarrow KNO_3 + CO_2 + H_2O$ . Solve for the following

- a. The moles of water produced from 4.5 moles of potassium carbonate and 6.0 moles of nitric acid
- b. Grams of potassium nitrate produced from 25.5 g of  $K_2CO_3$  and 12.4 g of nitric acid
- c. The mass of  $K_2CO_3$  needed to form 5.85 L of carbon dioxide at STP.

- a.  $HNO_3$  is limiting; 3.0 mol  $H_2O$
- b.  $HNO_3$  is limiting; 19.9 g  $KNO_3$
- c. 36.1 g  $K_2CO_3$

12. Using the reaction between Calcium hydroxide and acetic acid. Solve for the following

- a. The moles of acetic acid needed to react with 15.25 g of Calcium hydroxide
- b. The mass of calcium acetate produced from 15.25 g of Calcium hydroxide and 40.2 g of acetic acid
- c. The molecules of water produced from 4.5 moles of Calcium hydroxide and 255.5 g of acetic acid

- a. 0.4116 mol  $\text{HC}_2\text{H}_3\text{O}_2$
- b. 24.7 g  $\text{HC}_2\text{H}_3\text{O}_2$  excess, 32.55 g  $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
- c. 540 g  $\text{HC}_2\text{H}_3\text{O}_2$  limiting;  $2.562 \times 10^{24}$  molecules  $\text{H}_2\text{O}$

13. Solve for the following percent yield problems

- a. A student performs an ethanol preparation reaction isolating only 25 g instead of the 81 g that should have been produced
- b. The decomposition of potassium chlorate gives potassium chloride and oxygen gas. If 2.00 g of  $\text{KClO}_3$  gave 0.720 g of oxygen, what is the percent yield for this reaction
- c. Benzene ( $\text{C}_6\text{H}_6$ ) reacts with bromine to produce bromobenzene ( $\text{C}_6\text{H}_5\text{Br}$ ) and hydrogen bromide. What is the theoretical yield of bromobenzene in this reaction when 30.0 g of benzene reacts with 65.0 g of bromine? If the actual yield of bromobenzene was 56.7 g, what was the percentage yield?

- a. 31%
- b. T.Y.= 0.783 g  $\text{O}_2$ ; 92.0%
- c. 61.4 g  $\text{Br}_2$  excess; T.Y.= 60.3 g  $\text{C}_6\text{H}_5\text{Br}$ ; 94.0%