Practice! (Mole to Mole)

1) When aluminum is heated in the presence of oxygen, aluminum oxide is formed. How many moles of aluminum oxide can be made from 7.0 moles of aluminum?

$$4Al\,(s) + 3O_2\,(g) \longrightarrow 2Al_2O_3\,(s)$$

$$7.0\;mol\;Al\left(\frac{2\;mol\;Al_2O_3}{4\;mol\;Al}\right) = \boxed{3.5\;mol\;Al_2O_3}$$

2) When steam is passed over iron, hydrogen gas and iron (II) oxide are formed. How many moles of steam would be needed to completely react 3.0 moles of iron?

$$H_2O\,(g) + Fe\,(s) \longrightarrow H_2\,(g) + FeO\,(s)$$

$$3.0\;mol\;Fe\left(\frac{1\;mol\;H_2O}{1\;mol\;Fe}\right) = \boxed{3.0\;mol\;H_2O}$$

3) In a reaction between ammonium hydroxide and copper (II) nitrate, how many moles of ammonium hydroxide is needed to create 8.4 moles of copper (II) hydroxide precipitate?

$$2NH_4OH\,(aq) + Cu(NO_3)_2\,(aq) \longrightarrow Cu(OH)_2\,(s) + 2NH_4NO_3\,(g)$$

$$8.4\;mol\;Cu(OH)_2\left(\frac{2\;mol\;NH_4OH}{1\;mol\;Cu(OH)_2}\right) = \boxed{17\;mol\;NH_4OH}$$

4) When ammonia gas (NH_3) is heated in the presence of oxygen, nitrogen and water are created. How many moles of nitrogen gas are produced if 18 moles of ammonia are used?

$$4NH_3 (g) + 3O_2 (g) \longrightarrow 2N_2 (g) + 6H_2O (l)$$

$$18 \text{ mol } NH_3 \left(\frac{2 \text{ mol } N_2}{4 \text{ mol } NH_3} \right) = \boxed{9.0 \text{ mol } N_2}$$

5) How much copper was made from a reaction between copper (I) nitrate and iron if 6.3 moles of iron (II) nitrate were created?

$$2CuNO_3 (aq) + Fe (s) \longrightarrow Fe(NO_3)_2 (aq) + 2Cu (s)$$

$$6.3 \text{ mol } Fe(NO_3)_2 \left(\frac{2 \text{ mol } Cu}{1 \text{ mol } Fe(NO_3)_2} \right) = \boxed{13 \text{ mol } Cu}$$

6) How many moles of chlorine will be needed to react with 14 moles of potassium iodide completely?

$$Cl_2 (g) + 2KI (aq) \longrightarrow 2KCl (aq) + I_2 (s)$$

$$14 \text{ mol } KI \left(\frac{1 \text{ mol } Cl_2}{2 \text{ mol } KI} \right) = \boxed{7.0 \text{ mol } Cl_2}$$

More Practice! (Grams to Grams)

7) 47.2 grams of zinc reacts with hydrochloric acid (HCl). How many grams of (hydrogen gas) would be produced?

$$Zn\,(s) + 2HCl\,(aq) \longrightarrow ZnCl_2\,(aq) + H_2\,(g)$$

$$47.2\,g\ Zn \left(\frac{1\ mol\ Zn}{65.38\ g} \right) \left(\frac{1\ mol\ H_2}{1\ mol\ Zn} \right) \left(\frac{2.016\ g}{1\ mol\ H_2} \right) = \boxed{1.46\ g\ H_2}$$

8) 112.2 g of calcium oxide combines with tetraphosphorus decoxide to create calcium phosphate. How many grams of (product) would be created?

$$6\,CaO\,(s) + P_4O_{10}\,(g) \longrightarrow 2\,Ca_3(PO_4)_2\,(s)$$

$$112.2\,g\ CaO \left(\frac{1\ mol\ CaO}{56.08\ g} \right) \left(\frac{2\ mol\ Ca_3(PO_4)_2}{6\ mol\ CaO} \right) \left(\frac{310.20\ g}{1\ mol\ Ca_3(PO_4)_2} \right) = \boxed{206.9\ g\ Ca_3(PO_4)_2}$$

9) How much silicon monoxide is needed to react completely with 14.5 g of hydrogen fluoride if the reaction produces silicon difluoride and water?

$$SiO \, (s) + 2HF \, (aq) \longrightarrow SiF_2 \, (s) + H_2O \, (l)$$

$$14.5 \, g \atop HF \left(\frac{1 \, mol \, HF}{20.01 \, g} \right) \left(\frac{1 \, mol \, SiO}{2 \, mol \, HF} \right) \left(\frac{44.09 \, g}{1 \, mol \, SiO} \right) = \boxed{16.0 \, g \atop SiO}$$

10) Aluminum is placed into a solution of iron (II) nitrate. If 62.1 g of iron was created, how many grams of aluminum nitrate were made?

$$2Al \, (s) + 3Fe(NO_3)_2 \, (aq) \longrightarrow 2Al(NO_3)_3 \, (aq) + 3Fe \, (s)$$

$$62.1 \, g \atop Fe \left(\frac{1 \, mol \, Fe}{55.85 \, g} \right) \left(\frac{2 \, mol \, Al(NO_3)_3}{3 \, mol \, Fe} \right) \left(\frac{213.01 \, g}{1 \, mol \, Al(NO_3)_3} \right) = \boxed{158 \, g \atop Al(NO_3)_3}$$

11) Hydrogen peroxide decomposes into water and oxygen. If 13.5 g of oxygen is produced, how much hydrogen peroxide did you start with?

$$2H_2O_2 \, (aq) \longrightarrow 2H_2O \, (l) + O_2 \, (g)$$
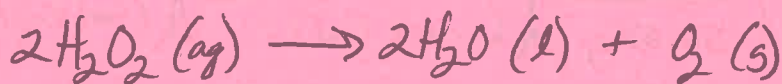
$$13.5 \, g \atop O_2 \left(\frac{1 \, mol \, O_2}{32.00 \, g} \right) \left(\frac{2 \, mol \, H_2O_2}{1 \, mol \, O_2} \right) \left(\frac{34.02 \, g}{1 \, mol \, H_2O_2} \right) = \boxed{28.7 \, g \atop H_2O_2}$$