Stoichiometry WS
Solutions

1. $Na_2SiO_3 + 8HF \rightarrow H_2SiF_6 + 2NaF + 3H_2O$

a) $.3\,mol\,Na_2SiO_3 \times \frac{8\,mols\,HF}{1\,mol\,Na_2SiO_3} = \boxed{2.4\,mol\,HF}$

b) $.5\,mol\,HF \times \frac{2\,mol\,NaF}{8\,mol\,HF} \times \frac{42\,g\,NaF}{mol\,NaF} = \boxed{5.25\,g\,NaF}$

c) $.8\,g\,HF \times \frac{mol\,HF}{20\,g\,HF} \times \frac{1\,mol\,Na_2SiO_3}{8\,mol\,HF} \times \frac{188\,g\,Na_2SiO_3}{mol\,Na_2SiO_3}$

$= \boxed{.61\,g\,Na_2SiO_3}$

2) $C_6H_2O_6 \rightarrow 2\,C_2H_5OH + 2\,CO_2$

a) $.4\,mol\,C_6H_2O_6 \times \frac{2\,mol\,CO_2}{1\,mol\,C_6H_2O_6} = \boxed{.8\,mol\,CO_2}$

b) $7.5\,g\,C_2H_5OH \times \frac{mol\,C_2H_5OH}{46\,g\,C_2H_5OH} \times \frac{1\,mol\,C_6H_2O_6}{2\,mol\,C_2H_5OH} \times \frac{180\,g\,C_6H_2O_6}{mol\,C_6H_2O_6}$

$= \boxed{14.7\,g\,C_6H_2O_6}$

c) $7.5\,g\,C_2H_5OH \times \frac{mol\,C_2H_5OH}{46\,g\,C_2H_5OH} \times \frac{2\,mol\,CO_2}{2\,mol\,C_2H_5OH} \times \frac{44\,g\,CO_2}{mol\,CO_2}$

$= \boxed{7.16\,g\,CO_2}$

3) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

a) $.15\,Kg\,Fe_2O_3 \times \frac{1000\,g}{1\,Kg} \times \frac{mol\,Fe_2O_3}{160\,g\,Fe_2O_3} \times \frac{3\,mol\,CO}{1\,mol\,Fe_2O_3} \times \frac{28\,g\,CO}{mol\,CO} = \boxed{78.75\,g\,CO}$

b) $.15\,Kg\,Fe_2O_3 \times \frac{1000\,g}{Kg} \times \frac{mol\,Fe_2O_3}{160\,g\,Fe_2O_3} \times \frac{2\,mol\,Fe}{1\,mol\,Fe_2O_3} \times \frac{55.8\,g\,Fe}{mol\,Fe} =$

$\boxed{105\,g\,Fe}$

$.15\,Kg\,Fe_2O_3 \times \frac{1000\,g}{Kg} \times \frac{mol\,Fe_2O_3}{160\,g\,Fe_2O_3} \times \frac{3\,mol\,CO_2}{1\,mol\,Fe_2O_3} \times \frac{44\,g\,CO_2}{mol\,CO_2} = \boxed{124\,g\,CO_2}$

4) $2\,NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

a) $1.85\,mol\,NaOH \times \frac{1\,mol\,CO_2}{2\,mol\,NaOH} = .925\,mol\,CO_2\ Needed$

$NaOH \rightarrow$ limiting

b) $1.85\,mol\,NaOH \times \frac{1\,mol\,Na_2CO_3}{2\,mol\,NaOH} = \boxed{.925\,mol\,Na_2CO_3}$

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

a) Find limiting

$30\,g\,C_6H_6 \times \frac{mol\,C_6H_6}{78\,g\,C_6H_6} \times \frac{1\,mol\,Br_2}{1\,mol\,C_6H_6} \times \frac{160\,g\,Br_2}{mol\,Br_2} = 61.5\,g\,Br_2$ Needed

C_6H_6 = limiting

$30\,g\,C_6H_6 \times \frac{mol\,C_6H_6}{78\,g\,C_6H_6} \times \frac{1\,mol\,C_6H_5Br}{1\,mol\,C_6H_6} \times \frac{157\,g\,C_6H_5Br}{mol\,C_6H_5Br} = \boxed{60.38\,g\,C_6H_5Br}$

b) Actual = 56.7 g

$\%\ Yield = \frac{56.7}{60.38} \times 100 = \boxed{93.9\%}$