Knowledge

For each question, select the best answer from the four alternatives.

1. Which is a correct statement based on the balanced chemical equation given below? (7.1) K/U

   $N_2(g) + O_2(g) \rightarrow 2\ NO(g)$

   (a) If 2 mol of N_2 is consumed, 4 mol of NO will be produced.
   (b) If a sample containing 30 dozen O_2 molecules is consumed, 60 dozen NO molecules will be produced.
   (c) If a sample of NO(g) containing 6 000 000 molecules is produced, 3 000 000 $N_2(g)$ molecules will be consumed.
   (d) all of the above

2. Hydrogen, $H_2(g)$, and nitrogen, $N_2(g)$, combine to form ammonia, $NH_3(g)$:

   $3\ H_2(g) + N_2(g) \rightarrow 2\ NH_3(g)$

   Which amount of nitrogen will react with 18 mol of hydrogen? (7.1) K/U T/I

   (a) 6 mol (c) 18 mol
   (b) 9 mol (d) 54 mol

3. Why is lithium hydroxide chosen to absorb carbon dioxide exhaled by astronauts on space missions? (7.2) K/U

   (a) It can be recycled onboard the spacecraft.
   (b) It reacts more rapidly with CO_2 than other hydroxides such as NaOH or $Ca(OH)_2$.
   (c) It absorbs the most CO_2 per kilogram.
   (d) It poses no danger to astronauts upon contact.

4. Hydrogen peroxide slowly decomposes in light:

   $2\ H_2O_2(l) \rightarrow 2\ H_2O(l) + O_2(g)$

   Which pair of values are stoichiometric amounts? (7.2) K/U T/I

   (a) 7.2 g H_2O and 6.4 g O_2
   (b) 3.6 g H_2O and 1.6 g O_2
   (c) 3.6 mol H_2O and 3.2 mol O_2
   (d) all of the above

5. Which is true about blue and orange Bunsen burner flames of about the same size? (7.3) K/U A

   (a) The orange flame will occur when the barrel of the burner is fully open.
   (b) The blue flame will be hotter.
   (c) The blue flame will be richer in fuel than the orange flame.
   (d) The orange flame will be cleaner than the blue flame.

6. Aluminum and chlorine undergo a synthesis reaction to form aluminum chloride:

   $2\ Al(s) + 3\ Cl_2(g) \rightarrow 2\ AlCl_3(s)$

   If 8.0 mol of Al is reacted with 10.0 mol of Cl_2, what is the maximum amount of $AlCl_3$ that can be produced? (7.3) T/I

   (a) 6.7 mol
   (b) 8.0 mol
   (c) 12.0 mol
   (d) 15.0 mol

7. Phosphorus burns in oxygen:

   $P_4(s) + 5\ O_2(g) \rightarrow 2\ P_2O_5(s)$

   If 4 mol of molecular phosphorus is available to react with 25 mol of O_2, how many moles of the excess reactant will remain? (7.4) T/I

   (a) 1 mol
   (b) 5 mol
   (c) 20 mol
   (d) 21 mol

8. Which of the following factors limits the yield of alcohol from the fermentation of sugars by yeast? (7.5) K/U

   (a) alcohol chemically reacting with the sugars
   (b) an inability of the alcohol to mix with water
   (c) the escape of $CO_2(g)$ from the fermentation mixture
   (d) the toxicity of the alcohol

9. The actual yield in a chemical procedure is often less than the theoretical yield. What is the most likely reason? (7.5) K/U

   (a) loss of material when a solution is transferred to a new container
   (b) use of a reactant that has become impure by reacting with water or $CO_2(g)$ in the air over time
   (c) formation of an alternative product due to a competing side reaction
   (d) all of the above

10. Which situation describes a reaction with a percentage yield of 100 %? (7.5) K/U

    (a) The amounts of reactants initially present are stoichiometric.
    (b) More product is made than the limiting reagent has the potential to produce.
    (c) No competing reactions occur and the limiting reagent is fully consumed.
    (d) none of the above

Indicate whether each statement is true or false. If you think the statement is false, rewrite it to make it true.

11. The value that would complete the ratio below is 21.

$$\frac{3}{7} = \frac{?}{42}$$ (7.1) T/I

12. The coefficients for the balanced chemical equation below are 2, 2, and 3.

$3\ H_2(g) + N_2(g) \rightarrow 2\ NH_3(g)$ (7.1) K/U

13. The compound ammonia, NH_3, is commonly used as a fertilizer. (7.1) K/U

14. Stoichiometric amounts in grams are multiples of the coefficients in a balanced chemical equation. (7.2) K/U

15. For any reaction that has a strong tendency to form products, 100 % of the reactants will theoretically be converted to products when stoichiometric amounts of the reactants are initially present. (7.2) K/U

16. When the supply of a reactant in a chemical reaction runs out and the reaction stops, that reactant is said to be in excess. (7.3) K/U

17. A Bunsen burner is most easily ignited when the gas mixture is rich. (7.3) K/U

18. If a butane, C_4H_{10}, tank were attached to a stove designed for propane, C_3H_8, the air/fuel mixture would likely be somewhat leaner than the ideal mixture. (7.3) K/U

19. The quantity that directly links the amount of limiting reagent in a reaction to the amount of product is the mass ratio. (7.4) K/U

Match each term on the left with the most appropriate description on the right.

20. Aluminum metal and sulfur combine to form aluminum sulfide:

$16\ Al(s) + 3\ S_8(s) \rightarrow 8\ Al_2S_3(s)$ (7.1, 7.2) K/U T/I

(a) amount of S_8 that will produce 32 mol of Al_2S_3	(i) 8 mol
(b) amount of Al that will produce 32 mol of Al_2S_3	(ii) 12 mol
(c) amount of Al that will react with 9 mol of S_8	(iii) 48 mol
(d) amount of Al_2S_3 produced when 16 mol of Al is consumed	(iv) 64 mol

Write a short answer to each question.

21. Aluminum undergoes a single displacement reaction with hydrochloric acid:

$2\ Al(s) + 6\ HCl(aq) \rightarrow 2\ AlCl_3(aq) + 3\ H_2(g)$

State each specified ratio, below, in simplest whole numbers. (7.1) K/U T/I

(a) amount of HCl to amount of Al

(b) amount of Al to amount of $AlCl_3$

(c) amount of H_2 to amount of Al

22. The reaction of copper(II) oxide and aluminum metal produces molten copper that can be used to weld conductors together in electrical circuits:

$3\ CuO(s) + 2\ Al(s) \rightarrow 3\ Cu(l) + Al_2O_3(s) + \text{heat}$ (7.1) K/U T/I

(a) What amount of Cu is produced if 0.4 mol of Al react?

(b) What amount of CuO is required to produce 0.2 mol of Cu?

23. What is the gas that is found in the atmosphere and also fills up sodium azide-type airbags when they deploy? (7.2) K/U

24. Give an everyday example of the reaction represented by this chemical equation:

$CaCO_3(s) + 2\ HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$ (7.2) K/U A

25. What colour of Bunsen burner flame results when the combustion of methane is incomplete? (7.3) K/U

26. How do competing reactions affect percentage yield? (7.5) K/U

Understanding

27. Explain how a balanced chemical equation is similar to a cooking recipe. Also describe how this analogy is not accurate. (7.1) K/U

28. State for each item below whether the quantity is always conserved, sometimes conserved, or never conserved in balanced chemical equations. Give examples to support your answers. (7.1, 7.2) K/U

(a) number of molecules

(b) number of atoms

29. How can a researcher use limewater to test for the presence of carbon dioxide? (7.2) K/U

30. Summarize the steps required to solve a stoichiometry problem in which you are given the mass of a reactant and asked to determine the mass of a product. (7.2) K/U

31. Explain why Bunsen burners always have air vents. (7.3) K/U

32. Both baking soda and sodium hydroxide effectively neutralize acid spills. What are the advantages of using baking soda? (7.3) K/U

33. Why are expensive reactants usually the limiting reagents in industrial chemical processes? (7.3) K/U
34. Chemical engineers must decide how much of various reactants to keep on hand at a chemical plant. How could the concept of limiting reagents guide the engineers? (7.4) K/U
35. Briefly describe how we use mole ratios to decide which of two reactants is limiting when they are not present in stoichiometric amounts. (7.4) K/U
36. Could the actual yield of a reaction ever be greater than the theoretical yield? Explain your thinking. (7.5) K/U T/I
37. Why is the percentage yield always less than 100 % when cisplatin, a cancer drug, is synthesized? What problem does this create for manufacturers of the drug? (7.5) K/U

Analysis and Application

38. Dinitrogen pentoxide decomposes to produce nitrogen dioxide and oxygen:

    $2\ N_2O_5(g) \rightarrow O_2(g) + 4\ NO_2\ (g)$

    Copy and complete each of the following sentences in your notebook and fill in the blanks. (7.1) K/U T/I

    (a) 0.50 mol of dinitrogen pentoxide will produce _____ mol of oxygen and _____ mol of nitrogen dioxide.

    (b) _____ mol of dinitrogen pentoxide will produce _____ mol of oxygen and 1.60 mol of nitrogen dioxide.

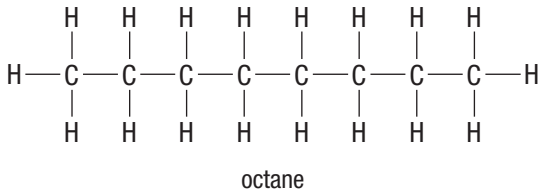
39. Decane, $C_{10}H_{22}(l)$, undergoes complete combustion if there is sufficient oxygen available:

    $2\ C_{10}H_{22}(l) + 31\ O_2(g) \rightarrow 20\ CO_2(g) + 22\ H_2O(g)$ (7.1) K/U T/I

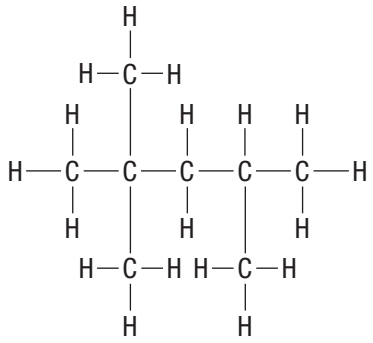
    (a) What amount of oxygen is required for the complete combustion of 5.50 mol of decane?

    (b) A sample of decane is burned, producing 12 mol of carbon dioxide. What amount of water is also produced?

40. When copper and sulfur react, two products are possible: copper(I) sulfide, Cu_2S, and copper(II) sulfide, CuS. A scientist hypothesizes that holding a loop of thin copper wire in the vapour from boiling sulfur will produce pure Cu_2S when the copper and sulfur react. Suggest what measurements, related to mole ratios, the scientist should make to test this hypothesis. (7.1) T/I
41. The structures of two liquid substances commonly found in gasoline are shown in **Figure 1.** Both substances have the chemical formula C_8H_{18}. (7.1, 7.2) K/U T/I C



octane



2,2,4–trimethylpentane

Figure 1

    (a) Write the chemical equation for the complete combustion of these substances.

    (b) Assuming a density of 0.70 g/cm^3 for octane, what mass of carbon dioxide will be formed when 10.0 L of octane is burned in excess oxygen?

42. The combustion reaction between hydrogen and oxygen is used to power rocket engines, including the main engines on the space shuttle. The equation for the reaction is

    $2\ H_2(g) + O_2(g) \rightarrow 2\ H_2O(g)$ (7.1, 7.3) K/U T/I A

    (a) What is the stoichiometric mole ratio of oxygen to hydrogen in this reaction?

    (b) A typical actual fuel mixture for the reaction in rocket engines is 4 g O_2 : 1 g H_2. Convert this to a mole ratio.

    (c) Based on your answers to (a) and (b), state which reactant is in excess in a fuel mixture with a ratio of 4 g O_2 : 1 g H_2.

43. Think of an example involving common objects that illustrates the meaning of the coefficients in a balanced chemical equation (similar to the examples with s'mores in this chapter). Prepare a table with headings, values, and drawings to illustrate your example. Your table should have three rows: one for individual entities, one for dozens of entities, and one for amount (in moles) of entities. (7.1, 7.2, 7.3, 7.4) T/I C A
44. When copper combines with oxygen, copper(II) oxide is formed. (7.1, 7.3, 7.4) K/U T/I C

    (a) Write the balanced equation for this reaction.

    (b) If 7.0 mol of copper reacts with 4.0 mol of oxygen, what amount of copper(II) oxide is produced? What amount of the excess reactant remains?

45. Glucose, $C_6H_{12}O_6(s)$, can be decomposed into carbon and water:

$C_6H_{12}O_6(s) \rightarrow 6\ C(s) + 6\ H_2O(g)$ (7.2) K/U T/I

(a) Calculate the masses of carbon and water that would be produced when 36.0 g of glucose decomposes completely into carbon and water.

(b) Calculate the mass of glucose that must have fully decomposed if 21.6 g of carbon and 32.4 g of water are produced.

46. When heated, mercury(II) oxide decomposes:

$2\ HgO(s) \rightarrow 2\ Hg(l) + O_2(g)$

This reaction led to the discovery of oxygen in the eighteenth century. What mass of each element is produced when 0.500 mol of mercury(II) oxide is fully decomposed? (7.2) K/U T/I

47. List an object, appliance, or activity in your home that involves stoichiometry and describe how stoichiometry applies. (7.2) K/U A

48. Aluminum foil reacts with aqueous copper(II) chloride:

$2\ Al(s) + 3\ CuCl_2(aq) \rightarrow 2\ AlCl_3(aq) + 3\ Cu(s)$

blue solution — colourless solution

Predict what you would expect to observe in each of the following situations. (7.2, 7.3) T/I

(a) A 0.1 mol piece of aluminum foil is placed in a solution containing 0.3 mol of copper(II) chloride, $CuCl_2$.

(b) A 0.1 mol piece of aluminum foil is placed in a solution containing 0.1 mol of copper(II) chloride.

49. Sulfur dioxide can be "scrubbed" out of gaseous emissions from a fossil fuel power plant:

$SO_2(g) + CaCO_3(s) \rightarrow CaSO_3(s) + CO_2(g)$

To make the scrubbing as effective as possible, operators would have to provide an excess of which reactant? Why? (7.2, 7.3) K/U T/I

50. A metallurgist completely dissolves a 10.00 g piece of silver-containing alloy in excess nitric acid and then adds sodium chloride solution to turn the dissolved silver into a precipitate of silver chloride:

$AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

She filters out the silver chloride, obtaining 1.20 g. (7.2, 7.3) T/I A

(a) Calculate the mass of silver present in the original sample.

(b) What percentage of the alloy, by mass, is silver?

(c) Why is it important to add excess sodium chloride solution in the precipitation step?

51. Canada consumes about 80 billion m^3 of natural gas annually. Natural gas is principally composed of methane, CH_4, and has a density of about 0.70 kg/m^3. (7.2, 7.3) T/I C A

(a) Write the balanced chemical equation for the complete combustion of methane.

(b) Assuming that all of the natural gas is burned completely, calculate the mass of carbon dioxide in tonnes that is discharged into the atmosphere each year.

(c) Predict the environmental effect of the discharge of the carbon dioxide into the atmosphere.

52. If you cook a meal in a pan over the yellow-orange flame from a campfire, the bottom of the pan becomes blackened. Why does this happen? (7.3) T/I A

53. The concept of limiting reagents can be applied to a natural gas home furnace to save money, conserve fossil fuels, and also protect the environment. Explain how. (7.3) T/I A

54. Preserved fruit sometimes contains a residue of sulfur dioxide, SO_2. You could analyze the residue by soaking the fruit in water to convert the sulfur dioxide to sulfite ions, $SO_3^{2-}(aq)$, adding hydrogen peroxide to convert the sulfite ions to sulfate ions, $SO_4^{2-}(aq)$, and adding barium chloride, $BaCl_2(aq)$, to precipitate the sulfate ions as white barium sulfate, $BaSO_4(s)$. When you measure the mass of the barium sulfate, you can determine the amount of SO_2 originally present in the fruit. Describe a procedure that will precipitate all of the SO_4^{2-} without using any more $BaCl_2(aq)$ than is necessary, thus providing a stoichiometric amount. Specify in your procedure which reagents should be used in excess. (7.3) T/I A

55. **Table 1** shows the results of an investigation in which different masses of zinc were placed in equal volumes of hydrochloric acid. The volume of the hydrogen gas produced in each trial was measured. (7.3) T/I C

(a) Write the balanced chemical equation for the reaction between zinc and hydrochloric acid.

(b) State the limiting reagent in each trial and explain your reasoning.

Table 1 Reaction of Different Masses of Zinc with Hydrochloric Acid

Trial	1	2	3	4	5
volume of HCl(aq) (mL)	50	50	50	50	50
mass of Zn(s)	1.00	1.50	2.00	2.50	3.00
volume of $H_2(g)$ collected (mL)	374	561	611	611	611

56. Sulfur dioxide, $SO_2(g)$, reacts with hydrogen sulfide, $H_2S(g)$, to form sulfur, $S_8(s)$, and water:

$$8\ SO_2(g) + 16\ H_2S(g) \rightarrow 3\ S_8(s) + 16\ H_2O(g)$$

Copy **Table 2** into your notebook and fill in the missing quantities. (7.4) K/U T/I

Table 2 Amounts in the Reaction of Sulfur Dioxide and Hydrogen Sulfide

Initial amount of $SO_2(g)$ (mol)	Initial amount of $H_2S(g)$ (mol)	Amount of $S_8(s)$ produced (mol)	Amount of excess reactant remaining (mol)
10.0	30.0		
5.0	8.0		
		6.0	2.0 H_2S

57. Arsine, $AsH_3(g)$, was once a product of a test used in forensic analysis. Tissues from a possible poisoning victim were treated with zinc and sulfuric acid. If arsenic was present (usually as diarsenic trioxide, $As_2O_3(s)$), arsine would form:

$$As_2O_3(s) + 6\ Zn(s) + 6\ H_2SO_4\ (aq) \rightarrow 2\ AsH_3(g) + 6\ ZnSO_4(aq) + 3\ H_2O(l)$$ (7.4) T/I

(a) In a lab exercise, a forensic technician reacts 19.8 g of As_2O_3 with 32.7 g of Zn in the presence of excess H_2SO_4. What mass of AsH_3 will be produced?

(b) What mass of the excess reactant (other than sulfuric acid) will remain?

58. The first balloon flight using hydrogen as the buoyant gas took place in 1783. The hydrogen was obtained by reacting iron with sulfuric acid. (7.4) T/I

(a) Write the equation for the single replacement reaction of iron with sulfuric acid. (Hint: The product involves Fe^{2+} ions.)

(b) If 40.0 g of iron is reacted with 100.0 g of sulfuric acid, what mass of hydrogen is made?

(c) What mass of the excess reagent remains?

59. One of the reactions in the industrial production of nitric acid involves the production of nitric oxide:

$$4\ NH_3(g) + 5\ O_2(g) \rightarrow 4\ NO(g) + 6\ H_2O(g)$$ (7.4) T/I

(a) If 4500 kg of ammonia, $NH_3(g)$, react with 7500 kg of O_2, what mass of NO will form?

(b) What mass of the excess reagent will remain?

60. Phosphine, $PH_3(g)$, is an important pesticide. It is released when aluminum phosphide pellets are spread over an area to be treated and the aluminum phosphide reacts with water vapour in the air:

$$AlP(s) + 3\ H_2O(l) \rightarrow PH_3(g) + Al(OH)_3(s)$$

If 100.0 g of aluminum phosphide pellets are placed in a well-sealed closet and the air in the closet contains 50.0 g of water vapour, what is the theoretical yield, in grams, of phosphine? (7.4, 7.5) T/I

61. Gold can be extracted from ore using sodium cyanide:

$$4\ Au(s) + 8\ NaCN(aq) + O_2(g) + 2\ H_2O(l) \rightarrow 4\ NaAu(CN)_2(aq) + 4\ NaOH(aq)$$

This step of the cyanide process has a 95 % yield. Suppose a gold ore body contains 3.00 kg of gold for every 1.00×10^6 kg of ore. What mass of $NaAu(CN)_2$ will be formed when 1.00×10^6 kg of ore is treated? Give your answer in kilograms, to three significant figures. (7.4, 7.5) T/I

62. Methylbenzene (toluene), $C_6H_5CH_3(l)$, is a common paint thinner. It can be prepared from benzene, $C_6H_6(l)$:

$$CH_3Cl(g) + C_6H_6(l) \rightarrow C_6H_5CH_3(l) + HCl(g)$$

In an investigation, 25.0 g of benzene is combined with 20.0 g of chloromethane, CH_3Cl, in the presence of an appropriate catalyst. (7.4, 7.5) T/I

(a) Calculate the theoretical yield of toluene.

(b) If 22.0 g of $C_6H_5CH_3$ is actually obtained, what is the percentage yield?

(c) Suggest reasons for the discrepancy between the actual yield and the theoretical yield.

63. Aspirin, $C_9H_8O_4(s)$, can be synthesized from salicylic acid, $C_7H_6O_3(s)$, and acetic anhydride, $C_4H_6O_3(l)$:

$$C_7H_6O_3(s) + C_4H_6O_3(l) \rightarrow C_9H_8O_4(s) + HC_2H_3O_2(l)$$

In an experiment, a chemistry student obtains 12.2 g of aspirin using this reaction. (7.5) T/I

(a) The student determined the percentage yield to be 72 %. What was the theoretical yield (in grams) for the synthesis?

(b) Considering the theoretical yield, what mass of salicylic acid must have been present initially, assuming acetic anhydride was in excess?

Evaluation

64. To learn about the metabolic rate of crickets, a researcher plans to seal several of the insects in a chamber with a raised mesh floor, beneath which lies a cup containing sodium hydroxide pellets, NaOH(s). The researcher intends to measure the mass gained by the cup of sodium hydroxide pellets as a direct determination of the mass of CO_2 given off by the crickets. The crickets will not be harmed because they cannot come into contact with the sodium hydroxide and they will be removed before the concentration of oxygen in the chamber is significantly lowered. (7.2) T/I A

(a) Evaluate this experimental design.

(b) On what balanced chemical equation has the researcher based the experimental design?

65. In a car design assignment, a college student specifies equal masses of sodium azide in the frontal airbags for front seat occupants. Evaluate this design. (7.2) T/I A

66. There are about 11 ammonia plants in Canada, producing between 4 million and 5 million tonnes of ammonia each year. The diagram in **Figure 2** summarizes the industrial process commonly used to make ammonia.

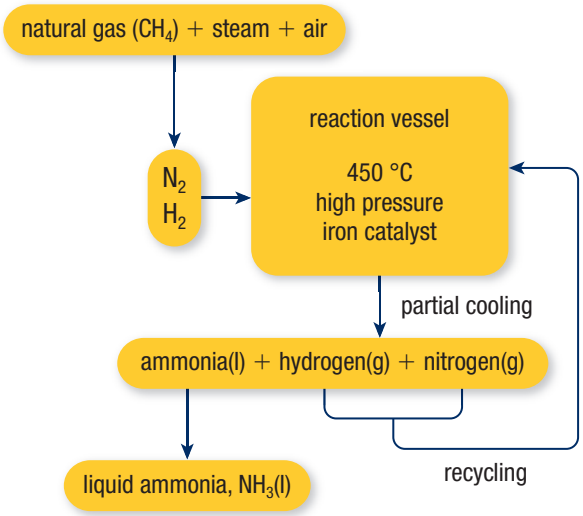


Figure 2

Which part of this process uses principles of green chemistry? How is this beneficial to the company and/or the environment? (7.3) T/I A

67. Table salt is usually "iodized" by the manufacturer. The iodine is generally present as potassium iodide, KI(s). Dissolving a table salt sample in water and then treating it with aqueous potassium iodate, KIO_3(aq), and excess sulfuric acid, H_2SO_4(aq), results in two reactions:

$$2\ KIO_3(aq) + 10\ KI(aq) + 12\ HCl(aq) \rightarrow 6\ I_2(aq) + 6\ H_2O(l) + 12\ KCl(aq)$$

$$3\ KIO_3(aq) + 6\ I_2(aq) + 18\ HCl(aq) + 12\ KCl(aq) \rightarrow 15\ KICl_2(aq) + 9\ H_2O(l)$$

The overall reaction is:

$$KIO_3(aq) + 2\ KI(aq) + 6\ HCl(aq) \rightarrow 3\ KICl_2(aq) + 3\ H_2O(l)$$

As KIO_3(aq) is added in measured increments, the first reaction produces iodine, which turns the solution purple. The colour then fades as the second reaction uses up the iodine. Based on these reactions, describe the measurements and calculations necessary to determine the mass of KI in the salt sample. (7.3, 7.4) T/I

68. A student filters out a precipitate and allows it and the filter paper to dry overnight. He then measures the mass of the filter paper and precipitate. When the student subtracts the original mass of the filter paper from the combined mass of the paper and precipitate, he is perplexed to discover that the amount of precipitate appears to be greater than the theoretical yield. Suggest two reasons this could have happened. (7.5) T/I A

Reflect on Your Learning

69. How did your appreciation of the usefulness of mathematical ratios grow as you studied this chapter? Offer an example of how you might use ratios in your everyday life. A

70. (a) What questions do you still have about limiting reagents and percentage yield?
    (b) Where can you find answers to these questions? K/U A

71. What concept or skill in this chapter did you find to be most difficult? Describe strategies you could employ to improve your understanding. T/I

Research

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72. The chemical reaction in sodium azide-propelled airbags produces pure sodium. If the sodium is not immediately converted to a safe compound, it would pose a danger. C A
    (a) Research the chemical reactions that convert the sodium to a safe form. Provide the balanced chemical equations for the reactions that directly produce and remove the sodium.
    (b) In the case of an accident, whom do the sodium-removing reactions protect?
    (c) Do further research and find out about other types of airbag-inflation systems that do not use sodium azide. Summarize what you have discovered by preparing a poster that displays all relevant chemical equations and describes inflation systems through diagrams.

73. Compounds that do not obey the law of definite proportions are called non-stoichiometric compounds. Research these substances, focussing on one particular compound. Write a report of your findings that includes the structure and uses of your chosen compound. A

74. Propane and butane are very common fuels. Find out how they are similar and how they are different. Explore the pros and cons of each one. Summarize your findings in a graphic organizer such as a Venn diagram or t-chart. T/I C A

75. Research how carburetors and fuel injection systems create a proper air/fuel mixture in the internal combustion engines of cars and trucks. Prepare a poster that presents what you have learned in the form of diagrams and flow charts. C A

76. Partially hydrogenated vegetable oils are ingredients in many food products. "Trans fats" are unwanted by-products of the hydrogenation reaction. Research partially hydrogenated vegetable oils to find out how they are made and why trans fats are a problem. Also research what consumers can do to avoid trans fats without sacrificing tasty foods. Prepare an oral report, supported by visual aids, on your discoveries. C A