Che 111: Chapter 4 Practice Problems Key

1. Balance the following equations.
a. ___Fe_2O_3(S) + _3 _ H_2(g)
$$\Rightarrow$$
 _2_Fe(S) + _3 _ H_2O(1)
b. _3_SCl_2(I) + _4 _ NaF(S) \Rightarrow ___S2Cl_2(I) + ___SF_4(g) + _4 _ NaCl(S)
c. ___PCl_5(S) + _4 _ H_2O(1) \Rightarrow ___ H_3PO_4(aq) + _5 _ HCl(aq)
d. _2_As(S) + _5 _ Cl_2(g) \Rightarrow _2 _ AsCl_5(S)
e. _2 _ C_2H_5SH(I) + _9 _ O_2(g) \Rightarrow _4 _ CO_2(g) + _6 _ H_2O(1) + _2 _ SO_2(g)
f. _2 _ N_2O_5(g) \Rightarrow _4 _ NO_2(g) + ___O_2(g)
g. _3 _ Mg(S) + _2 _ Cr(NO_3)_5(aq) \Rightarrow _3 _ Mg(NO3)_2(aq) + _2 _ Cr(S)

h. _6___ H_2O(g) + __4_NO(g) \rightarrow __5__ O_2(g) + __4_ NH_3(g)

2. The primary use of 1,2-dichloroethane, ClCH2CH2Cl, is to make vinyl chloride, which is then converted into polyvinyl chloride (PVC) for many purposes, including plastic pipes. Balance the following equation, which describes the industrial reaction for producing 1,2-dichloroethane.

 $_2_C_2H_4 + _4_HCI + _O_2 \rightarrow _2_CICH_2CH_2CI + _2_H_2O$

3. Predict whether each of the following substances is **soluble** or **insoluble** in water.

- a. MgSO₄ (fireproofing) _____soluble_____
- b. barium sulfate (used in paints) _____insoluble______

c. Bi(OH)₃ (used in plutonium separation) _____insoluble_____

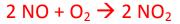
- d. Ammonium sulfite (used in medicine and photography)____soluble_____
- Sodium sulfate, which is used to make detergents and glass, is one product of the reaction of sodium chloride, sulfur dioxide, water, and oxygen. The other product is hydrogen chloride. Write a balanced equation, without including states, for this reaction. (remember that some elements are described with formulas containing subscripts such as oxygen, O₂)

4 NaCl + 2 SO₂ + 2 H₂O + O₂ \rightarrow 2 Na₂SO₄ + 4 HCl

- 5. Nitric acid, HNO₃, which is used to make fertilizers and explosives, is made industrially in the three steps described below. Write a balanced equation, without including states, for each of these steps.
 - a. Ammonia reacts with oxygen to form nitrogen monoxide and water.



b. Nitrogen monoxide reacts with oxygen to form nitrogen dioxide.



c. Nitrogen dioxide reacts with water to form nitric acid and nitrogen monoxide

 $3 \text{ NO}_2 + \text{H}_2\text{O} \rightarrow 2 \text{ HNO}_3 + \text{NO}$

6. For each of the following pairs of formulas, predict if they would react to yield a precipitate. If there is no reaction, write, "No Reaction". If there is a reaction, write the complete equation for the reaction.

a. 3 KOH (aq) + $_Cr(NO_3)_3$ (aq) \rightarrow 3 KNO₃ (aq) + $_Cr(OH)_3$ (s)

b. $Mg(C_2H_3O_2)_2$ (aq) + NaCl (aq) $\rightarrow MgCl_2$ (aq) + NaC₂H₃O₂ (aq) NO REACTION