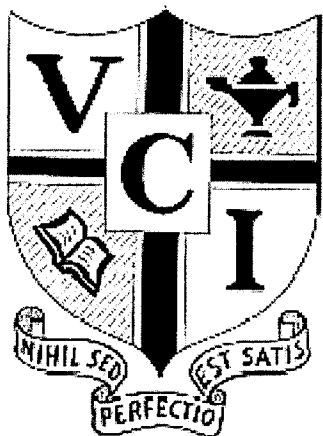


Science Notebook



30S

Chemistry

Stoichiometry

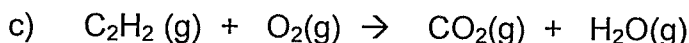
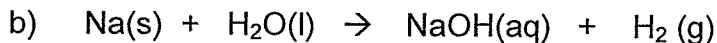
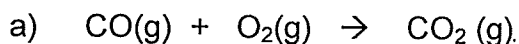
Student Name: _____ Date: _____

30S Chemistry

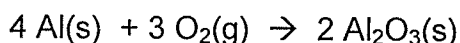
Stoichiometry Introductory Questions

Answer the following questions in your Chemistry notebook. Show your work for any calculations.

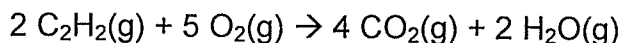
1. After balancing each of these equations, interpret them in terms of relative quantities in the following ways:
- Number of representative particles;
 - Number of moles;
 - Masses of reactants and products; and
 - Volumes of gases at STP (where appropriate)



2. The formation of aluminum oxide from its constituent elements is represented by this equation:



- a) Write the six mole ratios of that can be derived from this equation.
- b) How many moles of aluminum are needed to form 2.3 mol of Al_2O_3 ?
- c) How many moles of oxygen are required to react completely with 0.84 moles of Al?
- d) Calculate the number of moles of Al_2O_3 formed when 17.2 moles of O_2 react with aluminum.
3. The complete combustion of ethyne gas is represented by this equation:

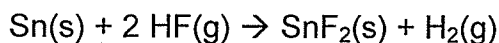


- a) How many grams of oxygen are required to "burn" 13.0g of C_2H_2 ?
- b) How many grams of CO_2 and grams of H_2O are produced when 13.0g of C_2H_2 react with the oxygen required to burn 13.0g of C_2H_2 ?
- c) Use the answers from a and b above to show that this equation obeys the law of conservation of matter.

4. Ethyne gas, C_2H_2 , is produced by adding water to calcium carbide, CaC_2 , as shown in the following equation:



- How many grams of ethyne are produced by adding water to 5.00g of CaC_2 ?
 - How many moles of CaC_2 are needed to react completely with 98.0g of H_2O ?
 - How many grams of $Ca(OH)_2$ are produced when 5.34 mol of C_2H_2 are produced?
5. Tin (II) fluoride, formerly found in many toothpastes, is formed in this reaction:



- How many grams of SnF_2 can be made by reacting 7.2×10^{24} molecules of HF with Sn?
 - How many litres of hydrogen gas, at STP, are produced by reacting 23.4g of Sn with HF?
 - How many litres of HF are needed to produce 14.2L of H_2 , assuming STP conditions?
 - How many molecules of H_2 are produced by the reaction of tin with 80.0L of HF (at STP)?
6. On the attached page:
- Find and record a balanced chemical equation of your choice,
 - Compose a four-part (a-d), series of questions related to the reaction, using the questions on this assignment as models and your own creativity.
- a) Include an answer key showing the complete solutions to the problems you create. Your problem will be shared with our class for review!

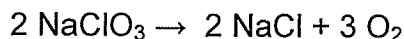
Student Name: _____ Date: _____

30S Chemistry

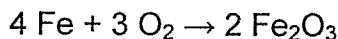
Chemical Reactions Stoichiometry Practice

Solve each of the following problems. Be sure to show ALL work.

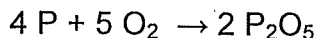
1. Given 0.880 moles of sodium chlorate, NaClO_3 , how many moles of O_2 could be produced if the compound decomposes as follows:



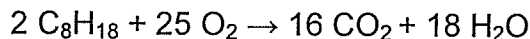
2. If you wanted to make 7.40 moles of Fe_2O_3 according to the following synthesis reaction, you would need to use how many moles of O_2 molecules?



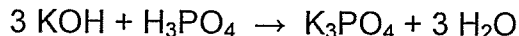
3. When 7.60 moles of O_2 combines with phosphorous, P, how many moles of P_2O_5 are produced?



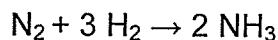
4. How many moles of O_2 molecules are needed to burn 0.300 moles of octane, C_8H_{18} , according to the equation:



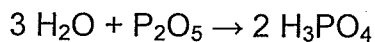
5. If 0.660 moles of potassium hydroxide, KOH, reacts, how many grams of K_3PO_4 will be produced? The reaction is:



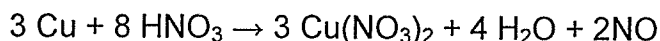
6. What mass of ammonia, NH_3 , can be produced from 5.00 moles of H_2 according to the equation:



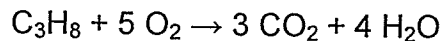
7. If you have 1.32 moles of diphosphorus pentoxide, P_2O_5 , available to react, how many grams of phosphoric acid, H_3PO_4 , could be produced?



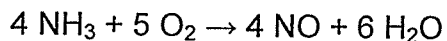
8. What mass (g) of NO is formed from 2.90 moles of nitric acid, HNO_3 , reacting with copper as follows:



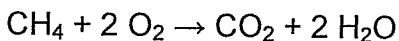
9. When 63.8g of propane, C_3H_8 , is burned in a gas BBQ, how many moles of water, H_2O , are produced?



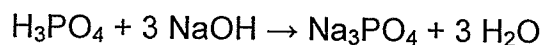
10. When 47.6g of NH_3 burns, how many moles of O_2 are required?



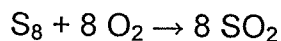
11. How many grams of O_2 are needed to burn 3.84g of methane, CH_4 ?



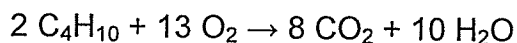
12. What mass (g) of H_3PO_4 will react with 54.0g of $NaOH$, sodium hydroxide?



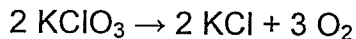
13. When 154g of sulfur burns, what mass of SO_2 is produced?



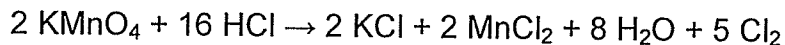
14. If a BIC butane lighter burns up 0.440g of butane, C_4H_{10} , each time it's used, how many grams of CO_2 are produced?



15. Decomposition of 49.0g of $KClO_3$ produces how many grams of O_2 ?



16. What mass (g) of $KMnO_4$ is needed to produce 17.8g of Cl_2 ?



Student Name: _____ Date: _____

305 Chemistry Empirical and Molecular Formula Practice

Answer each of the following questions in your notebook. Show all work.
Practice Determining Empirical Formulas:

1. Calculate the empirical formula of the compound that contains 1.0 g S for each 1.5 g O.
2. Calculate the empirical formula of the compound containing 75.0% C and 25.0% H.
3. Calculate the empirical formula of the compound containing 81.8% C and 18.2% H.
4. Determine the empirical formula of the compound containing 37.5% C, 12.5% H, and 50.0% O by weight.
5. Determine the empirical formula of the compound containing 26.1% C, 4.3% H, and 69.6% O by weight.
6. Determine the empirical formula of the compound containing 38.7% C, 16.1% H, and 45.2% N by weight.
7. What is the empirical formula of a compound if a 50.0 g sample of it contains 9.1 g Na, 20.6 g Cr, and 22.2 g O?

Practice Determining Molecular Formulas:

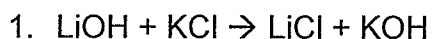
8. Empirical formula C_3H_7 , molecular weight 86g.
9. Empirical formula S, molecular weight 256g.
10. Empirical formula CH, molecular weight 26g.
11. Empirical formula NO_2 , molecular weight 46g.

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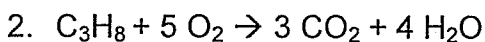
305 Chemistry

Stoichiometry Percent, Actual and Theoretical Yield

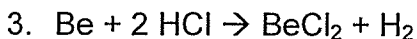
Answer the following questions. Show all work.



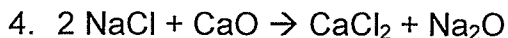
- The reaction began with 20 grams of lithium hydroxide. What is the theoretical yield of lithium chloride?
- 6 grams of lithium chloride was actually produced. Calculate the % yield.



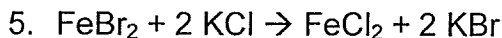
- If I start with 5 grams of C_3H_8 , what is my theoretical yield of water?
- I got a percent yield of 75%. How many grams of water did I make?



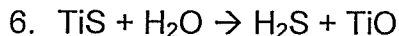
My theoretical yield of beryllium chloride was 10.7 grams. If my actual yield was 4.5 grams, what was my percent yield?



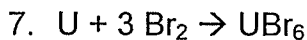
What is my theoretical yield of Na_2O if I start with 20 grams of calcium oxide?



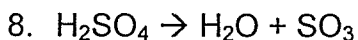
- What is my theoretical yield of iron (II) chloride if I start with 34 grams of iron (II) bromide?
- What is my percent yield of iron (II) chloride if my actual yield is 4 grams?



What is my percent yield of titanium (II) oxide if I start with 20 grams of titanium (II) sulfide and my actual yield of titanium (II) oxide is 22 grams?



What is my actual yield of uranium hexabromide if I start with 100 grams of uranium and get a percent yield of 83%?



If I start with 89 grams of sulfuric acid and produce 7.1 grams of water, what is my percent yield?

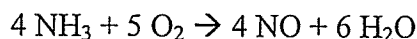
Student Name: _____ Date: _____

30S Chemistry

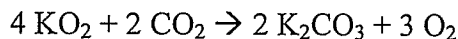
Stoichiometry Limiting Reagent Problems

Answer each of the following questions in your notebook. Show all work.

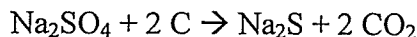
1. For the following balanced chemical reaction, if 9.35 grams of NH_3 are reacted with 22.23 grams of O_2 , what is the limiting reagent?



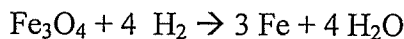
2. For the following balanced chemical reaction, if 13.2 grams of KO_2 are reacted with 2.89 grams of CO_2 , what is the excess reagent?



3. For the following balanced chemical reaction, if 66.6 grams of Na_2SO_4 are reacted with 12.6 grams of C , what is the limiting reagent?



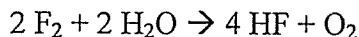
4. For the following balanced chemical reaction, if 27.23 grams of Fe_3O_4 are reacted with 1.2 grams of H_2 , what is the limiting reagent?



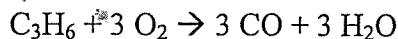
5. For the following balanced chemical reaction, if 73.83 grams of C_6H_6 are reacted with 173.65 grams of O_2 , what is the limiting reagent? What mass of excess reagent remains?



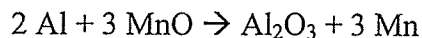
6. For the following balanced chemical reaction, if 23.8 grams of F_2 are reacted with 15.41 grams of H_2O , what is the limiting reagent?



7. For the following balanced chemical reaction, if 71.11 grams of C_3H_6 are reacted with 218.17 grams of O_2 , what is the excess reagent?



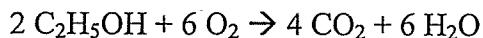
8. For the following balanced chemical reaction, if 72.78 grams of Al are reacted with 366.07 grams of MnO , what is the limiting reagent?



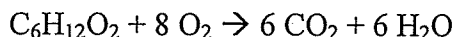
9. For the following balanced chemical reaction, if 73.96 grams of C_7H_{16} are reacted with 346.83 grams of O_2 , how many grams of excess reagent are left over?



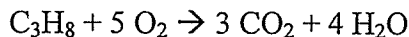
10. For the following balanced chemical reaction, if 49.2 grams of C_2H_5OH are reacted with 78.21 grams of O_2 , what is the limiting reagent?



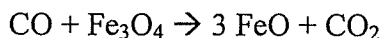
11. For the following balanced chemical reaction, if 90.69 grams of $C_6H_{12}O_2$ are reacted with 187.75 grams of O_2 , what is the excess reagent?



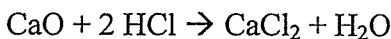
12. For the following balanced chemical reaction, if 52.85 grams of C_3H_8 are reacted with 267.71 grams of O_2 , what is the limiting reagent?



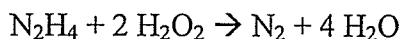
13. For the following balanced chemical reaction, if 27.02 grams of CO are reacted with 247.52 grams of Fe_3O_4 , what is the limiting reagent?



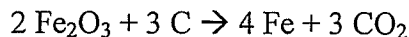
14. For the following balanced chemical reaction, if 13.05 grams of CaO are reacted with 17.12 grams of HCl , what is the mass of the excess reagent?



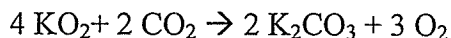
15. For the following balanced chemical reaction, if 55.95 grams of N_2H_4 are reacted with 105.82 grams of H_2O_2 , what is the limiting reagent?



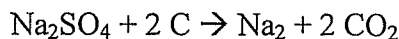
16. For the following balanced chemical reaction, if 39.97 grams of Fe_2O_3 are reacted with 3.5 grams of C , what is the excess reagent?



17. For the following balanced chemical reaction, if 10.92 grams of KO_2 are reacted with 2.84 grams of CO_2 , what is the limiting reagent?



18. For the following balanced chemical reaction, if 43.92 grams of Na_2SO_4 are reacted with 5.92 grams of C , what is the limiting reagent?



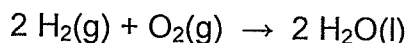
Student Name: _____ Date: _____

30S Chemistry

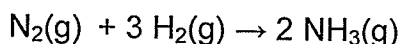
Stoichiometry STP Gas Conversions Practice

Solve each of the following problems. Be sure to show ALL work.

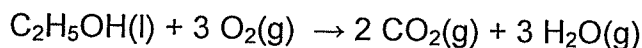
1. What volume of O₂, at STP, would be needed to use up 0.360 moles of hydrogen?



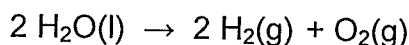
2. What volume of NH₃, at STP, is produced by reacting 0.720 moles of H₂ gas?



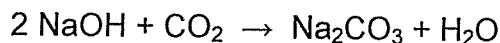
3. At STP, what volume of oxygen is needed to burn 25.0g of ethanol, C₂H₅OH?



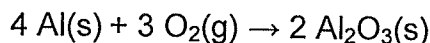
4. Calculate the volume of oxygen, at STP, that can be produced by the electrolysis of 5.00g of water.



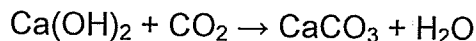
5. Given 12.0g of sodium hydroxide, how many litres of carbon dioxide at STP would be required to react with it?



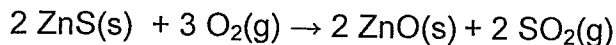
6. How many grams of aluminum are required to react with 5.00 L of oxygen?



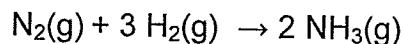
7. When 9.97L of CO₂ undergoes the reaction shown below, how many grams of CaCO₃ can be produced? Assume STP conditions.



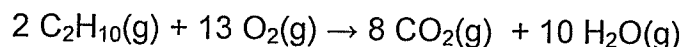
8. What mass of ZnS would react with 112 L of O₂ at STP?



9. If 4.93L of H₂ gas at STP are completely reacted, how many molecules of ammonia, NH₃, are produced?



10. When 33.65g of butane is burned, what volume of CO₂ at STP would be produced?



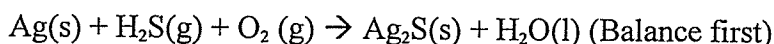
Student Name: _____ Date: _____

30S Chemistry

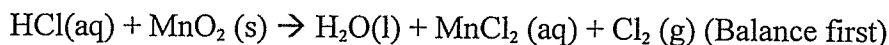
Chemical Reactions Stoichiometry Problems

Answer each of the following questions in your notebook. Show all work.

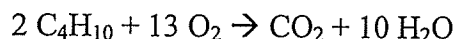
1. Silver sulfide (Ag_2S) is the common tarnish on silver objects. What weight of silver sulfide can be made from 1.23 mg of hydrogen sulfide (H_2S) obtained from a rotten egg? The reaction of formation of silver sulfide is given below:



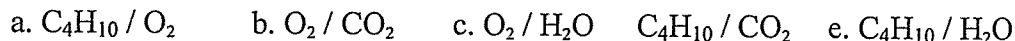
2. A somewhat antiquated method for preparing chlorine gas involves heating hydrochloric acid with pyrolusite (manganese dioxide), a common manganese ore. (Reaction given below.) How many kg of HCl react with 5.69 kg of manganese dioxide?



3. Given the following equation:



Show what the following molar ratios should be:



4. Given the following equation: $2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$

How many moles of O_2 can be produced by letting 12.00 moles of KClO_3 react?

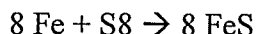
5. Given the following equation: $2 \text{K} + \text{Cl}_2 \rightarrow 2 \text{KCl}$

How many grams of KCl is produced from 2.50 g of K and excess Cl_2 . From 1.00 g of Cl_2 and excess K?

6. Given the following equation: $\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow 2 \text{NaOH}$

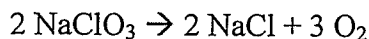
How many grams of NaOH is produced from 1.20×10^2 grams of Na_2O ? How many grams of Na_2O are required to produce 1.60×10^2 grams of NaOH?

7. Given the following equation:



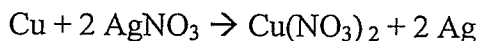
What mass of iron is needed to react with 16.0 grams of sulfur? How many grams of FeS are produced?

8. Given the following equation:



12.00 moles of NaClO₃ will produce how many grams of O₂? How many grams of NaCl are produced when 80.0 grams of O₂ are produced?

9. Given the following equation:



How many moles of Cu are needed to react with 3.50 moles of AgNO₃? If 89.5 grams of Ag were produced, how many grams of Cu reacted?

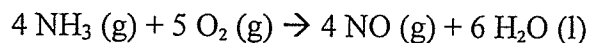
10. Molten iron and carbon monoxide are produced in a blast furnace by the reaction of iron(III) oxide and coke (pure carbon). If 25.0 kilograms of pure Fe₂O₃ is used, how many kilograms of iron can be produced? The reaction is:



11. The average human requires 120.0 grams of glucose (C₆H₁₂O₆) per day. How many grams of CO₂ (in the photosynthesis reaction) are required for this amount of glucose? The photosynthetic reaction is:



12. Given the reaction:



When 1.20 mole of ammonia reacts, find the number of moles of H₂O formed.