

Chapter 9 Presentation Practice

1. You are making brownies for a Chemistry Lovers event in Denver! You have the following available: 8 cups butter, 10 cups sugar, 15 cups flour, 7 cups cocoa powder, 12 eggs

The following recipe can be used to make delicious brownies:

1 cup butter + 2 cups sugar + 1 cup flour + .5 cups cocoa powder + 4 eggs → 32 brownies

- What is the limiting ingredient?
- Amount of butter left?
- Amount of sugar left?
- Amount of flour left?
- Amount of cocoa powder left?
- Number of eggs left?
- Number of delicious brownies made?

2. You work in Papa's Pizzeria! You have the following available: 40 cups pepperoni, 30 cups chopped pineapple, 35 cups cheese, 15 tbs seasoning. The following recipe is used to make Papa's signature pizza:

3 cups pepperoni + 2 cups pineapple + 4 cups cheese + 3 tbsp seasoning → 5 Papa's Pizzas

- What is the limiting ingredient?
- Amount of pepperoni left?
- Amount of pineapple left?
- Amount of cheese left?
- Amount of seasoning left?
- Number of Papa's Pizzas made?

Molecular Weights

FeCl₂ = 126.75 g/mol

AgNO₃ = 169.87 g/mol

Fe(NO₃)₂ = 179.85 g/mol

AgCl = 143.32 g/mol

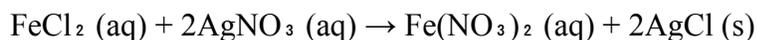
O₂ = 32.00 g/mol

C₂H₅OH = 46.07 g/mol

CO₂ = 44.01 g/mol

H₂O = 18.02 g/mol

3. You perform a reaction with 55.0 g of FeCl₂ and 82.0 g AgNO₃



- What is the limiting reactant?
- How many grams of excess reagent will be left over?
- What is the theoretical yield in grams of AgCl?
- What is the percent yield if you performed the reaction and produced 72.0 grams of AgCl?

4. You perform a reaction with 75.0 g O₂ and 100. g C₂H₅OH



- What is the limiting reactant?
- How many grams of excess reagent will be left over?
- What is the theoretical yield in grams of CO₂?
- How many Joules of heat will be produced?

Answer Key

- eggs
 - 5 cups butter
 - 4 cups sugar
 - 12 cups flour
 - 5.5 cups cocoa powder
 - 0 eggs
 - 96 brownies

- seasoning
 - 25 cups pepperoni
 - 20 cups pineapple
 - 15 cups cheese
 - 0 tbsp seasoning
 - 25 pizzas

- AgNO_3
 - 24.4 g FeCl_2 used
 - 69.2 g AgCl
 - 104%

- O_2
 - 64.0 g $\text{C}_2\text{H}_5\text{OH}$ left
 - 68.8 g CO_2
 - $1.95 \times 10^5 \text{ J}$

$$1. \frac{8 \text{ cups butter} \times 32 \text{ brownies}}{1 \text{ cup butter}} = 256 \text{ brownies}$$

$$\frac{10 \text{ cups sugar} \times 32 \text{ brownies}}{2 \text{ cups sugar}} = 160 \text{ brownies}$$

$$\frac{15 \text{ cups flour} \times 32 \text{ brownies}}{1 \text{ cup flour}} = 480 \text{ brownies}$$

$$\frac{7 \text{ cups cocoa} \times 32 \text{ brownies}}{0.5 \text{ cups cocoa}} = 448 \text{ brownies}$$

$$\frac{12 \text{ eggs} \times 32 \text{ brownies}}{4 \text{ eggs}} = 96 \text{ brownies}$$

$$\frac{12 \text{ eggs} \times 1 \text{ cup butter}}{4 \text{ eggs}} = 3 \text{ cups butter used} \rightarrow 8-3 = 5 \text{ cups left}$$

$$\frac{12 \text{ eggs} \times 2 \text{ cups sugar}}{4 \text{ eggs}} = 6 \text{ cups sugar used} \rightarrow 10-6 = 4 \text{ cups left}$$

$$\frac{12 \text{ eggs} \times 1 \text{ cup flour}}{4 \text{ eggs}} = 3 \text{ cups flour used} \rightarrow 15-3 = 12 \text{ cups left}$$

$$\frac{12 \text{ eggs} \times 0.5 \text{ cups cocoa}}{4 \text{ eggs}} = 1.5 \text{ cups cocoa used} \rightarrow 7-1.5 = 5.5 \text{ left}$$

$$3. \frac{55.0 \text{ g FeCl}_2 \times 1 \text{ mol}}{126.75 \text{ g}} \times \frac{2 \text{ mol AgCl}}{1 \text{ mol FeCl}_2} \times \frac{143.32 \text{ g}}{1 \text{ mol}} = 124.38 \text{ g AgCl}$$

$$\frac{82.0 \text{ g AgNO}_3 \times 1 \text{ mol}}{169.87 \text{ g}} \times \frac{2 \text{ mol AgCl}}{2 \text{ mol AgNO}_3} \times \frac{143.32 \text{ g}}{1 \text{ mol}} = 69.18 \text{ g AgCl}$$

$$\frac{82.0 \text{ g AgNO}_3 \times 1 \text{ mol}}{169.87 \text{ g}} \times \frac{1 \text{ mol FeCl}_2}{2 \text{ mol AgNO}_3} \times \frac{126.75 \text{ g}}{1 \text{ mol}} = 30.59 \text{ g FeCl}_2 \text{ used}$$

$$55.0 - 30.59 = 24.407 \text{ g left}$$

$$\frac{72.0 \text{ g AgCl}}{69.18 \text{ g AgCl}} \times 100 = 104\%$$

$$2. \frac{40 \text{ cups pepperoni} \times 5 \text{ pizzas}}{3 \text{ cups pepperoni}} = 67 \text{ pizzas}$$

$$\frac{30 \text{ cups pineapple} \times 5 \text{ pizzas}}{2 \text{ cups pineapple}} = 75 \text{ pizzas}$$

$$\frac{35 \text{ cups cheese} \times 5 \text{ pizzas}}{4 \text{ cups cheese}} = 44 \text{ pizzas}$$

$$\frac{15 \text{ tbs seasoning} \times 5 \text{ pizzas}}{3 \text{ tbs seasoning}} = 25 \text{ pizzas}$$

$$\frac{15 \text{ tbs seasoning} \times 3 \text{ cups pepperoni}}{3 \text{ tbs seasoning}} = 15 \text{ cups used} \rightarrow \overset{40-15}{25 \text{ cups left}}$$

$$\frac{15 \text{ tbs seasoning} \times 2 \text{ cups pineapple}}{3 \text{ tbs seasoning}} = 10 \text{ cups used} \rightarrow \overset{30-10}{20 \text{ cups left}}$$

$$\frac{15 \text{ tbs seasoning} \times 4 \text{ cups cheese}}{3 \text{ tbs seasoning}} = 20 \text{ cups used} \rightarrow \overset{35-20}{15 \text{ cups left}}$$

$$4. \frac{75.0 \text{ g O}_2 \times 1 \text{ mol}}{32 \text{ g O}_2} \times \frac{2 \text{ mol CO}_2}{3 \text{ mol O}_2} \times \frac{44.01 \text{ g}}{1 \text{ mol}} = 68.77 \text{ g CO}_2$$

$$\frac{100. \text{ g C}_2\text{H}_5\text{OH} \times 1 \text{ mol}}{46.07 \text{ g}} \times \frac{2 \text{ mol CO}_2}{1 \text{ mol C}_2\text{H}_5\text{OH}} \times \frac{44.01 \text{ g}}{1 \text{ mol}} = 191.06 \text{ g CO}_2$$

$$\frac{75.0 \text{ g O}_2 \times 1 \text{ mol}}{32 \text{ g O}_2} \times \frac{1 \text{ mol C}_2\text{H}_5\text{OH}}{3 \text{ mol O}_2} \times \frac{46.07 \text{ g}}{1 \text{ mol}} = 35.992 \text{ g C}_2\text{H}_5\text{OH used}$$

$$100. - 35.992 = 64.0078 \text{ g left}$$

$$\frac{75 \text{ g O}_2 \times 1 \text{ mol}}{32 \text{ g O}_2} \times \frac{250 \text{ kJ}}{3 \text{ mol O}_2} \times \frac{1000 \text{ J}}{1 \text{ kJ}} = 1.953125 \text{ J}$$

