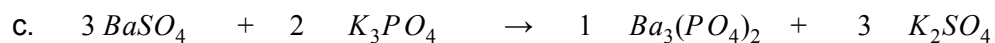
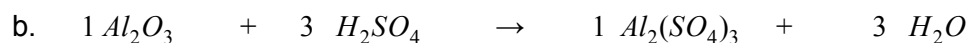
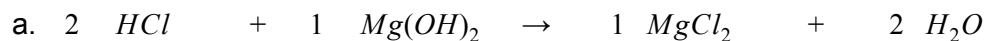


Review of Chemical Principles and Fundamentals

1. Balance the following equations below.



2. What is the molar mass of a sample if a single molecule of it weighs 5.34×10^{-27} g?

3.22×10^{-27} g/mol

3. What is the mass percent of the elements in $\text{Sr(NO}_2)_2$?

Sr: 48.78%

N: 15.60%

O: 35.63%

4. 0.314 mol of a diatomic molecule has a mass of 10.05g. Identify the molecule.

O₂

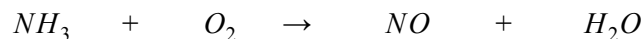
5. Calculate the volume of 0.642M KOH (aq) that should be used to make 1.00 L of 0.101M KOH.

157 mL

6. Hard water is water that has high mineral content (mainly Calcium and Magnesium). A concentration above 5.30×10^{-3} M is considered to be very hard water. Assuming that there are no magnesium ions present, is a 0.400 L solution of 0.120 g CaCO_3 and 0.155g CaSO_4 very hard water?

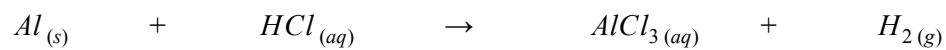
yes

7. For the following equation, determine the limiting reagent if 21.4g of NH_3 is reacted with 42.5g of O_2 .



O_2

8. For the following reaction, how many grams of AlCl_3 would be obtained if 5.43g of aluminum and 7.80g of hydrogen chloride (HCl) was used in the reaction?



9.51g

9. You think you synthesized 2-Nitrotoluene. You find that the molecular mass is 137.1g/mol. You find that the empirical formula is $\text{C}_7\text{H}_7\text{NO}_2$. Find the molecular formula of the compound you have synthesized.

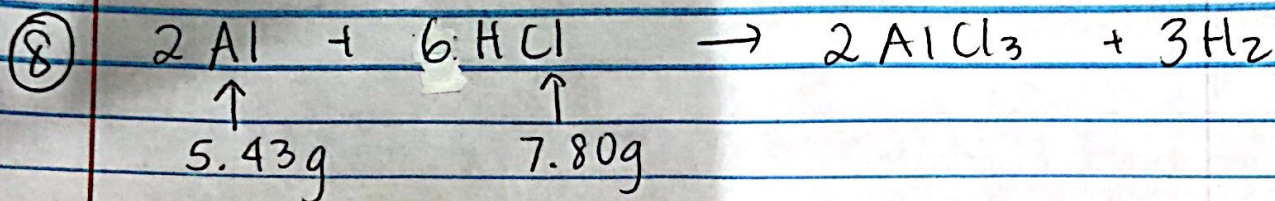
$\text{C}_7\text{H}_7\text{NO}_2$

10. You analyze a sample and find that it contains, in a 23.1g sample, 8.94g C, 2.25g H, and 11.92g O. Find the empirical formula of this compound.

CH₃O

11. Determine the molecular formula of a compound with the following composition by mass: 18% C, 2.5% H, 63.5% I, x% O, and a molar mass of 400g/mol.

C₆H₁₀O₄I₂



$$\frac{5.43 \text{g Al}}{26.98 \text{g/mol Al}} = 0.201 \text{ mol Al}$$

$$\frac{7.80 \text{g HCl}}{(1 + 35.45) \text{g/mol HCl}} = 0.214 \text{ mol HCl}$$

$$\frac{0.201 \text{ mol Al}}{2} = 0.1 \quad \text{VS.} \quad \frac{0.214 \text{ mol HCl}}{6} = 0.0357$$

↑
*smaller

*HCl is limiting!

$$0.214 \text{ mol HCl} \times \frac{2 \text{ mol AlCl}_3}{6 \text{ mol HCl}} \times (26.98 + 3(35.45)) \text{g} = 9.51 \text{g}$$

1 mol AlCl₃

10. Determine the molecular formula of a compound with the following composition by mass:

18% C, 2.5% H, 63.5% I, x% O, and a molar mass of 400g/mol.
 $\uparrow 16 (100 - 18 - 2.5 - 63.5)$

$$\frac{18 \text{ g C}}{12.01 \text{ g C/mol}} = 1.50 \text{ mol C}$$

$$\frac{2.5 \text{ g H}}{1 \text{ g H/mol}} = 2.48 \text{ mol H}$$

$$\frac{63.5 \text{ g I}}{126.9 \text{ g I/mol}} = 0.50038 \text{ mol I} \quad \leftarrow \text{smallest}$$

$$\frac{16 \text{ g O}}{16 \text{ g O/mol}} = 1 \text{ mol O}$$

empirical formula: $3\text{C} : 5\text{H} : 1\text{I} : 2\text{O}$
 $= \text{C}_3\text{H}_5\text{IO}_2$

molar mass: 199.937 g/mol

$$\frac{400}{199.937} = \sim 2$$

$\rightarrow \times 2$ every subscript

