Honors Chemistry PS.28

Name: Key Date: _____ Mods: _____

# Unit 7: Limiting & Excess Reactants

**1) Copper combines with aqueous silver nitrate to form aqueous copper (II) nitrate and silver.**

a. Write a balanced equation for this reaction.

$1\ Cu(s) + 2\ AgNO_3(aq) \rightarrow 1\ Cu(NO_3)_2(aq) + 2\ Ag(s)$

b. If you combined 100 g of copper with 200 g of silver nitrate, how many grams of silver would theoretically be produced?

$$100\text{ g Cu} \left|\frac{1\text{ mol Cu}}{63.6\text{ g Cu}}\right|\frac{2\text{ mol Ag}}{1\text{ mol Cu}}\left|\frac{107.9\text{ g Ag}}{1\text{ mol Ag}}\right| = 339.3\text{ g Ag}$$

ER ★

$$200\text{ g } AgNO_3 \left|\frac{1\text{ mol } AgNO_3}{169.9\text{ g } AgNO_3}\right|\frac{2\text{ mol Ag}}{2\text{ mol } AgNO_3}\left|\frac{107.9\text{ g Ag}}{1\text{ mol Ag}}\right| = 127\text{ g Ag}$$

LR ★

c. How many grams of the excess reactant would be left over?

$$200\text{ g } AgNO_3 \left|\frac{1\text{ mol } AgNO_3}{169.9\text{ g } AgNO_3}\right|\frac{1\text{ mol Cu}}{2\text{ mol } AgNO_3}\left|\frac{63.6\text{ g Cu}}{1\text{ mol Cu}}\right| = 37.4\text{ g Cu used}$$

ER ★ LR

HAD − USED : 100 g − 37.4 g = 62.6 g Cu left over

**2) Gaseous carbon monoxide combines with hydrogen gas to produce liquid methanol, $CH_3OH$.**

a. Write a balanced equation for this reaction.

$1\ CO(g) + 2\ H_2(g) \rightarrow 1\ CH_3OH(\ell)$

b. If you combined 152.5 g of carbon monoxide and 24.5 g of hydrogen, how many grams of methanol would theoretically be produced?

$$152.5\text{ g CO} \left|\frac{1\text{ mol CO}}{28\text{ g CO}}\right|\frac{1\text{ mol } CH_3OH}{1\text{ mol CO}}\left|\frac{32\text{ g } CH_3OH}{1\text{ mol } CH_3OH}\right| = 174.3\text{ g } CH_3OH$$

LR ★

$$24.5\text{ g } H_2 \left|\frac{1\text{ mol } H_2}{2\text{ g } H_2}\right|\frac{1\text{ mol } CH_3OH}{2\text{ mol } H_2}\left|\frac{32\text{ g } CH_3OH}{1\text{ mol } CH_3OH}\right| = 196\text{ g } CH_3OH$$

ER ★

c. How many grams of the excess reactant would be left over?

$$152.5\text{ g CO} \left|\frac{1\text{ mol CO}}{28\text{ g CO}}\right|\frac{2\text{ mol } H_2}{1\text{ mol CO}}\left|\frac{2\text{ g } H_2}{1\text{ mol } H_2}\right| = 21.78\text{ g } H_2 \text{ used}$$

ER ★ LR

HAD − USED : 24.5 g − 21.78 g = 2.72 g $H_2$ left over

**3) Nitrogen gas and oxygen gas combine to form dinitrogen monoxide (laughing gas).**

a. Write a balanced equation for this reaction.

$2\ N_2(g) + 1\ O_2(g) \rightarrow 2\ N_2O(g)$

b. If you combined 50 g of nitrogen gas with 75 g of oxygen gas, how many grams of laughing gas would theoretically be produced?

$$50\ g\ N_2 \left|\frac{1\ mol\ N_2}{28\ g\ N_2}\right|\frac{2\ mol\ N_2O}{2\ mol\ N_2}\left|\frac{44\ g\ N_2O}{1\ mol\ N_2O}\right| = 78.57\ g\ N_2O$$

LR ★

$$75\ g\ O_2 \left|\frac{1\ mol\ O_2}{32\ g\ O_2}\right|\frac{2\ mol\ N_2O}{1\ mol\ O_2}\left|\frac{44\ g\ N_2O}{1\ mol\ N_2O}\right| = 206.25\ g\ N_2O$$

ER ★

c. How many grams of the excess reactant would be left over?

$$50\ g\ N_2 \left|\frac{1\ mol\ N_2}{28\ g\ N_2}\right|\frac{1\ mol\ O_2}{2\ mol\ N_2}\left|\frac{32\ g\ O_2}{1\ mol\ O_2}\right| = 28.57\ g\ O_2\ used$$

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HAD − USED: $75\ g - 28.57\ g = 46.43\ g\ O_2$ left over

**4) Gaseous dinitrogen tetroxide combines with gaseous dinitrogen tetrahydride to form nitrogen gas and water.**

a. Write a balanced equation for this reaction.

$1\ N_2O_4(g) + 2\ N_2H_4(g) \rightarrow 3\ N_2(g) + 4\ H_2O(\ell)$

b. If you combined 900 g of dinitrogen tetroxide and 400 g of dinitrogen tetrahydride, how many grams of water would theoretically be produced?

$$900\ g\ N_2O_4 \left|\frac{1\ mol\ N_2O_4}{92\ g\ N_2O_4}\right|\frac{4\ mol\ H_2O}{1\ mol\ N_2O_4}\left|\frac{18\ g\ H_2O}{1\ mol\ H_2O}\right| = 704.35\ g\ H_2O$$

ER ★

$$400\ g\ N_2H_4 \left|\frac{1\ mol\ N_2H_4}{32\ g\ N_2H_4}\right|\frac{4\ mol\ H_2O}{2\ mol\ N_2H_4}\left|\frac{18\ g\ H_2O}{1\ mol\ H_2O}\right| = 450\ g\ H_2O$$

LR ★

c. How many grams of the excess reactant would be left over?

$$400\ g\ N_2H_4 \left|\frac{1\ mol\ N_2H_4}{32\ g\ N_2H_4}\right|\frac{1\ mol\ N_2O_4}{2\ mol\ N_2H_4}\left|\frac{92\ g\ N_2O_4}{1\ mol\ N_2O_4}\right| = 575\ g\ N_2O_4\ used$$

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HAD − USED: $900\ g - 575\ g = 325\ g\ N_2O_4$ left over