Chapter 3 Mass Relationships in Chemical Reactions

Student: ____

1. An atom of bromine has a mass about four times greater than that of an atom of neon. Which choice makes the correct comparison of the relative numbers of bromine and neon atoms in 1,000 g of each element?

   A. The number of bromine and neon atoms is the same.
   B. There are one thousand times as many bromine atoms as neon atoms.
   C. There are one thousand times as many neon atoms as bromine atoms.
   D. There are four times as many neon atoms as bromine atoms.
   E. There are four times as many bromine atoms as neon atoms.

2. An atom of bromine has a mass about four times greater than that of an atom of neon. How many grams of neon will contain the same number of atoms as 1,000 g of bromine?

   A. 4 g Ne
   B. 250 g Ne
   C. 400 g Ne
   D. 1,000 g Ne
   E. 4,000 g Ne

3. What is the average mass, in grams, of one atom of iron?

   A. 6.02×10^{23} g
   B. 1.66×10^{-24} g
   C. 9.28×10^{-23} g
   D. 55.85 g
   E. 55.85×10^{-23} g

4. What is the mass, in grams, of one arsenic atom?

   A. 5.48×10^{-23} g
   B. 33.0 g
   C. 74.9 g
   D. 1.24×10^{-22} g
   E. 8.04×10^{21} g

5. What is the mass, in grams, of one copper atom?

A. 1.055×10^{-22} g
B. 63.55 g
C. 1 amu
D. 1.66×10^{-24} g
E. 9.476×10^{21} g

6. The mass of 1.21×10^{20} atoms of sulfur is

A. 3.88×10^{21} g.
B. 2.00 mg.
C. 32.06 g.
D. 6.44 mg.
E. 2.00×10^{-4} g.

7. The mass of 1.63×10^{21} silicon atoms is

A. 2.71×10^{-23} g.
B. 4.58×10^{22} g.
C. 28.08 g.
D. 1.04×10^{4} g.
E. 7.60×10^{-2} g.

8. What is the mass of 7.80×10^{18} carbon atoms?

A. 1.30×10^{-5} g
B. 6.43×10^{3} g
C. 7.80×10^{18} g
D. 1.56×10^{-4} g
E. 12.01 g

9. If 0.274 moles of a substance weighs 62.5 g, what is the molar mass of the substance, in units of g/mol?

A. 2.28×10^{2} g/mol
B. 1.71×10^{1} g/mol
C. 4.38×10^{-3} g/mol
D. 2.17×10^{2} g/mol
E. none of these

10. One mole of iron

A. is heavier than one mole of lead (Pb).
B. is 77.0 g of iron.
C. is 26.0 g of iron.
D. weighs the same as one mole of lead.
E. is none of these.

11. Which of these quantities does *not* represent 1.00 mol of the indicated substance?

A. 6.02×10^{23} C atoms
B. 26.0 g Fe
C. 12.01 g C
D. 65.4 g Zn
E. 6.02×10^{23} Fe atoms

12. One nanogram doesn't seem like a very large number. How many magnesium atoms are there in 1.00 ng of magnesium?

A. 4.11×10^{-11} atoms
B. 2.48×10^{13} atoms
C. 6.83×10^{-35} atoms
D. 6.02×10^{14} atoms
E. 1.46×10^{34} atoms

13. How many silicon atoms are there in 1.00 g of silicon?

A. 1 atom
B. 0.0356 atoms
C. 2.57×10^{23} atoms
D. 2.14×10^{22} atoms
E. 1.75×10^{25} atoms

14. How many atoms are in 5.54 g of F_2?

A. 6.02×10^{23} atoms
B. 0.146 atoms
C. 0.292 atoms
D. 8.78×10^{22} atoms
E. 1.76×10^{23} atoms

15. How many atoms are in 4.39 g of CO_2?

A. 1.80×10^{23} atoms
B. 6.01×10^{22} atoms
C. 1.16×10^{26} atoms
D. 6.04×10^{24} atoms
E. 1.81×10^{25} atoms

16. How many atoms are in 0.0728 g of PCl_3?

A. 1.28×10^{21} atoms
B. 4.38×10^{22} atoms
C. 4.39×10^{21} atoms
D. 3.19×10^{20} atoms
E. 6.02×10^{24} atoms

17. Determine the number of moles of aluminum in 96.7 g of Al.

A. 0.279 mol
B. 3.58 mol
C. 7.43 mol
D. 4.21 mol
E. 6.02×10^{23} mol

18. Calculate the number of moles of xenon in 12.0 g of xenon.

A. 1.00 mol
B. 0.0457 mol
C. 0.183 mol
D. 7.62×10^{-3} mol
E. 0.0914 mol

19. How many moles of CF_4 are there in 171 g of CF_4?

A. 0.51 mol
B. 1.94 mol
C. 4.07 mol
D. 88.0 mol
E. 171 mol

20. How many moles of NH_3 are there in 77.5 g of NH_3?

A. 0.220 mol
B. 4.55 mol
C. 14.0 mol
D. 1.31×10^{3} mol
E. none of these

21. Calculate the number of moles of cesium in 50.0 g of cesium.

A. 0.376 mol
B. 0.357 mol
C. 2.66 mol
D. 2.80 mol
E. 0.0200 mol

22. Which of the following samples contains the greatest number of atoms?

A. 100 g of Pb
B. 2.0 mole of Ar
C. 0.1 mole of Fe
D. 5 g of He
E. 20 million O_2 molecules

23. Calculate the molecular mass of potassium permanganate, $KMnO_4$.

A. 52 amu
B. 70 amu
C. 110 amu
D. 158 amu
E. 176 amu

24. Calculate the molecular mass of menthol, $C_{10}H_{20}O$.

A. 156 amu
B. 140 amu
C. 29 amu
D. 146 amu
E. 136 amu

25. What is the molar mass of acetaminophen, $C_8H_9NO_2$?

A. 43 g/mol
B. 76 g/mol
C. 151 g/mol
D. 162 g/mol
E. 125 g/mol

26. What is the molar mass of nicotine, $C_{10}H_{14}N_2$?

A. 134 g/mol
B. 148 g/mol
C. 158 g/mol
D. 210 g/mol
E. 162 g/mol

27. What is the mass of 0.0250 mol of P_2O_5?

A. 35.5 g
B. 5676 g
C. 0.0250 g
D. 1.51×10^{22} g
E. 3.55 g

28. Calculate the mass of 3.00 moles of CF_2Cl_2.

A. 3.00 g
B. 174 g
C. 363 g
D. 1.81×10^{24} g
E. 40.3 g

29. The molecular formula of aspirin is $C_9H_8O_4$. How many aspirin molecules are present in one 500-milligram tablet?

A. 2.77 molecules
B. 2.77×10^{-3} molecules
C. 1.67×10^{24} molecules
D. 1.67×10^{21} molecules
E. none of these is correct.

30. Formaldehyde has the formula CH_2O. How many molecules are there in 0.11 g of formaldehyde?

A. 6.1×10^{-27}
B. 3.7×10^{-3}
C. 4
D. 2.2×10^{21}
E. 6.6×10^{22}

31. How many molecules are there in 8.0 g of ozone, O_3?

A. 3 molecules
B. 3.6×10^{24} molecules
C. 1.0×10^{23} molecules
D. 3.0×10^{23} molecules
E. 6.0×10^{23} molecules

32. How many moles of HCl are represented by 1.0×10^{19} HCl molecules?

A. 1.7×10^{-5} mol
B. 1.5×10^{-3} mol
C. 1.0×10^{19} mol
D. 36.5 mol
E. 6.02×10^{4} mol

33. How many sodium atoms are there in 6.0 g of Na_3N?

A. 3.6×10^{24} atoms
B. 4.6×10^{22} atoms
C. 1.3×10^{23} atoms
D. 0.217 atoms
E. 0.072 atoms

34. How many moles of oxygen atoms are there in 10 moles of $KClO_3$?

A. 3 mol
B. 3.3 mol
C. 10 mol
D. 30 mol
E. 6.02×10^{24} mol

35. How many sulfur atoms are there in 21.0 g of Al_2S_3?

A. 8.42×10^{22} atoms
B. 2.53×10^{23} atoms
C. 2.14×10^{23} atoms
D. 6.02×10^{23} atoms
E. 6.30×10^{26} atoms

36. How many sulfur atoms are present in 25.6 g of $Al_2(S_2O_3)_3$?

A. 0.393
B. 6
C. 3.95×10^{22}
D. 7.90×10^{22}
E. 2.37×10^{23}

37. How many fluorine atoms are there in 65 g of CF_4?

A. 0.74 atoms
B. 3.0 atoms
C. 4.5×10^{23} atoms
D. 1.8×10^{24} atoms
E. 2.4×10^{23} atoms

38. How many moles of O atoms are in 25.7 g of $CaSO_4$?

A. 0.189 mol
B. 0.755 mol
C. 4.00 mol
D. 1.14×10^{23} mol
E. 4.55×10^{23} mol

39. How many O atoms are there in 51.4 g $CaSO_4$?

A. 4
B. 2.40×10^{24}
C. 1.13
D. 9.09×10^{23}
E. 2.28×10^{23}

40. How many moles of Cl atoms are there in 65.2 g $CHCl_3$?

A. 0.548 mol
B. 1.09 mol
C. 3.3×10^{23} mol
D. 1.64 mol
E. 3.0 mol

41. How many carbon atoms are there in 10 lbs of sugar, $C_{12}H_{22}O_{11}$?

A. 9.6×10^{25} atoms
B. 8.0×10^{24} atoms
C. 159 atoms
D. 4.21 atoms
E. 342 atoms

42. How many grams of sulfur are there in 6.0 g of $Fe_2(SO_4)_3$?

A. 2.40 g
B. 0.48 g
C. 6.00 g
D. 0.92 g
E. 1.44 g

43. How many grams of sodium are there in 10. g of sodium sulfate, Na_2SO_4?

A. 0.16 g
B. 0.32 g
C. 3.2 g
D. 1.6 g
E. 142 g

44. How many grams of nitrogen are there in 7.5 g of $Ca(NO_3)_2$?

A. 0.64 g
B. 1.3 g
C. 0.15 g
D. 1.15 g
E. 2.3 g

45. The mass of four moles of molecular bromine (Br_2) is

A. 80 g.
B. 320 g.
C. 640 g.
D. 140 g.
E. 24×10^{23} g.

46. Calculate the mass of 4.50 moles of chlorine gas, Cl_2.

A. 6.34×10^{-2} g
B. 4.5 g
C. 15.7 g
D. 160 g
E. 319 g

47. What is the mass of 3.00 moles of ethanol, C_2H_6O?

A. 4.99×10^{-24} g
B. 138 g
C. 6.52×10^{-2} g
D. 50 g
E. 1.81×10^{24} g

48. What is the mass of 0.20 mole of C_2H_6O (ethanol)?

A. 230 g
B. 46 g
C. 23 g
D. 4.6 g
E. none of these

49. What is the mass of 8.25×10^{19} UF_6 molecules?

A. 352 g
B. 0.0482 g
C. 1.37×10^{-4} g
D. 2.90×10^{22} g
E. 8.25×10^{19} g

50. An average atom of uranium (U) is approximately how many times heavier than an atom of potassium?

A. 6.1 times
B. 4.8 times
C. 2.4 times
D. 12.5 times
E. 7.7 times

51. Boron obtained from borax deposits in Death Valley consists of two isotopes. They are boron-10 and boron-11 with atomic masses of 10.013 amu and 11.009 amu, respectively. The atomic mass of boron is 10.81 amu (see periodic table). Which isotope of boron is more abundant, boron-10 or boron-11?

A. This cannot be determined from data given.
B. Neither, their abundances are the same.
C. Boron-10
D. Boron-11

52. The element oxygen consists of three naturally occuring isotopes: ^{16}O, ^{17}O, and ^{18}O. The atomic mass of oxygen is 16.0 amu. What can be implied about the relative abundances of these isotopes?

A. More than 50% of all O atoms are ^{17}O.
B. Almost all O atoms are ^{18}O.
C. Almost all O atoms are ^{17}O.
D. The isotopes all have the same abundance, i.e. 33.3%.
E. The abundances of ^{17}O and ^{18}O are very small.

53. The empirical formula of a compound of uranium and fluorine that is composed of 67.6% uranium and 32.4% fluorine is

A. U_2F
B. U_3F_4
C. UF_4
D. UF_6
E. UF_8

54. The percent composition by mass of a compound is 76.0% C, 12.8% H, and 11.2% O. The molar mass of this compound is 284.5 g/mol. What is the molecular formula of the compound?

A. $C_{10}H_6O$
B. $C_9H_{18}O$
C. $C_{16}H_{28}O_4$
D. $C_{20}H_{12}O_2$
E. $C_{18}H_{36}O_2$

55. A compound was discovered whose composition by mass is 85.6% C and 14.4% H. Which of these choices could be the molecular formula of this compound?

A. CH_4
B. C_2H_4
C. C_3H_4
D. C_2H_6
E. C_3H_8

56. What is the coefficient of H_2O when the following equation is properly balanced with the smallest set of whole numbers?

___ Na + ___ H_2O → ___ NaOH + ___ H_2

A. 1
B. 2
C. 3
D. 4
E. 5

57. What is the coefficient of H_2O when the following equation is properly balanced with the smallest set of whole numbers?

$$\_\_\_\ Al_4C_3 + \_\_\_\ H_2O \rightarrow \_\_\_\ Al(OH)_3 + \_\_\_\ CH_4$$

A. 3
B. 4
C. 6
D. 12
E. 24

58. When balanced with the smallest set of whole numbers, the coefficient of O_2 in the following equation is:

$$\_\_\ C_2H_4 + \_\_\ O_2 \rightarrow \_\_\ CO_2 + \_\_\ H_2O$$

A. 1.
B. 2.
C. 3.
D. 4.
E. 6.

59. When a chemical equation is balanced, it will have a set of whole number coefficients that cannot be reduced to smaller whole numbers. What is the coefficient for O_2 when the following combustion reaction of a hydrocarbon is balanced?

$$\_\_\_\ C_7H_{14} + \_\_\_\ O_2 \rightarrow \_\_\_\ CO_2 + \_\_\_\ H_2O$$

A. 42
B. 21
C. 11
D. 10
E. none of these

60. What is the coefficient preceding O_2 when the following combustion reaction of a fatty acid is properly balanced using the smallest set of whole numbers?

$$\_\_\ C_{18}H_{36}O_2 + \_\_\ O_2 \rightarrow \_\_\ CO_2 + \_\_\ H_2O$$

A. 1
B. 8
C. 9
D. 26
E. 27

61. What is the coefficient of H_2SO_4 when the following equation is properly balanced with the smallest set of whole numbers

$$\_\_\_ \ Ca_3(PO_4)_2 + \_\_\_ \ H_2SO_4 \rightarrow \_\_\_ \ CaSO_4 + \_\_\_ \ H_3PO_4$$

A. 3
B. 8
C. 10
D. 11
E. none of these

62. Balance the equation below using the smallest set of whole numbers. What is the coefficient of H_2O?

$$\_\_\_ \ PCl_3(l) + \_\_\_ \ H_2O(l) \rightarrow \_\_\_ \ H_3PO_3(aq) + \_\_\_ \ HCl(aq)$$

A. 1
B. 2
C. 3
D. 5
E. none of these

63. What is the coefficient of O_2 when the following equation is properly balanced with the smallest set of whole numbers?

$$\_\_\_ \ CH_3OH + \_\_\_ \ O_2 \rightarrow \_\_\_ \ CO_2 + \_\_\_ \ H_2O$$

A. 1
B. 2
C. 3
D. 7
E. none of these

64. Balance the following equation using the smallest set of whole numbers, then add together the coefficients. Don't forget to count coefficients of one.

$$\_\_ \ SF_4 + \_\_ \ H_2O \rightarrow \_\_ \ H_2SO_3 + \_\_ \ HF$$

The sum of the coefficients is

A. 4.
B. 6.
C. 7.
D. 9.
E. none of these

65. Balance the following equation using the smallest set of whole numbers, then add together the coefficients. Don't forget to count coefficients of one.

___ Cr + ___ $H_2SO_4 \rightarrow$ ___ $Cr_2(SO_4)_3$ + ___ H_2

The sum of the coefficients is

A. 4.
B. 9.
C. 11.
D. 13.
E. 15.

66. Balance the following equation using the smallest set of whole numbers, then add together the coefficients. Don't forget to count coefficients of one.

___ Al + ___ $H_2SO_4 \rightarrow$ ___ $Al_2(SO_4)_3$ + ___ H_2

The sum of the coefficients is

A. 3.
B. 5.
C. 6.
D. 9.
E. 12.

67. Balance the following equation using the smallest set of whole numbers, then add together the coefficients. Don't forget to count coefficients of one.

___ CH_4 + ___ $Cl_2 \rightarrow$ ___ CCl_4 + ___ HCl

The sum of the coefficients is

A. 4.
B. 6.
C. 8.
D. 10.
E. 12.

68. Ammonia reacts with diatomic oxygen to form nitric oxide and water vapor:

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

When 40.0 g NH_3 and 50.0 g O_2 are allowed to react, which is the limiting reagent?

A. NH_3
B. O_2
C. Neither reagent is limiting.

69. Ammonia reacts with diatomic oxygen to form nitric oxide and water vapor:

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

When 20.0 g NH_3 and 50.0 g O_2 are allowed to react, which is the limiting reagent?

A. NH_3
B. O_2
C. Neither reagent is limiting.

70. When 22.0 g NaCl and 21.0 g H_2SO_4 are mixed and react according to the equation below, which is the limiting reagent?

$2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$

A. NaCl
B. H_2SO_4
C. Na_2SO_4
D. HCl
E. No reagent is limiting.

71. Vanadium(V) oxide reacts with calcium according to the chemical equation below. When 10.0 moles of V_2O_5 are mixed with 10.0 moles of Ca, which is the limiting reagent?

$V_2O_5(s) + 5Ca(l) \rightarrow 2V(l) + 5CaO(s)$

A. V_2O_5
B. Ca
C. V
D. CaO
E. No reagent is limiting.

72. Chlorine gas can be made from the reaction of manganese dioxide with hydrochloric acid. Which is the limiting reagent when 28 g of MnO_2 are mixed with 42 g of HCl?

$MnO_2(s) + 4HCl(aq) \rightarrow MnCl_2(aq) + 2H_2O(l) + Cl_2(g)$

A. MnO_2
B. HCl
C. $MnCl_2$
D. Cl_2
E. No reagent is limiting.

73. How many grams of Cl_2 can be prepared from the reaction of 16.0 g of MnO_2 and 30.0 g of HCl according to the following chemical equation?

$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

A. 0.82 g
B. 5.8 g
C. 13.0 g
D. 14.6 g
E. 58.4 g

74. Hydrochloric acid can be prepared by the following reaction:

$2NaCl(s) + H_2SO_4(aq) \rightarrow 2HCl(g) + Na_2SO_4(s)$

How many grams of HCl can be prepared from 2.00 mol H_2SO_4 and 150 g NaCl?

A. 7.30 g
B. 93.5 g
C. 146 g
D. 150 g
E. 196 g

75. Calculate the mass of FeS formed when 9.42 g of Fe reacts with 8.50 g of S.

$Fe(s) + S(s) \rightarrow FeS(s)$

A. 17.9 g
B. 87.9 g
C. 26.0 g
D. 14.8 g
E. 1.91×10^{-3} g

76. What is the theoretical yield of chromium that can be produced by the reaction of 40.0 g of Cr_2O_3 with 8.00 g of aluminum according to the chemical equation below?

$2Al + Cr_2O_3 \rightarrow Al_2O_3 + 2Cr$

A. 7.7 g
B. 15.4 g
C. 27.3 g
D. 30.8 g
E. 49.9 g

77. Calculate the mass of excess reagent remaining at the end of the reaction in which 90.0 g of SO_2 are mixed with 100.0 g of O_2.

$2SO_2 + O_2 \rightarrow 2SO_3$

A. 11.5 g
B. 22.5 g
C. 67.5 g
D. 77.5 g
E. 400 g

78. What is the maximum number of grams of ammonia, NH_3, that can be obtained from the reaction of 10.0 g of H_2 and 80.0 g of N_2?

$N_2 + 3H_2 \rightarrow 2NH_3$

A. 28.4 g
B. 48.6 g
C. 56.7 g
D. 90.0 g
E. 97.1 g

79. How many grams of water could be made from 5.0 mol H_2 and 3.0 mol O_2?

A. 90. g
B. 36 g
C. 42 g
D. 45 g
E. 108 g

80. Ammonia reacts with diatomic oxygen to form nitric oxide and water vapor:

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

What is the theoretical yield of water, in moles, when 40.0 g NH_3 and 50.0 g O_2 are mixed and allowed to react?

A. 1.30 mol
B. 1.57 mol
C. 1.87 mol
D. 3.53 mol
E. 2.87 mol

81. What is the theoretical yield of vanadium, in moles, that can be produced by the reaction of 2.0 mole of V_2O_5 with 6.0 mole of calcium based on the following chemical equation?

$V_2O_5(s) + 5Ca(l) \rightarrow 2V(l) + 5CaO(s)$

A. 1.0 mol
B. 1.6 mol
C. 2.0 mol
D. 2.4 mol
E. 4.0 mol

82. What is the theoretical yield of vanadium, in moles, that can be produced by the reaction of 1.0 mole of V_2O_5 with 4.0 mole of calcium based on the following chemical equation?

$V_2O_5(s) + 5Ca(l) \rightarrow 2V(l) + 5CaO(s)$

A. 1.0 mol
B. 1.6 mol
C. 2.0 mol
D. 0.80 mol
E. 3.2 mol

83. What is the theoretical yield of vanadium that can be produced by the reaction of 40.0 g of V_2O_5 with 40.0 g of calcium based on the following chemical equation?

$V_2O_5(s) + 5Ca(l) \rightarrow 2V(l) + 5CaO(s)$

A. 11.2 g
B. 5.6 g
C. 22.4 g
D. 40.0 g
E. 20.3 g

84. How many grams of Cr can be produced by the reaction of 44.1 g of Cr_2O_3 with 35.0 g of Al according to the following chemical equation?

$$2Al + Cr_2O_3 \rightarrow Al_2O_3 + 2Cr$$

A. 7.56 g
B. 30.2 g
C. 67.4 g
D. 104 g
E. 60.4 g

85. What is the theoretical yield of aluminum that can be produced by the reaction of 60.0 g of aluminum oxide with 30.0 g of carbon according to the following chemical equation?

$$Al_2O_3 + 3C \rightarrow 2Al + 3CO$$

A. 30.0 g
B. 7.9 g
C. 101.2 g
D. 45.0 g
E. 31.8 g

86. A 1.375 g sample of mannitol, a sugar found in seaweed, is burned completely in oxygen to give 1.993 g of carbon dioxide and 0.9519 g of water. The empirical formula of mannitol is

A. CHO
B. CH_7O_3
C. C_3H_2O
D. $C_3H_7O_3$
E. CH_2O

87. A 0.8715 g sample of sorbic acid, a compound first obtained from the berries of a certain ash tree, is burned completely in oxygen to give 2.053 g of carbon dioxide and 0.5601 g of water. The empirical formula of sorbic acid is

A. CH_2O
B. C_3H_4O
C. CH_4O_3
D. $C_3H_4O_2$
E. $C_2H_4O_2$

88. The first step in the Ostwald process for producing nitric acid is

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$.

If the reaction of 150. g of ammonia with 150. g of oxygen gas yields 87. g of nitric oxide (NO), what is the percent yield of this reaction?

A. 100%
B. 49%
C. 77%
D. 33%
E. 62%

89. One way of obtaining pure sodium carbonate is through the decomposition of the mineral trona, $Na_5(CO_3)_2(HCO_3)\cdot 2H_2O$,

$Na_5(CO_3)_2(HCO_3)\cdot 2H_2O(s) \rightarrow 5Na_2CO_3(s) + CO_2(g) + 3H_2O(g)$

When 1.00 metric ton (1×10^3 kg) of trona is decomposed, 0.74 metric ton of Na_2CO_3 is recovered. What is the percent yield of this reaction?

A. 93%
B. 43%
C. 22%
D. 83%
E. 17%

90. When octane (C_8H_{18}) is burned in a particular internal combustion engine, the yield of products (carbon dioxide and water) is 93%. What mass of carbon dioxide will be produced in this engine when 15.0 g of octane is burned with 15.0 g of oxygen gas?

A. 13. g
B. 12. g
C. 21 g
D. 54. g
E. 43. g

91. The Hall process for the production of aluminum involves the reaction of aluminum oxide with elemental carbon to give aluminum metal and carbon monoxide. If the yield of this reaction is 75%, what mass of aluminum metal can be produced from the reaction of 1.65×10^6 of aluminum oxide with 1.50×10^6 g of carbon?

A. 1.6×10^5 g
B. 3.3×10^5 g
C. 6.6×10^5 g
D. 8.7×10^5 g
E. 1.7×10^6 g

92. The Hall process for the production of aluminum involves the reaction of aluminum oxide with elemental carbon to give aluminum metal and carbon monoxide. If the yield of this reaction is 82% and aluminum ore is 71% by mass aluminum oxide, what mass of aluminum ore must be mined in order to produce 1.0×10^3 kg (1 metric ton) of aluminum metal by the Hall process?

A. 1.8×10^3 kg
B. 2.2×10^3 kg
C. 1.1×10^3 kg
D. 1.6×10^3 kg
E. 3.3×10^3 kg

93. A method for producing pure copper metal involves the reaction of copper(I) sulfide with oxygen gas to give copper metal and sulfur dioxide. Suppose the yield of this reaction is 87%. What mass of a copper ore consisting of 46% copper(I) sulfide must be mined in order to produce 1.0×10^3 kg (1.0 metric ton) of copper metal?

A. 1.4×10^3 kg
B. 3.2×10^3 kg
C. 1.3×10^3 kg
D. 1.5×10^3 kg
E. 8.0×10^3 kg

94. Solid sodium hydrogen carbonate (also known as sodium bicarbonate) can be decomposed to form solid sodium carbonate, gaseous carbon dioxide, and water vapor. When the balanced chemical reaction for this process is written such that the coefficient of water is 1, what is the coefficient of carbon dioxide?

A. 0
B. 1
C. 2
D. ½
E. cannot be determined

95. Aluminum hydroxide reacts with nitric acid to form aluminum nitrate and water. What mass of water can be formed by the reaction of 15.0 g of aluminum hydroxide with excess nitric acid?

A. 1.15 g
B. 3.46 g
C. 45.0 g
D. 6.14 g
E. 10.4 g

96. Liquid hexane, C_6H_{14}, burns in oxygen gas to yield carbon dioxide and water. What is the minimum mass of oxygen required for the complete reaction of 10.0 mL of hexane?
[Given: density of hexane = 0.660 g/mL]

A. 3.71 g
B. 2.45 g
C. 23.3 g
D. 46.6 g
E. 35.3 g

97. Liquid heptane, C_7H_{16} , burns in oxygen gas to yield carbon dioxide and water. What mass of carbon dioxide is produced when 15.0 mL of heptane burns completely?
[Given: density of heptane = 0.6838 g/mL]

A. 46.1 g
B. 71.8 g
C. 4.49 g
D. 6.59 g
E. 31.5 g

98. Liquid heptane, C_7H_{16}, burns in oxygen gas to yield carbon dioxide and water. What mass of water is produced when 15.0 mL of heptane burns completely?
[Given: density of heptane = 0.6838 g/mL]

A. 14.8 g
B. 2.70 g
C. 31.6 g
D. 1.85 g
E. 21.6 g

99. Liquid heptane, C_7H_{16}, burns in oxygen gas to yield carbon dioxide and water. What is the minimum mass of oxygen required for the complete reaction of 25.5 mL of heptane?
[Given: density of heptane = 0.6838 g/mL]

A. 8.14 g
B. 89.6 g
C. 61.3 g
D. 30.6 g
E. 5.57 g

100. A gold wire has a diameter of 1.00 mm. What length of this wire contains exactly 1.00 mol of gold?
[Given: density of Au = 17.0 g/cm^3]

A. 2630 m
B. 3.69 m
C. 251 m
D. 14.8 m
E. 62.7 m

101. A silver wire has a diameter of 0.500 mm. What length of this wire contains exactly 1.00 mol of silver?
[Given: density of Ag = 10.5 g/cm^3]

A. 52.3 m
B. 222 m
C. 13.1 m
D. 2.01 m
E. 890 m

102. A copper wire has a diameter of 2.00 mm. What length of this wire contains exactly 1.00 mol of copper?
[Given: density of Cu = 8.92 g/cm^3]

A. 0.178 m
B. 0.567 m
C. 180 m
D. 45.1 m
E. 2.27 m

Chapter 3 Mass Relationships in Chemical Reactions Key

1.D	26.E	51.D	76.B
2.B	27.E	52.E	77.D
3.C	28.C	53.D	78.C
4.D	29.D	54.E	79.A
5.A	30.D	55.B	80.C
6.D	31.C	56.B	81.D
7.E	32.A	57.D	82.B
8.D	33.C	58.C	83.E
9.A	34.D	59.B	84.B
10.E	35.B	60.D	85.E
11.B	36.E	61.A	86.D
12.B	37.D	62.C	87.B
13.D	38.B	63.C	88.D
14.E	39.D	64.D	89.A
15.B	40.D	65.B	90.B
16.A	41.A	66.D	91.C
17.B	42.E	67.D	92.E
18.E	43.C	68.B	93.B
19.B	44.B	69.A	94.B
20.B	45.C	70.A	95.E
21.A	46.E	71.B	96.C
22.B	47.B	72.B	97.E
23.D	48.E	73.C	98.A
24.A	49.B	74.B	99.C
25.C	50.A	75.D	100.D
			101.A
			102.E