Name KEY Date _____ Hour _____

Stoichiometry Part 1

Sh *all work using dimensional analysis!*

1. **4 Na + __O_2 → 2 Na_2O**

a) How many moles of Sodium would be needed to react with 3.82 moles of oxygen?

$$3.82 \text{ mol } O_2 \times \frac{4 \text{ mol Na}}{1 \text{ mol } O_2} = 15.28 \text{ mol Na}$$

b) How many moles of Na_2O can be produced from 13.5 moles Na?

$$13.5 \text{ mol Na} \times \frac{2 \text{ mol } Na_2O}{4 \text{ mol Na}} = 6.75 \text{ mol } Na_2O$$

c) How many moles of O_2 are needed to produce 34.7 grams of Na_2O?

$$34.7 \text{ g } Na_2O \times \frac{1 \text{ mol } Na_2O}{61.979 \text{ g } Na_2O} \times \frac{1 \text{ mol } O_2}{2 \text{ mol } Na_2O} = 0.280 \text{ mol } O_2$$

2. **__C_2H_4 + 3 O_2 → 2 CO_2 + 2 H_2O**

a) When 0.624 moles of O_2 are reacted, how many moles of carbon dioxide are produced?

$$0.624 \text{ mol } O_2 \times \frac{2 \text{ mol } CO_2}{3 \text{ mol } O_2} = 0.416 \text{ mol } CO_2$$

b) How many grams of C_2H_4 are needed to produce 3.7 moles of water?

$$3.7 \text{ mol } H_2O \times \frac{1 \text{ mol } C_2H_4}{2 \text{ mol } H_2O} \times \frac{28.054 \text{ g } C_2H_4}{1 \text{ mol } C_2H_4} = 51.9 \text{ g } C_2H_4 = 52 \text{ g } C_2H_4$$

c) How many grams of O_2 are needed to react with 2.56 g of C_2H_4?

$$2.56 \text{ g } C_2H_4 \times \frac{1 \text{ mol } C_2H_4}{28.054 \text{ g } C_2H_4} \times \frac{3 \text{ mol } O_2}{1 \text{ mol } C_2H_4} \times \frac{31.998 \text{ g } O_2}{1 \text{ mol } O_2} = 8.76 \text{ g } O_2$$

3. **__N_2 + __F_2 → __NF_3** $N_2 + 3F_2 \rightarrow 2NF_3$

a) When 62.0 g of fluorine are reacted, how many moles of NF_3 will be formed?

$$62.0 \text{ g } F_2 \times \frac{1 \text{ mol } F_2}{37.997 \text{ g } F_2} \times \frac{2 \text{ mol } NF_3}{3 \text{ mol } F_2} = 1.09 \text{ mol } NF_3$$

b) How many molecules of N_2 are needed to produce 2.85 g of NF_3?

$$2.85 \text{ g } NF_3 \times \frac{1 \text{ mol } NF_3}{71.002 \text{ g } NF_3} \times \frac{1 \text{ mol } N_2}{2 \text{ mol } NF_3} \times \frac{6.02 \times 10^{23} \text{ molecules } N_2}{1 \text{ mol } N_2} = 1.21 \times 10^{22} \text{ molecules } N_2$$

c) 3.54 g of nitrogen will react with how many grams of fluorine?

$$3.54 \text{ g } N_2 \times \frac{1 \text{ mol } N_2}{28.01348 \text{ g } N_2} \times \frac{3 \text{ mol } F_2}{1 \text{ mol } N_2} \times \frac{37.997 \text{ g } F_2}{1 \text{ mol } F_2} = 14.4 \text{ g } F_2$$

4. $4\ NH_3 + 7\ O_2 \rightarrow 4\ NO_2 + 6\ H_2O$

a) What mass of NO_2 can be produced from 3.56×10^{22} molecules of oxygen?

$$\frac{3.56 \times 10^{22}\ \text{molecules } O_2}{1} \times \frac{1\ \text{mol } O_2}{6.02 \times 10^{23}\ \text{molecules } O_2} \times \frac{4\ \text{mol } NO_2}{7\ \text{mol } O_2} \times \frac{46.005\ \text{g } NO_2}{1\ \text{mol } NO_2} = 1.5\ \text{g } NO_2$$

b) 13.8 g of NH_3 would be able to produce how many moles of H_2O?

$$\frac{13.8\ \text{g } NH_3}{1} \times \frac{1\ \text{mol } NH_3}{17.031\ \text{g } NH_3} \times \frac{6\ \text{mol } H_2O}{4\ \text{mol } NH_3} = 3.65\ \text{mol } H_2O$$

c) How many grams of O_2 are needed to produce 15.5 g of H_2O?

$$\frac{15.5\ \text{g } H_2O}{1} \times \frac{1\ \text{mol } H_2O}{18.0153\ \text{g } H_2O} \times \frac{7\ \text{mol } O_2}{6\ \text{mol } H_2O} \times \frac{31.998\ \text{g } O_2}{1\ \text{mol } O_2} = 32.1\ \text{g } O_2$$

4b) $$\frac{13.8\ \text{g } NH_3}{1} \times \frac{1\ \text{mol } NH_3}{17.031\ \text{g } NH_3} \times \frac{6\ \text{mol } H_2O}{4\ \text{mol } NH_3} = 1.22\ \text{mol } H_2O$$

$$\frac{13.8\ \text{g } NH_3}{1} \times \frac{1\ \text{mol } NH_3}{17.031\ \text{g } NH_3} \times \frac{6\ \text{mol } H_2O}{4\ \text{mol } NH_3} \times \frac{18.0153\ \text{g } H_2O}{1\ \text{mol } H_2O} = 21.9\ \text{g } H_2O$$