7.1 pg. 174 #3, 4; pg. 175 #5, 6; pg. 179 #7, 8; pg. 181 #9 to 11, 13, 14

#3) 4.65 mol Si

#4) 2.17×10^{23} molecules H_2O

#5) 2.75×10^{24} atoms

#6) 7.72 mol NO_2

#7) a. 30.0 g/mol b. 137.5 g/mol c. 60.0 g/mol d. 108.0 g/mol

#8) a. 71.0 g b. 46.0 g c. 331.6 g d. 60.1 g

#9) a. 94.2 g/mol b. 136.2 g/mol c. 317.2 g/mol

#10) a. 175.3 g/mol b. 139.6 g/mol c. 84.0 g/mol d. 294.3 g/mol

#11) One mole of any substance contains Avogadro's number (6.02×10^{23}) of representative particles.

#13) a. 3 atoms b. 4 atoms c. 3 atoms d. 9 atoms

#14) a. 2.49×10^{-1} mol NH_3 b. 2×10^{-15} mol O_2
c. 0.100 mol Br_2 d. 7.99 mol Li

7.2 pg. 183 #16 to 19; pg. 184 #20, 21; pg. 185 #22, 23; pg. 186 #24 to 28;

#16) a. 1.30×10^{2} g b. 1.27 g c. 1.55 g

#17) a. 355 g b. 225 g

#18) a. 3.43×10^{-2} mol B b. 0.343 mol TiO_2 c. 8.82 mol $(NH_4)_2CO_3$

#19) a. 0.987 mol N_2O_3 b. 2.68 mol N_2 c. 1.21 mol Na_2O

#20) a. 7.17×10^{-2} L b. 21.5 L c. 82.9 L

#21) a. 3.00 mol SO_2 b. 3.93×10^{-2} mol He c. 44.6 mol C_2H_6

#22) 80.2 g/mol

#23) 3.74 g/L

#24) a. 6.5 g Be b. 67.2 g N_2 c. 5.44 g H_2O_2 d. 8.34 x 10^2 g $Ca(NO_3)_2$

#25) a. 7.85 x 10^{23} molecules NO_2 b. 1.21 L Cl_2 c. 12.9 g CH_4

#26) They would have the same volume but different masses; equal volumes of gases have the same number of molecules at the same temperature and pressure.

#27) a. 2.5 mol H_2 b. 2.40 x 10^{-6} mol Li_2HPO_4 c. 6.93 mol Al d. 2.13 mol SnF_2

#28) gas A: 28.0 g/mol, nitrogen gas B: 64.1 g/mol, sulfur dioxide gas C: 16.0 g/mol, methane

7.2 (Part of 12.5) pg. 348 #31 to 33; pg. 349 #34 to 36; pg. 353 #40 and 41

#31) 5.60 L

#32) 1.66 x 10^1 L

#33) 1.38 x 10^{23} nitrogen molecules

#34) 1.50 L $He_{(g)}$

#35) 4.48 L

#36) 7.67 x 10^1 L

#40) by using Avogadro's hypothesis and the molar mass and molar volume of the gas

#41) a. 38 L b. 0.40 L c. 5.6 x 10^3 L

7.3 pg. 189 #29, 30; pg. 191 #31 to 33; pg. 192 #34; pg. 193 # 35, 36; pg. 194 #37, 38; pg. 195 #39 to 43

#29) a. 72.2% Mg, 27.8% N b. 87.1% Ag, 12.9% S

#30) a. 93.0% Hg, 7.0% O

#31) a. 80.0% C, 20.0% H b. 19.2% Na, 0.83% H, 26.7% S, 53.3% O
c. 26.2% N, 7.5% H, 66.4% Cl

#32) a. 46.7% N b. 82.4% N c. 35.0% N

#33) a. 70 g H b. 0.17 g H c. 0.16 g H

#34) a. 58.4 g N b. 103 g N c. 43.8 g N

#35) a. OH b. CH_3 c. $HgSO_4$ d. C_2HNO_3

#36) C_3H_8N

#37) a. $C_2H_6O_2$ b. $C_6H_4Cl_2$

#38) a. $C_6H_{12}O_6$ b. $Na_2Cr_2O_7$

#39) a. 74.2% N, 25.8% O b. 39.3% Na, 60.7% Cl

#40) $C_5H_{10}O_2$

#41) a. 25.4% Ca, 30.4% C, 3.8% H, 40.5% O b. 3.7% H, 44.4% C, 51.9% N

#42) a. 4.7g H b. 14 g H

#43) a. Molecular
b. Molecular
c. Molecular and Empirical
d. Molecular and Empirical

Answers

44. number, mass, or volume; Examples will vary.

45. **a.** molecule **c.** molecule
b. formula unit **d.** atom

46. **a.** 3 **c.** 9
b. 2 **d.** 10

47. All contain 6.02×10^{23} molecules.

48. 1.00 mol C_2H_6

49. **a.** 1.81×10^{24} atoms Sn
b. 2.41×10^{23} formula units KCl
c. 4.52×10^{24} molecules SO_2
d. 2.89×10^{21} formula units NaI

50. **a.** 98.0 g **d.** 132.1 g
b. 76.0 g **e.** 89.0 g
c. 100.1 g **f.** 159.8 g

51. **a.** 60.1 g **c.** 106.8 g
b. 28.0 g **d.** 63.5 g

52. Answers will vary but should include:
(1) Determine the number of moles of each atom from the formula.
(2) Look up the atomic mass of each element.
(3) Multiply the number of moles of each atom by its molar mass.
(4) Sum these products.

53. 71.0 g Cl_2

54. Answers will vary.

55. **a.** 0.258 mol SiO_2
b. 4.80×10^{-4} mol AgCl
c. 1.12 mol Cl_2
d. 0.106 mol KOH
e. 5.93 mol $Ca(C_2H_3O_2)_2$
f. 2.00×10^{-2} mol Ca

56. **a.** 108 g C_5H_{12}
b. 547 g F_2
c. 71.8 g $Ca(CN)_2$
d. 238 g H_2O_2
e. 224 g NaOH
f. 1.88 g Ni

57. **a.** 1.7×10^2 L Ar **c.** 26.9 L O_2
b. 9.9 L C_2H_6

58. **a.** 1.96 g/L **c.** 2.05 g/L
b. 0.902 g/L

59. **a.** 234 L SO_3
b. 2.99×10^{-22} g $C_9H_8O_4$
c. 3.13×10^{25} atoms

60. **a.** 5.9% H, 94.1% S
b. 22.6% N, 6.5% H, 19.4% C, 51.6% O
c. 41.7% Mg, 54.9% O, 3.4% H
d. 42.1% Na, 18.9% P, 39.0% O

61. **a.** 3.33 g S **c.** 40.6 g Mg
b. 5.65 g N **d.** 152 g P

62. **d.** 77.7% Fe in FeO

63. H_2O_2

64. **a.** molecular **d.** molecular
b. molecular **e.** empirical
c. empirical **f.** empirical

65. **a.** $C_3H_6O_3$
b. Hg_2Cl_2
c. $C_6H_{10}O_4$

66. **a.** H_2O_2
b. $C_4H_8O_4$

CONCEPT PRACTICE

44. List three common ways that matter is measured. Give examples of each. *7.1*

45. Name the representative particle (atom, molecule, or formula unit) of each substance. *7.1*
a. oxygen **c.** sulfur dioxide
b. sodium sulfide **d.** potassium

46. How many hydrogen atoms are in a representative particle of each substance? *7.1*
a. $Al(OH)_3$ **c.** $(NH_4)_2HPO_4$
b. $H_2C_2O_4$ **d.** $C_4H_{10}O$

47. Which contains more molecules: 1.00 mol H_2O_2, 1.00 mol C_2H_6, or 1.00 mol CO? *7.1*

48. Which contains more atoms: 1.00 mol H_2O_2, 1.00 mol C_2H_6, or 1.00 mol CO? *7.1*

49. Find the number of representative particles in each substance. *7.1*
a. 3.00 mol Sn **c.** 7.50 mol SO_2
b. 0.400 mol KCl **d.** 4.80×10^{-3} mol NaI

50. Calculate the molar mass of each substance. *7.1*
a. H_3PO_4 **c.** $CaCO_3$ **e.** $C_4H_9O_2$
b. N_2O_3 **d.** $(NH_4)_2SO_4$ **f.** Br_2

51. Calculate the mass of 1.00 mol of each of these substances. *7.1*
a. silicon dioxide (SiO_2)
b. diatomic nitrogen (N_2)
c. iron(III) hydroxide ($Fe(OH)_3$)
d. copper (Cu)

52. List the steps you would take to calculate the molar mass of any compound. *7.1*

53. What is the gram molecular mass (gmm) of chlorine? *7.1*

54. Construct a numerical problem to illustrate the size of Avogadro's number. Exchange problems with a classmate and then compare your answers. *7.1*

55. How many moles is each of the following? *7.2*
a. 15.5 g SiO_2 **d.** 5.96 g KOH
b. 0.0688 g AgCl **e.** 937 g $Ca(C_2H_3O_2)_2$
c. 79.3 g Cl_2 **f.** 0.800 g Ca

56. Find the mass of each substance. *7.2*
a. 1.50 mol C_5H_{12}
b. 14.4 mol F_2
c. 0.780 mol $Ca(CN)_2$
d. 7.00 mol H_2O_2
e. 5.60 mol NaOH
f. 3.21×10^{-2} mol Ni

57. Calculate the volume of each of the following gases at STP. *7.2*
a. 7.6 mol Ar
b. 0.44 mol C_2H_6
c. 1.20 mol O_2

58. What is the density of each of the following gases at STP? *7.2*
a. C_3H_8 **b.** Ne **c.** NO_2

59. Find each of the following quantities. *7.2*
a. the volume, in liters, of 835 g SO_3 at STP
b. the mass, in grams, of a molecule of aspirin ($C_9H_8O_4$)
c. the number of atoms in 5.78 mol NH_4NO_3

60. Calculate the percent composition of each compound. *7.3*
a. H_2S **c.** $Mg(OH)_2$
b. $(NH_4)_2C_2O_4$ **d.** Na_3PO_4

61. Using your answers from Problem 60, calculate the number of grams of these elements. *7.3*
a. sulfur in 3.54 g H_2S
b. nitrogen in 25.0 g $(NH_4)_2C_2O_4$
c. magnesium in 97.4 g $Mg(OH)_2$
d. phosphorus in 804 g Na_3PO_4

62. Which of the following compounds has the highest iron content? *7.3*
a. $FeCl_2$ **c.** $Fe(OH)_2$
b. $Fe(C_2H_3O_2)_3$ **d.** FeO

63. You find that 7.36 g of a compound has decomposed to give 6.93 g of oxygen. The only other element in the compound is hydrogen. If the molar mass of the compound is 34.0 g/mol, what is its molecular formula? *7.3*

64. Classify each formula as an empirical or a molecular formula. *7.3*
a. S_2Cl_2 **c.** Na_2SO_3 **e.** $C_{17}H_{19}NO_3$
b. $C_6H_{10}O_4$ **d.** $C_5H_{10}O_5$ **f.** $(NH_4)_2CO_3$

65. What is the molecular formula for each compound? Each compound's empirical formula and molar mass is given. *7.3*
a. CH_2O, 90 g/mol
b. HgCl, 472.2 g/mol
c. $C_3H_5O_2$, 146 g/mol

66. Determine the molecular formula for each compound. *7.3*
a. 94.1% O and 5.9% H; molar mass = 34 g
b. 40.0% C, 6.6% H, and 53.4% O; molar mass = 120 g