

Stoichiometry Worksheet 3 – Gram-to-Gram Calculations

Learning Target Students will calculate the theoretical yield in moles and grams

Textbook Section 9.2

Directions: You must solve each of the following problems using dimensional analysis. EVERY number in your work should be followed by a unit and a formula.

- For this reaction: $\text{Fe}_3\text{O}_4 + 4 \text{CO} \rightarrow 3 \text{Fe} + 4 \text{CO}_2$
 - How many grams of iron are produced from 23.2 grams of carbon monoxide?

 - How many grams of carbon dioxide are produced to react with 0.945 grams of Fe_3O_4 ?

- For this reaction: $6 \text{PbO} + \text{O}_2 \rightarrow 2 \text{Pb}_3\text{O}_4$
 - How many grams of Pb_3O_4 are produced from 7.85 grams of lead(II) oxide?

 - How many grams of lead(II) oxide must react with 1.75 grams of oxygen?

- For this reaction: $4 \text{Al} + 3 \text{O}_2 \rightarrow 2 \text{Al}_2\text{O}_3$
 - How many grams of aluminum oxide will be formed from 17 grams of aluminum reacting?

 - How many grams of oxygen are needed to react with 12.8 grams of aluminum?

- For this reaction: $4 \text{NH}_3 + 5 \text{O}_2 \rightarrow 4 \text{NO} + 6 \text{H}_2\text{O}$
 - How many grams of oxygen are needed to react with 1.24 grams of NH_3 ?

 - How many grams of water are produced from 7.65 grams of oxygen?

1a) 34.7 g iron
3a) 32 g aluminum oxide

1b) 0.718 g carbon dioxide
3b) 11.4 g oxygen

2a) 8.04 g Pb_3O_4
4a) 2.91 g oxygen

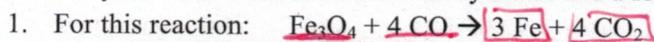
2b) 73.2 g lead(II) oxide
4b) 5.17 g water

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Directions: You must solve each of the following problems using dimensional analysis. EVERY number in your work should be followed by a unit and a formula.



a. How many grams of iron are produced from 23.2 grams of carbon monoxide?

$$\frac{23.2 \text{ g CO}}{1} \cdot \frac{1 \text{ mole CO}}{28 \text{ g CO}} \cdot \frac{3 \text{ moles Fe}}{4 \text{ moles CO}} \cdot \frac{56 \text{ g Fe}}{1 \text{ mole Fe}} = 34 \text{ g Fe}$$

b. How many grams of carbon dioxide are produced to react with 0.945 grams of Fe_3O_4 ?

$$\frac{0.945 \text{ g Fe}_3\text{O}_4}{1} \cdot \frac{1 \text{ mole Fe}_3\text{O}_4}{232 \text{ g Fe}_3\text{O}_4} \cdot \frac{4 \text{ moles CO}_2}{1 \text{ mole Fe}_3\text{O}_4} \cdot \frac{44 \text{ g CO}_2}{1 \text{ mole CO}_2} = 0.72 \text{ g Fe}_3\text{O}_4$$



a. How many grams of Pb_3O_4 are produced from 7.85 grams of lead(II) oxide?

$$\frac{7.85 \text{ g PbO}}{1} \cdot \frac{1 \text{ mole PbO}}{223 \text{ g PbO}} \cdot \frac{2 \text{ moles Pb}_3\text{O}_4}{6 \text{ moles PbO}} \cdot \frac{685 \text{ g Pb}_3\text{O}_4}{1 \text{ mole Pb}_3\text{O}_4} = 8.04 \text{ g Pb}_3\text{O}_4$$

b. How many grams of lead(II) oxide must react with 1.75 grams of oxygen?

$$\frac{1.75 \text{ g O}_2}{1} \cdot \frac{1 \text{ mole O}_2}{32 \text{ g O}_2} \cdot \frac{6 \text{ moles PbO}}{1 \text{ mole O}_2} \cdot \frac{223 \text{ g PbO}}{1 \text{ mole PbO}} = 73 \text{ g PbO}$$



a. How many grams of aluminum oxide will be formed from 17 grams of aluminum reacting?

$$\frac{17 \text{ g Al}}{1} \cdot \frac{1 \text{ mole Al}}{27 \text{ g Al}} \cdot \frac{2 \text{ moles Al}_2\text{O}_3}{4 \text{ moles Al}} \cdot \frac{102 \text{ g Al}_2\text{O}_3}{1 \text{ mole Al}_2\text{O}_3} = 32 \text{ g Al}_2\text{O}_3$$

b. How many grams of oxygen are needed to react with 12.8 grams of aluminum?

$$\frac{12.8 \text{ g Al}}{1} \cdot \frac{1 \text{ mole Al}}{27 \text{ g Al}} \cdot \frac{3 \text{ moles O}_2}{4 \text{ moles Al}} \cdot \frac{32 \text{ g O}_2}{1 \text{ mole O}_2} = 11 \text{ g O}_2$$



a. How many grams of oxygen are needed to react with 1.24 grams of NH_3 ?

$$\frac{1.24 \text{ g NH}_3}{1} \cdot \frac{1 \text{ mole NH}_3}{17 \text{ g NH}_3} \cdot \frac{5 \text{ moles O}_2}{4 \text{ moles NH}_3} \cdot \frac{32 \text{ g O}_2}{1 \text{ mole O}_2} = 2.9 \text{ g O}_2$$

b. How many grams of water are produced from 7.65 grams of oxygen?

$$\frac{7.65 \text{ g O}_2}{1} \cdot \frac{1 \text{ mole O}_2}{32 \text{ g O}_2} \cdot \frac{6 \text{ moles H}_2\text{O}}{5 \text{ moles O}_2} \cdot \frac{18 \text{ g H}_2\text{O}}{1 \text{ mole H}_2\text{O}} = 5.2 \text{ g H}_2\text{O}$$

1a) 34.7 g iron

3a) 32 g aluminum oxide

1b) 0.718 g carbon dioxide

3b) 11.4 g oxygen

2a) 8.04 g Pb_3O_4

4a) 2.91 g oxygen

2b) 73.2 g lead(II) oxide

4b) 5.17 g water