

## GFM, Percent Composition and Mole Conversions Practice

- What is the gram-formula mass of  $(\text{NH}_4)_3\text{PO}_4$ ?  
A) 112 g/mol      C) **149 g/mol**  
B) 121 g/mol      D) 242 g/mol
- The gram-formula mass of a compound is 48 grams. The mass of 1.0 mole of this compound is  
A) 1.0 g    B) 4.8 g    C) **48 g**    D) 480 g
- What is the mass in grams of 2.0 moles of  $\text{NO}_2$ ?  
A) **92**    B) 60.    C) 46    D) 30.
- What is the total mass in grams of 0.75 mole of  $\text{SO}_2$ ?  
A) 16 g    B) 24 g    C) 32 g    D) **48 g**
- Which quantity is equivalent to 39 grams of  $\text{LiF}$ ?  
A) 1.0 mole      C) 0.50 mole  
B) 2.0 moles      D) **1.5 moles**
- Which compound has the *smallest* percent composition by mass of chlorine?  
A)  $\text{HCl}$     B)  **$\text{KCl}$**     C)  $\text{LiCl}$     D)  $\text{NaCl}$
- The percent composition by mass of nitrogen in  $\text{NH}_4\text{OH}$  (gram-formula mass = 35 grams/mole) is equal to  
A)  $\frac{4}{35} \times 100$       C)  $\frac{35}{14} \times 100$   
B)  $\frac{14}{35} \times 100$       D)  $\frac{35}{4} \times 100$
- A hydrate is a compound that includes water molecules within its crystal structure. During an experiment to determine the percent by mass of water in a hydrated crystal, a student found the mass of the hydrated crystal to be 4.10 grams. After heating to constant mass, the mass was 3.70 grams. What is the percent by mass of water in this crystal?  
A) 90.%    B) 11%    C) **9.8%**    D) 0.40%
- A hydrate is a compound with water molecules incorporated into its crystal structure. In an experiment to find the percent by mass of water in a hydrated compound, the following data were recorded:

Mass of crucible + hydrated crystals before heating	7.50 grams
Mass of crucible	6.90 grams
Mass of crucible + anhydrous crystals after heating	7.20 grams

What is the percent by mass of water in the hydrate?

- A) 8.0%    B) **50.%**    C) 72.%    D) 96.%

- The percent by mass of water in  $\text{BaCl}_2 \cdot 2 \text{H}_2\text{O}$  (formula mass = 243) is equal to  
A)  $\frac{18}{243} \times 100$       C)  $\frac{243}{18} \times 100$   
B)  $\frac{36}{243} \times 100$       D)  $\frac{243}{36} \times 100$
- Given the equation representing a reaction:  
 $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$   
Which type of chemical reaction is represented by the equation?  
A) synthesis      C) **single replacement**  
B) decomposition    D) double replacement
- Which terms identify types of chemical reactions?  
A) decomposition and sublimation  
B) **decomposition and synthesis**  
C) deposition and sublimation  
D) deposition and synthesis
- The gram-formula mass of  $(\text{NH}_4)_2\text{CO}_3$  is  
A) 46.0 g      C) 78.0 g  
B) 64.0 g      D) **96.0 g**
- What is the gram formula mass of  $\text{Ca}_3(\text{PO}_4)_2$ ?  
A) 196 g      C) 245 g  
B) 214 g      D) **310. g**
- What is the percent composition by mass of aluminum in  $\text{Al}_2(\text{SO}_4)_3$  (gram-formula mass = 342 grams/mole)?  
A) 7.89%      C) 20.8%  
B) **15.8%**      D) 36.0%

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16. In a laboratory experiment, a student determined the mass of the product,  $\text{HgBr}(s)$ , to be 98.7 grams.

*a* Calculate the gram formula mass of  $\text{HgBr}(s)$ . Round atomic masses from the Periodic Table to the nearest tenth. [Show all work. Indicate the correct answer in proper significant figures and include an appropriate unit.]

*b* Calculate the number of moles of  $\text{HgBr}(s)$  produced. [Show all work. Indicate the correct answer in proper significant figures.]

17. In a laboratory experiment, a student determined the mass of the product,  $\text{NH}_4\text{NO}_3(s)$ , to be 7.89 grams.

*a*. Calculate the gram formula mass of  $\text{NH}_4\text{NO}_3(s)$ . Round atomic masses from the Periodic Table to the nearest tenth. [Show all work. Indicate the correct answer in proper significant figures and include an appropriate unit.]

*b*. Calculate the number of moles of  $\text{NH}_4\text{NO}_3(s)$  produced. [Show all work. Indicate the correct answer in proper significant figures.]

18. The following procedures are carried out during a laboratory activity to determine the mass in grams of  $\text{CuSO}_4$  in a hydrated sample of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ .

Step 1 Determine the mass in grams of the crucible and  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ .

Step 2 Determine the mass in grams of the crucible and  $\text{CuSO}_4$

Step 3 Determine the mass in grams of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ .

Step 4 Determine the mass in grams of the empty crucible.

Step 5 Determine the mass in grams of  $\text{CuSO}_4$

Arrange the steps above in the order that the student should use to determine the mass of  $\text{CuSO}_4$  in the sample.

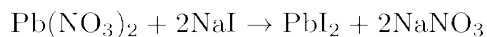
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19. Base your answer to the following question on the information below and on your knowledge of chemistry.

In a laboratory investigation, a solution that contains 13.2 grams of  $\text{Pb}(\text{NO}_3)_2$  reacts completely with a solution that contains 12.0 grams of  $\text{NaI}$ , producing 18.4 grams of  $\text{PbI}_2$  and an undetermined mass of a second product,  $\text{NaNO}_3$ . This reaction is represented by the balanced equation below.



Determine the mass of  $\text{NaNO}_3$  produced.

20. Base your answers to the following questions on the information below.

Scientists discovered, and have confirmed, that sulfur dioxide ( $\text{SO}_2$ ) and nitrogen oxides ( $\text{NO}_x$ ) are the primary causes of acid rain. In the US, about  $\frac{2}{3}$  of all  $\text{SO}_2$  comes from electric power generation that relies on burning fossil fuels like coal.

When sulfur dioxide reaches the atmosphere, it oxidizes to first form sulfur trioxide  $\text{SO}_3$ . It then becomes sulfuric acid as it joins with water in the air and falls back down to earth.

Acid rain causes acidification of lakes and streams. In addition, acid rain accelerates the decay of building materials and paints, including irreplaceable buildings, statues, and sculptures that are part of our nation's cultural heritage.

a Write a balanced chemical equation for the reaction between  $\text{SO}_2$  and  $\text{O}_2$  to form sulfur trioxide.

b Write a balanced chemical equation for the reaction between water and sulfur trioxide to form sulfuric acid. (See Reference Table K for the Formula of Sulfuric Acid)

c Buildings and statues are often made of limestone which is composed of calcium carbonate. Write the formula of calcium carbonate.

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# Answer Key

## Mole Conversions, GFM and Percent Composition Practice 2019

- C
- C
- A
- D
- D
- B
- B
- C
- B
- B
- C
- B
- D
- D
- B
- a)  $200.6 + 79.9 = 280.5\text{g}$  b)  $98.7\text{g} \times 1.00 \text{ mole}/280.5\text{g} = 0.352 \text{ mole}$
- a)  $14.0 + 4(1.0) + 14.0 + 3(16.0) = 80.0$   
g b)  $7.89\text{g} \times 1.00 \text{ mole}/80.0\text{g} = 0.0986 \text{ mole}$
- 4,1,3,2,5
- 6.8 g
- a)  $2 \text{SO}_2 + \text{O}_2 \rightarrow 2 \text{SO}_3$   
b)  $\text{H}_2\text{O} + \text{SO}_3 \rightarrow \text{H}_2\text{SO}_4$  c)  $\text{CaCO}_3$