Key-Review for Stoichiometry

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

a. $.88\,mol\,Al(OH)_3 \left| \frac{6\,mol\,H_2O}{2\,mol\,Al(OH)_3} \right. = 2.6\,mol\,H_2O$

b. $.88\,g\,H_2SO_4 \left| \frac{1\,mol\,H_2SO_4}{98.09\,g\,H_2SO_4} \right| \frac{6\,mol\,H_2O}{3\,mol\,H_2SO_4} \left| \frac{18.02\,g\,H_2O}{1\,mol\,H_2O} \right. = .32\,g\,H_2O$

c. $.88\,g\,H_2O \left| \frac{1\,mol\,H_2O}{18.02\,g\,H_2O} \right| \frac{1\,mol\,Al_2(SO_4)_3}{6\,mol\,H_2O} \left| \frac{342.17\,g\,Al_2(SO_4)_3}{1\,mol\,Al_2(SO_4)_3} \right. = 2.8\,g\,Al_2(SO_4)_3$

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

$102.27\,g\,H_2S \left| \frac{1\,mol\,H_2S}{34.09\,g\,H_2S} \right| \frac{1\,mol\,S_8}{8\,mol\,H_2S} \left| \frac{256.56\,g\,S_8}{1\,mol\,S_8} \right. = 96.210\,g\,S_8$

$64.00\,g\,O_2 \left| \frac{1\,mol\,O_2}{32.00\,g\,O_2} \right| \frac{1\,mol\,S_8}{4\,mol\,O_2} \left| \frac{256.56\,g\,S_8}{1\,mol\,S_8} \right. = 128.3\,g\,S_8$

a. LR - H_2S
b. TY - 96.210 g S_8

$102.27\,g\,H_2S \left| \frac{1\,mol\,H_2S}{34.09\,g\,H_2S} \right| \frac{4\,mol\,O_2}{8\,mol\,H_2S} \left| \frac{32.00\,g\,O_2}{1\,mol\,O_2} \right. = 48.000\,g\,O_2\ used$

c $64.00\,g\,O_2 - 48.000\,g\,O_2 = 16.00\,g\,O_2$ left over

d. $\%\,yield = \frac{84.78\,g}{96.210\,g} \times 100 = 88.12\%$

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

a. $150.0\,g\,Fe_2O_3 \left| \frac{1\,mol\,Fe_2O_3}{159.70\,g\,Fe_2O_3} \right| \frac{3\,mol\,CO}{1\,mol\,Fe_2O_3} \left| \frac{28.01\,g\,CO}{1\,mol\,CO} \right| = 78.93\,g\,CO$

b. $2.50\,mol\,CO \left| \frac{2\,mol\,Fe}{3\,mol\,CO} \right| \frac{55.85\,g\,Fe}{1\,mol\,Fe} = 93.1\,g\,Fe$

c. $100.0\,g\,Fe_2O_3 \left| \frac{1\,mol\,Fe_2O_3}{159.70\,g\,Fe_2O_3} \right| \frac{3\,mol\,CO_2}{1\,mol\,Fe_2O_3} \left| \frac{44.01\,g\,CO_2}{1\,mol\,CO_2} \right| = 82.67\,g\,CO_2$

$100.0\,g\,CO \left| \frac{1\,mol\,CO}{28.01\,g\,CO} \right| \frac{3\,mol\,CO_2}{3\,mol\,CO} \left| \frac{44.01\,g\,CO_2}{1\,mol\,CO_2} \right| = 157.1\,g\,CO_2$

d. LR – Fe_2O_3

TY – $82.67\,g\,CO_2$

e. $100.0\,g\,Fe_2O_3 \left| \frac{1\,mol\,Fe_2O_3}{159.70\,g\,Fe_2O_3} \right| \frac{3\,mol\,CO}{1\,mol\,Fe_2O_3} \left| \frac{28.01\,g\,CO}{1\,mol\,CO} \right| = 52.6\,g\,CO$ used

$100.0\,g\,CO - 52.6\,g = 47.4\,g\,CO$ left over

f. $\%\,yield = \frac{60.5\,g}{82.67\,g} \times 100 = 73.2\%$