Unit 8 Stoichiometry **Name _____**

Hard Copy Test **Block # ____**

Use dimensional analysis to solve the following problems. Show all work. Answers must contain proper number of significant digits, appropriate units, and correct chemical formula.

8. **Determine the limiting reactant if you begin with 50.0 grams of each reactant.**

$$3\ Pb(NO_3)_{2\ (aq)} + 2\ AlCl_{3\ (aq)} \rightarrow 2\ Al(NO_3)_{3\ (aq)} + 3\ PbCl_{2\ (s)}$$

Limiting Reactant

$$\frac{50.0\ g\ Pb(NO_3)_2}{1}\left|\frac{1\ mole\ Pb(NO_3)_2}{331\ g\ Pb(NO_3)_2}\right|\frac{2\ mole\ Al(NO_3)_3}{3\ mole\ Pb(NO_3)_2}\left|\frac{213\ g\ Al(NO_3)_3}{1\ mole\ Al(NO_3)_3}\right| = 21.5\ g\ Al(NO_3)_3$$

$$\frac{50.0\ g\ AlCl_3}{1}\left|\frac{1\ mole\ AlCl_3}{133\ g\ AlCl_3}\right|\frac{2\ mole\ Al(NO_3)_3}{2\ mole\ AlCl_3}\left|\frac{213\ g\ Al(NO_3)_3}{1\ mole\ Al(NO_3)_3}\right| = 80.1\ g\ Al(NO_3)_3$$

Limiting Reactant

$$\frac{50.0\ g\ Pb(NO_3)_2}{1}\left|\frac{1\ mole\ Pb(NO_3)_2}{331\ g\ Pb(NO_3)_2}\right|\frac{3\ mole\ PbCl_2}{3\ mole\ Pb(NO_3)_2}\left|\frac{278\ g\ PbCl_2}{1\ mole\ PbCl_2}\right| = 42.0\ g\ PbCl_2$$

$$\frac{50.0\ g\ AlCl_3}{1}\left|\frac{1\ mole\ AlCl_3}{133\ g\ AlCl_3}\right|\frac{3\ mole\ PbCl_2}{2\ mole\ AlCl_3}\left|\frac{278\ g\ PbCl_2}{1\ mole\ PbCl_2}\right| = 157\ g\ PbCl_2$$

9. **What is the theoretical yield of product for the reaction above?**

$21.5\ g\ Al(NO_3)_3$ *or* $42.0\ g\ PbCl_2$

What is the limiting reactant for the reaction above? $Pb(NO_3)_2$

What is the excess reactant for the reaction above? $AlCl_3$

10. **Calculate the mass of excess reactant used and the amount leftover.**

$$\frac{50.0\ g\ Pb(NO_3)_2}{1}\left|\frac{1\ mole\ Pb(NO_3)_2}{331\ g\ Pb(NO_3)_2}\right|\frac{2\ mole\ AlCl_3}{3\ mole\ Pb(NO_3)_2}\left|\frac{133\ g\ AlCl_3}{1\ mole\ AlCl_3}\right| = 13.4\ g\ AlCl_3$$

50.0 g start – 13.4 g used = 36.6 g leftover $AlCl_3$

11. **A student performed this reaction in the lab and collected 19.5 grams of aluminum nitrate and 38.7 grams of lead II chloride. Based on the theoretical yield found above, what is the student's percent yield?**

19.5/21.5 x 100 = 90.7% **38.7/42.0 x 100 = 92.1%**