Key - Study Guide for Stoichiometry Test

1. $2\,Al(OH)_3(s) + 3\,H_2SO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 6\,H_2O(l)$

A. $\frac{.99 \text{ mol } Al(OH)_3}{} \left| \frac{6 \text{ mol } H_2O}{2 \text{ mol } Al(OH)_3} \right. = 3.0 \text{ mol } H_2O$

B. $\frac{2.40 \text{ mol } H_2SO_4}{} \left| \frac{2 \text{ mol } Al(OH)_3}{3 \text{ mol } H_2SO_4} \right. = 1.60 \text{ mol } Al(OH)_3$

C. $\frac{.04466 \text{ mol } H_2SO_4}{} \left| \frac{1 \text{ mol } Al_2(SO_4)_3}{3 \text{ mol } H_2SO_4} \right. = 0.01489 \text{ mol } Al_2(SO_4)_3$

2. $8\,H_2S(g) + 4\,O_2(g) \rightarrow S_8(l) + 8\,H_2O(l)$

A. $\frac{2.50 \text{ mol } H_2S}{} \left| \frac{1 \text{ mol } S_8}{8 \text{ mol } H_2S} \right| \frac{256.56 \text{ g } S_8}{1 \text{ mol } S_8} = 80.2 \text{ g } S_8$

B. $\frac{2.500 \text{ g } O_2}{} \left| \frac{1 \text{ mol } O_2}{32.00 \text{ g } O_2} \right| \frac{8 \text{ mol } H_2O}{4 \text{ mol } O_2} = .1563 \text{ mol } H_2O$

C. $\frac{.776 \text{ mol } H_2S}{} \left| \frac{4 \text{ mol } O_2}{8 \text{ mol } H_2S} \right| \frac{32.00 \text{ g } O_2}{1 \text{ mol } O_2} = 12.4 \text{ g } O_2$

3. $3\,BaSO_4(aq) + 2\,Fe(NO_3)_3(aq) \rightarrow 3\,Ba(NO_3)_2(aq) + Fe_2(SO_4)_3(s)$

A. $\frac{50.0 \text{ g } Fe(NO_3)_3}{} \left| \frac{1 \text{ mol } Fe(NO_3)_3}{241.88 \text{ g } Fe(NO_3)_3} \right| \frac{3 \text{ mol } Ba(NO_3)_2}{2 \text{ mol } Fe(NO_3)_3} \left| \frac{261.35 \text{ g } Ba(NO_3)_2}{1 \text{ mol } Ba(NO_3)_2} \right. =$

$= 81.0 \text{ g } Ba(NO_3)_2$

B. $\frac{34.50 \text{ g } BaSO_4}{} \left| \frac{1 \text{ mol } BaSO_4}{233.40 \text{ g } BaSO_4} \right| \frac{1 \text{ mol } Fe_2(SO_4)_3}{3 \text{ mol } BaSO_4} \left| \frac{399.91 \text{ g } Fe_2(SO_4)_3}{1 \text{ mol } Fe_2(SO_4)_3} \right. =$

$= 19.70 \text{ g } Fe_2(SO_4)_3$

C. $\frac{34.50 \text{ g } Fe(NO_3)_3}{} \left| \frac{1 \text{ mol } Fe(NO_3)_3}{241.88 \text{ g } Fe(NO_3)_3} \right| \frac{1 \text{ mol } Fe_2(SO_4)_3}{2 \text{ mol } Fe(NO_3)_3} \left| \frac{261.35 \text{ g } Fe_2(SO_4)_3}{1 \text{ mol } Fe_2(SO_4)_3} \right.$

$= 18.64 \text{ g } Fe_2(SO_4)_3$

4. $Fe_2O_3(s) + 3\,CO(g) \rightarrow 3\,CO_2(g) + 2\,Fe(s)$

A. $\frac{30.00\,g\,Fe_2O_3}{} \left| \frac{1\,mol\,Fe_2O_3}{159.70\,g\,Fe_2O_3} \right| \frac{2\,mol\,Fe}{1\,mol\,Fe_2O_3} \left| \frac{55.85\,g\,Fe}{1\,mol\,Fe} \right. = 20.98\,g\,Fe$

$\frac{20.00\,g\,CO}{} \left| \frac{1\,mol\,CO}{28.01\,g\,CO} \right| \frac{2\,mol\,Fe}{3\,mol\,CO} \left| \frac{55.85\,g\,Fe}{1\,mol\,Fe} \right. = 26.59\,g\,Fe$

i) Theoretical Yield = 20.98 g Fe
ii) Limiting Reactant = Fe_2O_3
iii) Excess Reactant = CO
iv)

$$\%\ yield = \frac{11.98\,g}{20.98\,g} \times 100 = 57.10\%$$

B. $\frac{.1000\,g\,Fe_2O_3}{} \left| \frac{1\,mol\,Fe_2O_3}{159.70\,g\,Fe_2O_3} \right| \frac{2\,mol\,Fe}{1\,mol\,Fe_2O_3} \left| \frac{55.85\,g\,Fe}{1\,mol\,Fe} \right. = .06994\,g\,Fe$

$\frac{.1700\,g\,CO}{} \left| \frac{1\,mol\,CO}{28.01\,g\,CO} \right| \frac{2\,mol\,Fe}{3\,mol\,CO} \left| \frac{55.85\,g\,Fe}{1\,mol\,Fe} \right. = .2260\,g\,Fe$

i) Theoretical Yield = .06994 g Fe
ii) Limiting Reactant = Fe_2O_3
iii) Excess Reactant = CO
iv)

$$\%\ yield = \frac{.09880\,g}{.06994\,g} \times 100 = 141.3\%$$