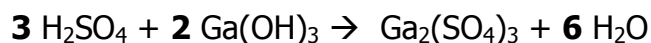1) Write a balanced equation for the reaction of sulfuric acid with gallium hydroxide to form water and gallium sulfate:

2) From the equation in part 1, determine the mass of gallium sulfate that can be made with 145 grams of sulfuric acid and 320 grams of gallium hydroxide.

3) Which is the limiting reagent in part 2?

4) How much of the excess reagent will remain once the reaction is complete?

Solutions

1) Write a balanced equation for the reaction of sulfuric acid with gallium hydroxide to form water and gallium sulfate:

3 H_2SO_4 + **2** $Ga(OH)_3$ → $Ga_2(SO_4)_3$ + **6** H_2O

2) From the equation in part 1, determine the mass of gallium sulfate that can be made with 145 grams of sulfuric acid and 320 grams of gallium hydroxide.

First determine how much gallium hydroxide you would need with 145 g of sulfuric acid. If the amount of gallium hydroxide is less than 320 g then the sulfuric acid is the limiting reagent. If it exceeds 320 g then the gallium hydroxide is the limiting reagent.

145 g H_2SO_4 x $\underline{1\ \ mol\ \ H_2SO_4}$ x $\underline{2\ mol\ Ga(OH)_3}$ x $\underline{120.74\ g\ Ga(OH)_3}$ =
           98.08 g H_2SO_4 3 mol H_2SO_4 1 mol $Ga(OH)_3$

   = 119 g $Ga(OH)_3$ (which means the limiting reagent is H_2SO_4)

145 g H_2SO_4 x $\underline{1\ \ mol\ \ H_2SO_4}$ x $\underline{1\ mol\ Ga_2(SO_4)_3}$ x $\underline{427.638\ g\ Ga_2(SO_4)_3}$=
           98.08 g H_2SO_4 3 mol H_2SO_4 1 mol $Ga_2(\underline{SO_4})_3$

   = 211 g $Ga_2(SO_4)_3$

3) Which is the limiting reagent in part 2?

Sulfuric acid

4) How much of the excess reagent will remain after the reaction is complete?

320 g Ga(OH)₃ - 119 g Ga(OH)₃ = 2̲0̲0 g Ga(OH)₃