

Stoichiometry (stoich) notes

1. What is Stoichiometry? _____

To make brownies, the recipe calls for you to mix together 1 box of mix, 3 eggs, 1 cup water, and $\frac{1}{2}$ cup oil.

The "recipe" ratio is 1 box mix : 3 eggs : 1 cup of water : $\frac{1}{2}$ cup of oil

2. A double recipe would be: _____ box mix : _____ eggs : _____ cup of water : _____ cup of oil

That was easy. How many cups of oil are required to make 2.50 batches of brownies? Not an impossible task to figure out, but you'd need to do some calculations. That's what stoich is about, except we use balanced equations instead of recipes.

3. $4\text{Al}_{(s)} + 3\text{O}_{2(g)} \rightarrow 2\text{Al}_2\text{O}_{3(s)}$ What is the mole ratio for this equation? _____

4. If you used up 8 moles of Al, how much O_2 would you need to complete the reaction? _____

5. If you used up only one mole of Al, how many moles of $2\text{Al}_2\text{O}_{3(s)}$ would form? _____

6. If you react 316.5 grams of Al, how many liters of O_2 would be necessary to complete the reaction?
Start at mass island I - and convert grams Al \rightarrow moles of Al

Second step is called going through the MOLE RATIO TUNNEL.

The last step is converting the moles of oxygen \rightarrow liters of oxygen

7. There are 3 “levels” of questions in stoich. Not harder, just longer or shorter.

The longest are called 3 step stoich problems. Examples include

The medium long ones are called 2 step stoich problems. Examples include

The shortest problems are called one-step—or moles to moles problems. The only example is

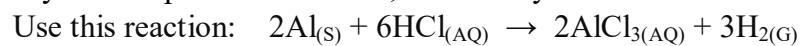
New Reaction now...

8. Propane (C_3H_8) gas burns with oxygen and forms carbon dioxide and water gases.

If 56.8 grams of $C_3H_{8(g)}$ is used up, how many liters of CO_2 form?

(3 steps) Start with a balanced equation:

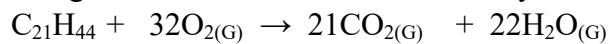
9. If you use up 23.1 moles HCl, how many formula units of aluminum chloride form?



10. If 371.5 grams of candle wax ($\text{C}_{21}\text{H}_{44}$) combusts. Assume STP; how many liters of CO_2 gas form?

Write the balanced equation first.

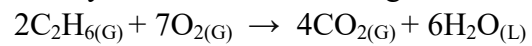
11. Using the same combustion reaction, if you consume 23.9 moles of O₂, how many moles of H₂O form?



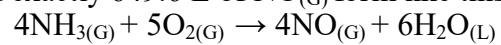
12. You have 4.56×10^{25} atoms of Zn that you put into H₃PO_{4(AQ)} to make them fizz away.
How many grams of hydrogen gas form?

14. How many liters of nitrogen gas are required to combine with 809 liters of hydrogen when ammonia forms? Balance the equation. Write the balanced equation first.

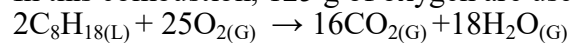
15. If exactly 15.6 moles of ethane gas combusts like this, how many moles of oxygen are used?



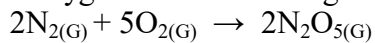
16. If exactly 649.6 L of $\text{NO}(\text{G})$ form like this, how many liters of O_2 are used?



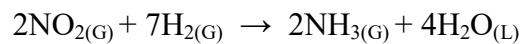
17. In this combustion, 125 g of oxygen are used up. How many g of H₂O are produced?



18. 105 g of N₂ react with oxygen to form dinitrogen pentoxide. How many molecules of O₂ are required in this reaction?



19. In an odd chemical reaction, 0.135 moles of H_2 reacts. How many grams of NH_3 form in this reaction?



This is hardest stoich problem I could ever imagine, and the last one you have to do:

20. When 9.42×10^{25} atoms of phosphorous react with sufficient chlorine to make phosphorous pentachloride, how many molecules of chlorine gas are necessary?