

7.1 Key

a. If 56.3 grams of barium chloride react with excess sodium phosphate, how many grams of barium phosphate will form?

$$(56.3 \text{ g BaCl}_2) \left( \frac{1 \text{ mole}}{208.236 \text{ g}} \right) \left( \frac{1 \text{ mole Ba}_3(\text{PO}_4)_2}{3 \text{ mole BaCl}_2} \right) \left( \frac{601.9327 \text{ g}}{1 \text{ mole}} \right) = 54.2474 \text{ g} \rightarrow \boxed{54.2}$$

b. Learn the formula for % yield:  $\% \text{ yield} = \frac{\text{actual (lab) value}}{\text{expected (stoichiometry) value}} \times 100\%$

c. Suppose that when the reaction in (a) is done in lab, only 53.3 grams of barium phosphate precipitate are actually collected. What was the percent yield for the reaction?

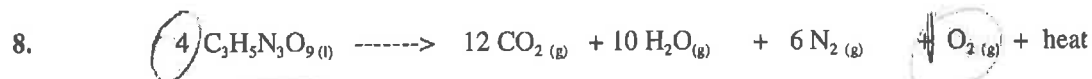
$$\frac{53.3 \text{ g}}{54.2474 \text{ g}} \times 100 = \boxed{98.3 \%}$$

d. What mass of sodium phosphate is needed to produce 100.0 grams of sodium chloride in the reaction?

$$(100.0 \text{ g NaCl}) \left( \frac{1 \text{ mole}}{58.4428 \text{ g}} \right) \left( \frac{2 \text{ moles Na}_3\text{PO}_4}{6 \text{ mole NaCl}} \right) \left( \frac{163.94076 \text{ g}}{1 \text{ mole}} \right) = \boxed{93.50 \text{ g}}$$

e. If 1.0 moles of sodium phosphate react, how many moles of barium phosphate will form?

$$(1.0 \text{ moles Na}_3\text{PO}_4) \left( \frac{1 \text{ mole Ba}_3(\text{PO}_4)_2}{2 \text{ moles Na}_3\text{PO}_4} \right) = \boxed{0.50 \text{ moles Ba}_3(\text{PO}_4)_2}$$



a. What mass of nitroglycerine are needed to produce 50.0 grams of oxygen gas?

$$(50.0 \text{ g O}_2) \left( \frac{1 \text{ mole}}{31.9988 \text{ g}} \right) \left( \frac{4 \text{ moles C}_3\text{H}_5\text{N}_3\text{O}_9}{1 \text{ mole O}_2} \right) \left( \frac{227.0872 \text{ g}}{1 \text{ mole}} \right) = 1419.3 \rightarrow \boxed{1420}$$

b. If 450 grams of nitroglycerine decompose, how many moles of carbon dioxide gas will be produced?

$$(450 \text{ g C}_3\text{H}_5\text{N}_3\text{O}_9) \left( \frac{1 \text{ mole}}{227.0872 \text{ g}} \right) \left( \frac{12 \text{ mole CO}_2}{4 \text{ moles C}_3\text{H}_5\text{N}_3\text{O}_9} \right) = \boxed{5.9 \text{ moles CO}_2}$$



a. If  $1.0 \times 10^{22}$  copper atoms react, what mass of NO gas can form?

$$(1.0 \times 10^{22} \text{ Cu atoms}) \left( \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ atoms}} \right) \left( \frac{2 \text{ mole NO}}{3 \text{ mole Cu}} \right) \left( \frac{30.0061 \text{ g}}{1 \text{ mole}} \right) = 0.33229 \rightarrow \boxed{0.33}$$

b. Suppose that the actual mass of NO collected in (a) is only 0.31 grams. Calculate the % yield.

$$\frac{0.31}{0.33229} \times 100 = \boxed{93 \%} \quad (\text{was } 93.29 \text{ before rounding})$$

c. If 10.0 grams of copper react, what mass of water can form in the reaction?

$$(10.0 \text{ g Cu}) \left( \frac{1 \text{ mole}}{63.546 \text{ g}} \right) \left( \frac{4 \text{ moles H}_2\text{O}}{3 \text{ moles Cu}} \right) \left( \frac{18.0152 \text{ g}}{1 \text{ mole}} \right) = \boxed{3.78 \text{ g H}_2\text{O}}$$