Chapter 2—Atoms, Molecules, and Ions

MULTIPLE CHOICE

1. Which of the following statements concerning atomic structure is/are correct?
    1. Neutrons and electrons are found in space as a cloud around the nucleus.
    2. The nucleus contains all the positive charge of an atom.
    3. Electrons surround the nucleus and account for the majority of an atom's volume.

    a. 1 only b. 2 only c. 3 only d. 2 and 3 e. 1, 2, and 3

    ANS: D

2. Atoms consist of three fundamental particles. What are these particles and their charges?
    a. proton (+1), neutron (neutral) and electron (−1)
    b. proton (−1), neutron (+1) and electron (neutral)
    c. proton (+1), neutron (−1) and electron (neutral)
    d. proton (neutral), neutron (+1) and electron (−1)
    e. proton (−1), neutron (neutral) and electron (+1)

    ANS: A

3. Rank the subatomic particles from least to greatest mass.
    a. electron mass = proton mass = neutron mass
    b. electron mass = neutron mass < proton mass
    c. electron mass = proton mass < neutron mass
    d. electron mass < proton mass < neutron mass
    e. electron mass < proton mass = neutron mass

    ANS: D

4. Atomic number is the_____ in the nucleus of an atom.
    a. number of electrons
    b. number of protons
    c. number of protons minus the number of neutrons
    d. sum of the number of electrons and neutrons
    e. sum of the number of neutrons and protons

    ANS: B

5. The atomic number of fluorine is ____.
    a. 7A b. 9 c. 10 d. 19 e. 0

    ANS: B

6. Which of the following statements is/are CORRECT?
    1. A hydrogen atom with 1 proton and zero neutrons is assigned a mass of exactly 1 atoms mass unit.
    2. 1 atomic mass unit is equivalent to 9.11×10^{-28} g.
    3. A carbon atom with 6 protons and 6 neutrons is assigned a mass of exactly 12 atomic mass units.

    a. 1 only b. 2 only c. 3 only d. 1 and 2 e. 1, 2, and 3

    ANS: C

7. What is the mass number of an argon atom with 22 neutrons?
    a. 2 b. 18 c. 22 d. 40 e. 39.95

    ANS: D

8. A neutral atom of the isotope ^{197}Au contains
    a. 197 neutrons and 276 electrons.
    b. 79 protons and 197 neutrons.
    c. 197 protons and 118 electrons.
    d. 197 protons, 79 neutrons, and 197 electrons.
    e. 79 protons and 118 neutrons.

    ANS: E

9. How many protons are there in an atom of scandium-45?
    a. 25 b. 66 c. 20 d. 21 e. 24

    ANS: D

10. How many protons, neutrons, and electrons are in a neutral atom of ^{55}Fe?
    a. 26 protons, 29 neutrons, 55 electrons
    b. 26 protons, 29 neutrons, 29 electrons
    c. 26 protons, 29 neutrons, 26 electrons
    d. 55 protons, 26 neutrons, 55 electrons
    e. 55 protons, 26 neutrons, 26 electrons

    ANS: C

11. What is the mass of chlorine-35 relative to carbon-12?
    a. 0.657 b. 0.522 c. 1.52 d. 2.92 e. 23

    ANS: D

12. Which of the following atoms contains the fewest protons?
    a. ^{232}Th b. ^{231}Pa c. ^{245}Pu d. ^{238}U e. ^{232}Pa

    ANS: A

13. Which of the following atoms contains more protons than neutrons?
    a. $^{1}_{1}\mathrm{H}$ b. $^{19}_{9}\mathrm{F}$ c. $^{34}_{16}\mathrm{S}$ d. $^{24}_{12}\mathrm{Mg}$ e. $^{4}_{2}\mathrm{He}$

    ANS: A

14. What is the atomic symbol for an element with 16 protons and 17 neutrons?
    a. $^{33}_{16}Cl$ b. $^{17}_{16}Cl$ c. $^{33}_{16}S$ d. $^{16}_{17}Cl$ e. $^{17}_{16}S$

    ANS: C

15. What is the identity of $^{58}_{28}X$?
    a. Ni b. Zn c. Rn d. Ce e. Pd

    ANS: A

16. What is the atomic symbol for an element that has 30 neutrons and a mass number of 55?
    a. At b. Zn c. Co d. Mn e. Cs

    ANS: D

17. How many neutrons are there in an atom of gallium-71 ?
    a. 31 b. 2 c. 102 d. 71 e. 40

    ANS: E

18. Which of the following atoms contains the largest number of neutrons?
    a. $^{42}_{20}Ca$ b. $^{39}_{19}K$ c. $^{37}_{17}Cl$ d. $^{41}_{19}K$ e. $^{42}_{18}Ar$

    ANS: E

19. An atom that has the same number of neutrons as ^{59}Ni is
    a. $^{58}Zn.$ b. $^{58}Co.$ c. $^{57}Cr.$ d. $^{58}Mn.$ e. $^{59}Zn.$

    ANS: B

20. Two isotopes of a given element will have the same number of ____, but a different number of ____ in their nucleus.
    a. protons, electrons
    b. electrons, protons
    c. protons, neutrons
    d. neutrons, protons
    e. electrons, neutrons

    ANS: C

21. If two different isotopes have the same atomic number, it must mean that
    a. they have the same atomic mass.
    b. they have the same mass number.
    c. they have the same number of protons.
    d. they have the same number of electrons.
    e. they have the same number of neutrons.

    ANS: C

22. Which of the following atomic symbols represents an isotope of ^{113}Cd?
    a. ^{112}Ag b. ^{114}In c. ^{113}In d. ^{114}Cd e. ^{113}Ag

    ANS: D

23. Which of the following statements is true concerning ^{16}O and ^{17}O?
    a. They have the same number of neutrons.
    b. They are isotopes.
    c. They have the same relative atomic mass.
    d. They have the same mass number.
    e. They have different chemical properties.

    ANS: B

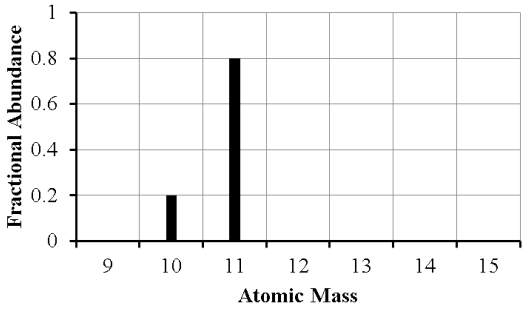
24. The masses of isotopes and their abundances are determined experimentally using
    a. a mass spectrometer.
    b. an analytical balance.
    c. a centrifuge.
    d. filtration followed by distillation.
    e. electrolysis.

    ANS: A

25. A sample of an element consists of two isotopes. The percent abundance of one of the isotopes is 54.0%. What is the percent abundance of the other isotope?
    a. 31.0 b. 27.0 c. 23.0 d. 54.0 e. 46.0

    ANS: E

26. The mass spectrum of an element with two naturally occurring isotopes is shown below. What is the best estimate of the element's (average) atomic weight?



    a. 10 amu b. 11 amu c. 10.8 amu d. 10.2 amu e. 10.5 amu

    ANS: C

27. Lithium has two naturally occurring isotopes, ^{6}Li and ^{7}Li . The atomic weight of lithium is 6.941. Which of the following statements concerning the relative abundance of each isotope is correct?

    a. The abundance of ^{7}Li is greater than ^{6}Li.
    b. The abundance of ^{7}Li is less than ^{6}Li.
    c. The abundance of ^{6}Li is equal to the abundance of ^{7}Li.
    d. Not enough data is provided to determine the correct answer.
    e. Based on the atomic mass, only ^{7}Li occurs naturally.

    ANS: A

28. The element chlorine has two stable isotopes, chlorine-35 with an atomic mass of 34.97 u and chlorine-37 with an atomic mass of 36.97 u. From the atomic weight found on the periodic table, one can conclude that:
    a. both isotopes have the same percent natural abundance
    b. there is an isotope of nitrogen with an atomic mass of 35.45 u
    c. chlorine-35 has the highest percent natural abundance
    d. chlorine-37 has the highest percent natural abundance

    ANS: C

29. Rubidium has two naturally occurring isotopes. The atomic weight of Rb is 85.4678 u. If 72.15% of Rb is found as Rb-85 (84.9117 u), what is the mass of the other isotope?
    a. 0.56 u b. 85.68 u c. 86.91 u d. 86.02 u e. 83.47 u

    ANS: C

30. An element consists of three isotopes. The abundance of one isotope is 92.21% and its atomic mass is 27.97693 u. The abundance of the second isotope is 4.70% and its atomic mass is 28.97649 u. The atomic mass of the third isotope is 29.97376 u. What is the atomic weight of the element?
    a. 28.09 u b. 28.98 u c. 28.96 u d. 29.87 u e. 29.07 u

    ANS: A

31. Naturally occurring element X exists in three isotopic forms: X-28 (27.979 u, 77.03% abundance), X-29 (28.976 u, 8.00% abundance), and X-30 (29.974 u, 14.97% abundance). Calculate the atomic weight of X.
    a. 29.64 u b. 28.36 u c. 29.05 u d. 29.60 u e. 27.38 u

    ANS: B

32. A certain element consists of two stable isotopes. The first has a mass of 14.0031 amu and a percent natural abundance of 99.63%. The second has a mass of 15.001 amu and a percent natural abundance of 0.37%. What is the atomic weight of the element?
    a. 13.95 u b. 14.00 u c. 14.01 u d. 14.50 u e. 19.50 u

    ANS: C

33. Copper has an atomic weight of 63.55 u. If 69.17% of Cu exists as Cu-63 (62.93960 u), what is the identity and the atomic mass of the other isotope?
    a. Cu-64; 63.82 u
    b. Cu-64; 64.16 u
    c. Cu-65; 64.16 u
    d. Cu-65; 64.92 u
    e. Cu-66; 65.91 u

    ANS: D

34. Silver has two stable isotopes with masses of 106.90509 u and 108.9047 u. The atomic weight of silver is 107.868 u. What is the percent abundance of each isotope?
    a. 50.0% Ag-107 and 50.0% Ag-109
    b. 51.8% Ag-107 and 48.2% Ag-109
    c. 55.4% Ag-107 and 44.6% Ag-109
    d. 48.2% Ag-107 and 51.8% Ag-109
    e. 44.6% Ag-107 and 55.4% Ag-109

    ANS: B

35. The elements in group 2A are known as the
    a. alkaline earth metals.
    b. halogens.
    c. transition metals.
    d. alkali metals.
    e. noble gases.

    ANS: A

36. Which of the following statements is/are CORRECT?
    1. The group 3A elements are also known as the chalcogens.
    2. The noble gases are sometimes called the rare gases because of their low abundances.
    3. The halogens, or group 7A elements, all exist as diatomic molecules.

    a. 1 only b. 2 only c. 3 only d. 2 and 3 e. 1, 2, and 3

    ANS: D

37. What element is in the fourth period in Group 3A?
    a. Sb b. Ga c. In d. Si e. Tl

    ANS: B

38. What halogen is in the third period?
    a. S b. Cl_2 c. I_2 d. H_2 e. Ar

    ANS: B

39. Which of the following statements is <u>not</u> true about the element iron?
    a. It is a metal.
    b. It is a transition element.
    c. It is in period 4.
    d. It has chemical and physical properties most similar to cadmium.
    e. It is in group 8B.

    ANS: D

40. In which group of the following groups of the periodic table are all the elements nonmetals?
    a. 2A b. 3A c. 5A d. 6A e. 7A

    ANS: E

41. Which element belongs to the actinides?
    a. curium b. rubidium c. barium d. iodine e. krypton

    ANS: A

42. What is the name of the halogen in period 4?
    a. iodine b. bromine c. barium d. neon e. potassium

    ANS: B

43. What is the common name of the group that has as one of its members the element which contains 4 protons in its nucleus?
    a. transition metals
    b. halogens
    c. noble gases
    d. alkaline earth metals
    e. alkali metals

    ANS: D

44. Which of the following elements is not a metalloid?
    a. boron b. selenium c. germanium d. arsenic e. silicon

    ANS: B

45. The formula of acetic acid, CH_3CO_2H, is an example of a(n)
    a. condensed formula.
    b. empirical formula.
    c. structural formula.
    d. ionic compound formula.
    e. mass spectrum.

    ANS: A

46. $C_2H_2F_4$ is the formula for two possible molecules. $C_2H_2F_4$ is an example of a(n)
    a. structural formula.
    b. empirical formula.
    c. condensed formula.
    d. space-filling model.

e. molecular formula.

ANS: E

47. Which element is most likely to form a 2– ion?
    a. K
    b. Mg
    c. P
    d. Br
    e. S

    ANS: E

48. Which atom is most likely to form a 2+ ion?
    a. scandium
    b. calcium
    c. aluminum
    d. oxygen
    e. fluorine

    ANS: B

49. Identify the ions present in Na_2SO_4.
    a. Na^+, S^{2-}, and O^{2-}
    b. Na^+, S^{2+}, and O^{2-}
    c. Na^+ and SO_4^{2-}
    d. Na^+, S^{2-}, and O^{2+}
    e. Na^+ and SO_4^-

    ANS: C

50. Identify the ions in $CaHPO_4$.
    a. Ca^{2+} and PO_4^{3-}
    b. Ca^{2+} and HPO_4^{2-}
    c. Ca^+ and HPO_4^-
    d. Ca^{3+} and HPO_4^{3-}
    e. Ca^{2+}, H^+, P^{3-}, and O^{2-}

    ANS: B

51. What charge is likely on a monatomic silver cation?
    a. 2–
    b. 1–
    c. 1+
    d. 2+
    e. 3+

    ANS: C

52. For a nonmetal in Group 6A of the periodic table, the most common monatomic ion will have a charge of ____.
    a. 3–
    b. 2–
    c. 1–
    d. 1+
    e. 2+

    ANS: B

53. Bismuth(III) sulfide is an ionic compound formed from Bi^{3+} and S^{2-}. What is the correct way to represent the formula?
    a. BiS^{+} b. BiS_2^{-} c. $Bi^{3+}S^{2-}$ d. Bi_2S_3 e. Bi_6S_9

    ANS: D

54. Which of the following formulas is not correct?
    a. $AlPO_4$ b. $KClO_4$ c. CaS d. $Na(NO_3)_2$ e. Na_2HPO_4

    ANS: D

55. What is the correct formula for an ionic compound that contains barium ions and carbonate ions?
    a. $BaCO_3$ b. $Ba(HCO_3)_2$ c. Ba_2CO_3 d. Ba_2C e. $Ba(CO_3)_2$

    ANS: A

56. Sodium sulfate has the chemical formula Na_2SO_4. Based on this information, the formula for chromium(III) sulfate is ____.
    a. $CrSO_4$ b. $Cr(SO_4)_3$ c. $Cr_2(SO_4)_3$ d. Cr_2SO_4 e. $Cr_3(SO_4)_2$

    ANS: C

57. What is the charge on the copper ion in Ga_3P?
    a. 3– b. 1– c. 0 d. 1+ e. 3+

    ANS: D
    NOT: Dynamic Question

58. What is the correct formula for calcium nitrate?
    a. CaN b. Ca_3N_2 c. $CaNO_2$ d. $Ca_3(NO_3)_2$ e. $Ca(NO_3)_2$

    ANS: E

59. What is the correct formula for potassium dihydrogen phosphate?
    a. KH_2PO_4 b. K_2HPO_4 c. $K_2H_2PO_4$ d. $K_3H_2PO_4$ e. KH_2P

    ANS: A

60. The formula for aluminum chloride is
    a. $AlCl_3$. b. AlCl. c. Al_2Cl. d. $AlCl_4$. e. $AlCl_2$.

    ANS: A

61. What is the correct formula for cobalt(III) bromide?
a. $CoBr$ b. $CoBr_3$ c. Co_2Br_3 d. Co_3Br_2 e. Co_3Br

ANS: B

62. What is the correct formula for gallium(III) sulfate?
a. $GaSO_4$ b. Ga_2SO_4 c. $Ga_3(SO_4)_2$ d. $Ga_2(SO_4)_3$ e. $Ga(SO_4)_2$

ANS: D

63. The correct name for Co^{2+} is
a. monocobalt ion.
b. cobalt(II) ion.
c. cobalt ion.
d. cobalt(I) ion.
e. cobalt.

ANS: B
NOT: Dynamic Question

64. What is the symbol for an ion of an element which has **56** protons and **54** electrons.
a. Ba^{2+} b. Ba^{2-} c. Xe^{2+} d. Xe^{2-} e. Ds^{2+}

ANS: A

65. What is the correct name for NH_4NO_3?
a. ammonia hydrogen nitrate
b. ammonia hydrogen nitride
c. ammonium nitric acid
d. ammonium nitrate
e. ammonium nitride

ANS: D

66. What is the formula for the compound which forms between the ammonium and bromide ions?
a. NH_3Br b. NH_4Br c. NH_3Br_2 d. NH_4Br_2 e. $(NH_4)_2Br$

ANS: B

67. What is the correct name for $SrCl_2$?
a. strontium dichloride
b. strontium dichlorine
c. strontium(II) dichloride
d. strontium chloride
e. iodine strontide

ANS: D

68. What is the correct name for $Ca(CH_3CO_2)_2$?
    a. calcium(II) carbonate
    b. calcium carbonate
    c. calcium acetate
    d. acetic calcide
    e. calcium carbonide

    ANS: C

69. Which of the following statements concerning ionic compounds is/are correct?
    1. As ion charges increase, the attraction between oppositely charged ions increases.
    2. Although not electrically conductive like metals, ionic compounds are malleable.
    3. Positive and negative ions are attracted to each other by electrostatic forces.

    a. 1 only b. 2 only c. 3 only d. 1 and 3 e. 1, 2, and 3

    ANS: D

70. Predict which ionic compound has the highest melting point.
    a. KBr b. MgO c. RbI d. $CaBr_2$ e. CsCl

    ANS: B

71. What is the correct name for Cl_2O_7?
    a. dichlorine heptoxide.
    b. chlorine oxide.
    c. dichloride heptoxide.
    d. dichlorine heptaoxygen.
    e. chlorine heptaoxygen.

    ANS: A

72. What is the correct name for CCl_4?
    a. carbon chlorine
    b. tetracarbon chloride
    c. carbon tetrachloride
    d. carbon(IV) chloride
    e. tetrachlorocarbide

    ANS: C

73. What is the common name for PH_3?
    a. laughing gas
    b. hydrazine
    c. nitroglycerin
    d. ammonia
    e. phosphine

    ANS: E

74. You have 2.50 g of each of the following elements: Ca, Cu, Cs, C, and Cr. Which sample contains the largest number of atoms?
    a. Ca
    b. Cu
    c. Cs
    d. C
    e. Cr

    ANS: D

75. What is the molecular mass of cyclooctane, C_8H_{16}?
    a. 13.02 g/mol
    b. 1553.53 g/mol
    c. 97.10 g/mol
    d. 112.21 g/mol
    e. 28.14 g/mol

    ANS: D

76. Calculate the number of moles in 0.48 g Cu.
    a. 0.033 mol
    b. 0.48 mol
    c. 31 mol
    d. 7.6×10^{-3} mol
    e. 1.3×10^{2} mol

    ANS: D

77. What is the mass of 0.71 mol Na?
    a. 1.2×10^{-24} g
    b. 12 g
    c. 16 g
    d. 0.031 g
    e. 32 g

    ANS: C

78. A 0.0050 g sample of boron contains ____ B atoms.
    a. 4.6×10^{-4}
    b. 7.7×10^{-28}
    c. 2.8×10^{20}
    d. 3.1×10^{21}
    e. 3.3×10^{22}

    ANS: C

79. The molar mass of platinum is 195.08 g/mol. What is the mass of 1.00×10^2 Pt atoms?
    a. 8.51×10^{-25} g
    b. 3.24×10^{-24} g
    c. 1.67×10^{-22} g
    d. 3.24×10^{-22} g
    e. 3.24×10^{-20} g

    ANS: E

80. A 1.583 g sample of an element contains 8.959×10^{21} atoms. What is the element symbol?
    a. Pd b. Te c. La d. Sb e. Rh

    ANS: A TOP: 2.9 Atoms, Molecules, and the Mole

81. What mass of Al contains the same number of atoms as 3.0 g Pb?
    a. 23 g
    b. 0.014 g
    c. 3.0 g
    d. 0.39 g
    e. 0.11 g

    ANS: D

82. A nail is coated with a 0.053 cm thick layer of zinc. The surface area of the nail is 8.59 cm^2. The density of zinc is 7.13 g/cm^3. How many zinc atoms are used in the coating?
    a. 5.9×10^{20} atoms
    b. 3.0×10^{22} atoms
    c. 3.8×10^{22} atoms
    d. 2.0×10^{24} atoms
    e. 1.3×10^{26} atoms

    ANS: B

83. What is the molar mass of calcium chloride hexahydrate?
    a. 75.53 g/mol
    b. 111.0 g/mol
    c. 117.0 g/mol
    d. 183.6 g/mol
    e. 219.1 g/mol

    ANS: E

84. What is the molar mass of sodium sulfate?
    a. 55.06 g/mol
    b. 119.1 g/mol
    c. 78.05 g/mol
    d. 142.0 g/mol
    e. 110.0 g/mol

    ANS: D

85. Calculate the number of moles of aluminum oxide in 6.83 g Al_2O_3.
    a. 6.70×10^{-2} mol
    b. 6.96×10^{2} mol
    c. 0.253 mol
    d. 0.127 mol
    e. 1.56×10^{-3} mol

    ANS: A

86. What is the mass of 8.04×10^{-3} mol O_2?
    a. 2.51×10^{-4} g
    b. 5.03×10^{-4} g
    c. 0.129 g
    d. 3.89 g
    e. 0.257 g

    ANS: E

87. What is the mass of 0.50 mol chromium(III) sulfide?
    a. 2.5×10^{-3} g
    b. 5.9×10^{-3} g
    c. 42 g
    d. 1.0×10^{2} g
    e. 110 g

    ANS: D

88. How many hydrogen atoms are present in 1.0 g of NH_3?
    a. 0.059 atoms
    b. 0.18 atoms
    c. 3.5×10^{22} atoms
    d. 1.1×10^{23} atoms
    e. 1.2×10^{22} atoms

    ANS: D

89. How many bromide ions are in 0.55 g of iron(III) bromide?
    a. 1.1×10^{21} ions
    b. 3.4×10^{21} ions
    c. 3.3×10^{23} ions
    d. 9.9×10^{23} ions
    e. 2.9×10^{26} ions

    ANS: B

90. If 1.00 g of an unknown molecular compound contains 8.35×10^{21} molecules, what is its molar mass?
    a. 44.0 g/mol
    b. 66.4 g/mol
    c. 72.1 g/mol
    d. 98.1 g/mol
    e. 132 g/mol

    ANS: C

91. What is the mass percent of chlorine in magnesium chloride?
    a. 25.53%
    b. 37.24%
    c. 40.67%
    d. 59.33%
    e. 74.47%

    ANS: E

92. What is the mass percent of each element in sulfuric acid, H_2SO_4?
    a. 2.055% H, 32.69% S, 65.25% O
    b. 1.028% H, 32.69% S, 66.28% O
    c. 28.57% H, 14.29% S, 57.17% O
    d. 1.028% H, 33.72% S, 65.25% O
    e. 2.016% H, 32.07% S, 65.91% O

    ANS: A

93. What is the empirical formula of an oxide of nitrogen that contains 63.64 % nitrogen by mass?
    a. N_2O_3 b. NO c. N_2O_5 d. NO_2 e. N_2O

    ANS: E

94. A molecule is found to contain 47.35% by mass C, 10.60% by mass H, and 42.05% by mass O. What is the empirical formula for this molecule?
    a. C_2H_6O b. C_3H_4O c. $C_3H_8O_2$ d. $C_4H_6O_2$ e. $C_4H_8O_3$

    ANS: C

95. An ionic compound has the formula MCl_2. The mass of 0.3011 mol of the compound is 62.69 grams. What is the identity of the metal?
    a. Ni b. Cu c. Sn d. Hg e. Ba

    ANS: E

96. The fully hydrated form of sodium sulfate is the decahydrate, $Na_2SO_4 \cdot 10H_2O$. This compound dehydrates (loses some waters of hydration) when heated. A sample of partially dehydrated sodium sulfate was found to have a molar mass of 232.1 g/mol. How many water molecules are found per formula unit in in this sample? (i.e. determine n in $Na_2SO_4 \cdot nH_2O$).
    a. 5 waters.
    b. 6 waters.
    c. 7 waters.
    d. 8 waters.
    e. 3 waters.

    ANS: A

97. A 3.592 g sample of hydrated magnesium bromide, $MgBr_2 \cdot xH_2O$, is dried in an oven. When the anhydrous salt is removed from the oven, its mass is 2.263 g. What is the value of *x*?
    a. 1 b. 3 c. 6 d. 8 e. 12

    ANS: C

98. A 2.000 g sample of $MgCl_2 \cdot xH_2O$ is dried in an oven. When the anhydrous salt is removed from the oven, its mass is 0.9366 g. What is the value of *x*?
    a. 1 b. 3 c. 6 d. 8 e. 12

    ANS: C

SHORT ANSWER

99. Elements that have the same number of protons, but differ in their number of neutrons are called _____.

    ANS: isotopes

100. Pure oxygen can exist as O_2 or O_3. Elements that exist in more than one distinct form are called _____.

    ANS: allotropes

101. Oxygen and _____ are the two most abundant elements in the Earth's crust.

    ANS: silicon

102. What are the names of four metalloids?

    ANS: boron, silicon, germanium, arsenic, (antimony, and tellurium)

103. In reactions, metals generally lose electrons to become _____, and nonmetals gain electrons to become anions.

    ANS: cations

104. In which ionic compound, NaBr or KBr, is the force of attraction between anions and cations stronger?

ANS: The force of attraction is stronger for NaBr. The electrostatic attraction between anions and cations decreases as the separation of the ions increases. The potassium ion will be farther from the bromide ion than the sodium ion due to its larger ionic radius.

105. The numerical quantity of a mole, 6.022×10^{23}, is defined as the number of atoms in a specific mass of an element. What is the mass and the identity of the element used to define one mole?

ANS: A mole is equal to the number of atoms in 12.00 grams of carbon-12.

106. The building blocks of atoms (neutrons, protons, and electrons) are called _____ particles.

ANS: subatomic

107. William Crookes was this first to observe particles produced from a cathode ray tube. These particles eventually became known as _____.

ANS: electrons

108. Millikan's oil drop experiment determined the charge of the _____.

ANS: electron