LA
GA – MA – PA
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LB

Stoichiometry Practice

1. Na_2SiO_3 (s) + 8 HF(aq) → H_2SiF_6 (aq) + 2 NaF(aq) + 3 H_2O (l)

a. How many moles of HF are needed to react with 0.300 mol of Na_2SiO_3?

(x mole Ratio) $0.300\ mol\ Na_2SiO_3 \times \frac{8\ mol\ HF}{1\ mol\ Na_2SiO_3} = \boxed{2.40\ mol\ HF}$

b. How many grams of NaF form when 0.500 mol of HF reacts with excess Na_2SiO_3?

(x mole Ratio x FM) $0.500\ mol\ HF \times \frac{2\ mol\ NaF}{8\ mol\ HF}$ $0.125\ mol\ NaF \times \frac{41.99\ g}{mol} = \boxed{5.25\ g\ NaF}$

c. How many grams of Na_2SiO_3 can react with 0.800 g of HF?

(÷ FM x mol Ratio x FM) $\frac{0.800\ g\ HF}{20.008\ g/mol} = 0.0399\ mol\ HF \times \frac{1\ mol\ Na_2SiO_3}{8\ mol\ HF} = .004998\ mol\ Na_2SiO_3 \times 122.07\ g/mol\ Na_2SiO_3$

$\boxed{0.610\ g\ Na_2SiO_3}$

2. $C_6H_{12}O_6$ (aq) → 2 C_2H_5OH (aq) + 2 CO_2 (g)

a. How many moles of CO_2 are produced when 0.400 mol of $C_6H_{12}O_6$ reacts in this fashion?

(.400 mol $C_6H_{12}O_6$ x mole Ratio) $.400\ mol\ C_6H_{12}O_6 \times \frac{2\ mol\ CO_2}{1\ mol\ C_6H_{12}O_6} = \boxed{.800\ mol\ CO_2}$

b. How many grams of $C_6H_{12}O_6$ are needed to form 7.50 g of C_2H_5OH?

(÷ FM x Mole Ratio x FM) $\frac{7.50\ g\ C_2H_5OH}{46.07\ g/mol} = 0.1628\ mol\ C_2H_5OH \times \frac{1\ mol\ C_6H_{12}O_6}{2\ mol\ C_2H_5OH} = 0.0814\ mol\ C_6H_{12}O_6 \times 180.162\ g/mol = \boxed{14.7\ g\ C_6H_{12}O_6}$

c. How many Liters of CO_2 form when 7.50 g of C_2H_5OH are produced?

$\frac{7.50\ g\ C_2H_5OH}{46.07\ g/mol} = 0.1628\ mol\ C_2H_5OH \times \frac{2\ mol\ CO_2}{2\ mol\ C_2H_5OH} = 0.1628\ mol\ CO_2 \times \frac{22.4\ L}{1\ mol} = \boxed{3.65\ L\ CO_2}$

3. Fe_2O_3 (s) + 3CO (g) → 2Fe(s) + 3CO_2 (g)

a. Calculate the number of grams of CO that can react with 0.150 kg of Fe_2O_3

0.150 kg → 150 g

$\frac{150\ g\ Fe_2O_3}{159.70\ g/mol} = 0.9393\ mol\ Fe_2O_3 \times \frac{3\ mol\ CO}{1\ mol\ Fe_2O_3} = 2.82\ mol\ CO \times \frac{28.011\ g}{mol} = \boxed{79.0\ g\ CO}$

b. Calculate the number of liters of CO_2 formed when 0.150 kg of Fe_2O_3 reacts

$\frac{150\ g\ Fe_2O_3}{159.70\ g/mol} = 0.9393\ mol\ Fe_2O_3 \times \frac{3\ mol\ CO_2}{1\ mol\ Fe_2O_3} = 2.82\ mol\ CO_2 \times \frac{22.4\ L}{mol} = \boxed{63.1\ L\ CO_2}$

4. 2 NaOH (s) + CO_2 (g) → Na_2CO_3 (s) + H_2O (l)

a. How many liters of CO_2 are needed to completely react with 15.2 grams of NaOH

$\frac{15.2\ g\ NaOH}{39.998\ g/mol} = 0.3800\ mol\ NaOH \times \frac{1\ mol\ CO_2}{2\ mol\ NaOH} = 0.1900\ mol\ CO_2 \times \frac{22.4\ L}{mol} = \boxed{4.26\ L\ CO_2}$

b. How many moles of Na_2CO_3 can be produced from 1.85 moles of NaOH?

$1.85\ mol\ NaOH \times \frac{1\ mol\ Na_2CO_3}{2\ mol\ NaOH} = \boxed{0.925\ mol\ Na_2CO_3}$

5. $C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$

a. How many grams of C_6H_6 is needed in this reaction to produce 30.0 g of C_6H_5Br?

$$\frac{30.0\ g\ C_6H_5Br}{157.0\ g/mol} = 0.1911\ mol\ C_6H_5Br \times \frac{1\ mol\ C_6H_6}{1\ mol\ C_6H_5Br} = 0.1911\ mol\ C_6H_6 \times 78.108\ \frac{g}{mol} = \boxed{14.9\ g\ C_6H_6}$$

b. How many liters of Br_2 is needed to completely react and form 12.5 grams of HBr

$$\frac{12.5\ g\ HBr}{80.908\ g/mol} = 0.1545\ mol\ HBr \times \frac{1\ mol\ Br_2}{1\ mol\ HBr} = 0.1545\ mol\ Br_2 \times \frac{22.4\ L}{1\ mol} = \boxed{3.46\ L\ Br_2}$$

6. $4\ Si_2H_3 + 17\ O_2 \rightarrow 8\ SiO_2 + 6\ H_2O_3$

a. How many grams of Silicon dioxide will be formed if 6×10^{28} molecules of oxygen react completely?

$$\frac{6E28\ molecules\ O_2}{6E23\ molecules/mol} = 1000\ mol\ O_2 \times \frac{8\ mol\ SiO_2}{17\ mol\ O_2} = 470.6\ mol\ SiO_2 \times 60.09\ g/mol = \boxed{2.83E4\ g\ SiO_2}$$

b. How many moles of oxygen are equal to 6.02×10^{25} molecules of oxygen?

$$\frac{6.02E25\ molecules\ O_2}{6.02E23\ molecules/mol} = \boxed{100\ mol\ O_2}$$