STOICHIOMETRY - LECTURE NOTES

Homework Answers (solutions to the homework) (the 4's) – *Craig*

EXAMPLE #7:

In a single replacement reaction, aluminum metal replaces zinc in a zinc nitrate solution. Calculate the mass (in mg) of zinc metal produced in this reaction when 200 mL of a 0.440 *M* solution of zinc nitrate is reacted with 0.305 grams of aluminum metal.

Answer:

$$\underset{0.305\,g}{2\,Al} + \underset{200\,mL,\ 0.440\,M}{3\,Zn(NO_3)_2} \rightarrow 2\,Al(NO_3)_3 + \underset{?\,mg}{3\,Zn}$$

L.R. STEP:

$$\frac{200\,mL}{} \left| \frac{1\,L}{1000\,mL} \right| \frac{0.440\,mol}{L} \left| \frac{2\,mol\ Al}{3\,mol\ Zn(NO_3)_2} \right| \frac{26.98\,g}{1\,mol\ Al} = 1.58\,g\ Al$$

Al IS L.R.! IF ALL 200 mL OF THE 0.440 M $Zn(NO_3)_2$ WERE REACTED, ONE WOULD NEED AT LEAST 1.58g OF Al. WE DO NOT HAVE ENOUGH Al. $Zn(NO_3)$ IS IN EXCESS.

$$\longrightarrow \frac{0.305\,g\ Al}{} \left| \frac{1\,mol\ Al}{26.98\,g} \right| \frac{3\,mol\ Zn}{2\,mol\ Al} \left| \frac{65.39\,g}{1\,mol\ Zn} \right| \frac{1000\,mg}{1\,g} = \boxed{1.11 \times 10^3\ mg}$$

EXAMPLE #8:

325 grams of lead metal is mixed with a 3.45 *M* solution of iron(III) nitrate. Calculate the volume (in milliliters) of iron(III) nitrate needed to completely react all of the lead metal in this single replacement reaction.

Answer:

$$\underset{325\,g}{3\,Pb} + \underset{?\,mL,\ 3.45\,M}{2\,Fe(NO_3)_3} \longrightarrow 3\,Pb(NO_3)_2 + 2\,Fe$$

- NOT A L.R. PROBLEM!
- START WITH THE "SET" THAT IS COMPLETE!

$$\frac{325\,g}{} \left| \frac{1\,mol\ Pb}{207.2\,g} \right| \frac{2\,mol\ Fe(NO_3)_3}{3\,mol\ Pb} \left| \frac{L}{3.45\,mol\ Fe(NO_3)_3} \right| \frac{1000\,mL}{1\,L} =$$

3.45 M

$$\boxed{303\,mL\ Fe(NO_3)_3}$$