

Chemistry: The Central Science, 12e (Brown et al.)
Chapter 2 Atoms, Molecules, and Ions

2.1 Multiple-Choice Questions

1) A molecule of water contains hydrogen and oxygen in a 1:8 ratio by mass. This is a statement of _____.

- A) the law of multiple proportions
- B) the law of constant composition
- C) the law of conservation of mass
- D) the law of conservation of energy
- E) none of the above

Answer: B

Diff: 2 Page Ref: Sec. 2.1

2) Which one of the following is not one of the postulates of Dalton's atomic theory?

- A) Atoms are composed of protons, neutrons, and electrons.
- B) All atoms of a given element are identical; the atoms of different elements are different and have different properties.
- C) Atoms of an element are not changed into different types of atoms by chemical reactions: atoms are neither created nor destroyed in chemical reactions.
- D) Compounds are formed when atoms of more than one element combine; a given compound always has the same relative number and kind of atoms.
- E) Each element is composed of extremely small particles called atoms.

Answer: A

Diff: 1 Page Ref: Sec. 2.1

3) Consider the following selected postulates of Dalton's atomic theory:

- (i) Each element is composed of extremely small particles called atoms.
- (ii) Atoms are indivisible.
- (iii) Atoms of a given element are identical.
- (iv) Atoms of different elements are different and have different properties.

Which of the postulates is(are) no longer considered valid?

- A) (i) and (ii)
- B) (ii) only
- C) (ii) and (iii)
- D) (iii) only
- E) (iii) and (iv)

Answer: C

Diff: 2 Page Ref: Sec. 2.1

4) Which pair of substances could be used to illustrate the law of multiple proportions?

- A) SO_2 , H_2SO_4
- B) CO , CO_2
- C) H_2O , O_2
- D) CH_4 , $\text{C}_6\text{H}_{12}\text{O}_6$
- E) NaCl , KCl

Answer: B

Diff: 1 Page Ref: Sec. 2.1

5) Which statement below correctly describes the responses of alpha, beta, and gamma radiation to an electric field?

- A) Both beta and gamma are deflected in the same direction, while alpha shows no response.
- B) Both alpha and gamma are deflected in the same direction, while beta shows no response.
- C) Both alpha and beta are deflected in the same direction, while gamma shows no response.
- D) Alpha and beta are deflected in opposite directions, while gamma shows no response.
- E) Only alpha is deflected, while beta and gamma show no response.

Answer: D

Diff: 2 Page Ref: Sec. 2.2

6) Which one of the following is not true concerning cathode rays?

- A) They originate from the negative electrode.
- B) They travel in straight lines in the absence of electric or magnetic fields.
- C) They impart a negative charge to metals exposed to them.
- D) They are made up of electrons.
- E) The characteristics of cathode rays depend on the material from which they are emitted.

Answer: E

Diff: 2 Page Ref: Sec. 2.2

7) The charge on an electron was determined in the _____.

- A) cathode ray tube, by J. J. Thompson
- B) Rutherford gold foil experiment
- C) Millikan oil drop experiment
- D) Dalton atomic theory
- E) atomic theory of matter

Answer: C

Diff: 1 Page Ref: Sec. 2.2

8) _____-rays consist of fast-moving electrons.

- A) Alpha
- B) Beta
- C) Gamma
- D) X
- E) none of the above

Answer: B

Diff: 1 Page Ref: Sec. 2.2

9) The gold foil experiment performed in Rutherford's lab _____.

- A) confirmed the plum-pudding model of the atom
- B) led to the discovery of the atomic nucleus
- C) was the basis for Thomson's model of the atom
- D) utilized the deflection of beta particles by gold foil
- E) proved the law of multiple proportions

Answer: B

Diff: 1 Page Ref: Sec. 2.2

10) In the Rutherford nuclear-atom model, _____.

- A) the heavy subatomic particles, protons and neutrons, reside in the nucleus
- B) the three principal subatomic particles (protons, neutrons, and electrons) all have essentially the same mass
- C) the light subatomic particles, protons and neutrons, reside in the nucleus
- D) mass is spread essentially uniformly throughout the atom
- E) the three principal subatomic particles (protons, neutrons, and electrons) all have essentially the same mass and mass is spread essentially uniformly throughout the atom

Answer: A

Diff: 1 Page Ref: Sec. 2.2

11) Cathode rays are _____.

- A) neutrons
- B) x-rays
- C) electrons
- D) protons
- E) atoms

Answer: C

Diff: 1 Page Ref: Sec. 2.2

12) Cathode rays are deflected away from a negatively charged plate because _____.

- A) they are not particles
- B) they are positively charged particles
- C) they are neutral particles
- D) they are negatively charged particles
- E) they are emitted by all matter

Answer: D

Diff: 1 Page Ref: Sec. 2.2

13) In the absence of magnetic or electric fields, cathode rays _____.

- A) do not exist
- B) travel in straight lines
- C) cannot be detected
- D) become positively charged
- E) bend toward a light source

Answer: B

Diff: 1 Page Ref: Sec. 2.2

14) Of the three types of radioactivity characterized by Rutherford, which is/are electrically charged?

- A) β -rays
- B) α -rays and β -rays
- C) α -rays, β -rays, and γ -rays
- D) α -rays
- E) α -rays and γ -rays

Answer: B

Diff: 1 Page Ref: Sec. 2.2

15) Of the three types of radioactivity characterized by Rutherford, which is/are not electrically charged?

- A) α -rays
- B) α -rays, β -rays, and γ -rays
- C) γ -rays
- D) α -rays and β -rays
- E) α -rays and γ -rays

Answer: C

Diff: 1 Page Ref: Sec. 2.2

16) Of the three types of radioactivity characterized by Rutherford, which are particles?

- A) β -rays
- B) α -rays, β -rays, and γ -rays
- C) γ -rays
- D) α -rays and γ -rays
- E) α -rays and β -rays

Answer: E

Diff: 1 Page Ref: Sec. 2.2

17) Of the three types of radioactivity characterized by Rutherford, which is/are not particles?

- A) β -rays
- B) α -rays and β -rays
- C) α -rays
- D) γ -rays
- E) α -rays, β -rays, and γ -rays

Answer: D

Diff: 1 Page Ref: Sec. 2.2

18) Of the following, the smallest and lightest subatomic particle is the _____.

- A) neutron
- B) proton
- C) electron
- D) nucleus
- E) alpha particle

Answer: C

Diff: 1 Page Ref: Sec. 2.3

19) All atoms of a given element have the same _____.

- A) mass
- B) number of protons
- C) number of neutrons
- D) number of electrons and neutrons
- E) density

Answer: B

Diff: 1 Page Ref: Sec. 2.3

20) Which atom has the smallest number of neutrons?

- A) carbon-14
- B) nitrogen-14
- C) oxygen-16
- D) fluorine-19
- E) neon-20

Answer: B

Diff: 1 Page Ref: Sec. 2.3

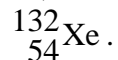
21) Which atom has the largest number of neutrons?

- A) phosphorus-30
- B) chlorine-37
- C) potassium-39
- D) argon-40
- E) calcium-40

Answer: D

Diff: 3 Page Ref: Sec. 2.3

22) There are _____ electrons, _____ protons, and _____ neutrons in an atom of



- A) 132, 132, 54
- B) 54, 54, 132
- C) 78, 78, 54
- D) 54, 54, 78
- E) 78, 78, 132

Answer: D

Diff: 2 Page Ref: Sec. 2.3

23) An atom of the most common isotope of gold, ${}^{197}\text{Au}$, has _____ protons, _____ neutrons, and _____ electrons.

- A) 197, 79, 118
- B) 118, 79, 39
- C) 79, 197, 197
- D) 79, 118, 118
- E) 79, 118, 79

Answer: E

Diff: 2 Page Ref: Sec. 2.3

24) Which combination of protons, neutrons, and electrons is correct for the isotope of copper, ${}^{63}_{29}\text{Cu}$?

- A) 29 p⁺, 34 n[°], 29 e⁻
- B) 29 p⁺, 29 n[°], 63 e⁻
- C) 63 p⁺, 29 n[°], 63 e⁻
- D) 34 p⁺, 29 n[°], 34 e⁻
- E) 34 p⁺, 34 n[°], 29 e⁻

Answer: A

Diff: 1 Page Ref: Sec. 2.3

25) Which isotope has 45 neutrons?

- A) ${}^{80}_{36}\text{Kr}$
- B) ${}^{80}_{35}\text{Br}$
- C) ${}^{78}_{34}\text{Se}$
- D) ${}^{34}_{17}\text{Cl}$
- E) ${}^{103}_{45}\text{Rh}$

Answer: B

Diff: 1 Page Ref: Sec. 2.3

26) Which pair of atoms constitutes a pair of isotopes of the same element?

- A) ${}^{14}_6\text{X}$ ${}^{14}_7\text{X}$
- B) ${}^{14}_6\text{X}$ ${}^{12}_6\text{X}$
- C) ${}^{17}_9\text{X}$ ${}^{17}_8\text{X}$
- D) ${}^{19}_{10}\text{X}$ ${}^{19}_9\text{X}$
- E) ${}^{20}_{10}\text{X}$ ${}^{21}_{11}\text{X}$

Answer: B

Diff: 1 Page Ref: Sec. 2.3

27) Which isotope has 36 electrons in an atom?

- A) ${}^{80}_{36}\text{Kr}$
- B) ${}^{80}_{35}\text{Br}$
- C) ${}^{78}_{34}\text{Se}$
- D) ${}^{34}_{17}\text{Cl}$
- E) ${}^{36}_{80}\text{Hg}$

Answer: A

Diff: 1 Page Ref: Sec. 2.3

28) Isotopes are atoms that have the same number of _____ but differing number of _____.

- A) protons, electrons
- B) neutrons, protons
- C) protons, neutrons
- D) electrons, protons
- E) neutrons, electrons

Answer: C

Diff: 1 Page Ref: Sec. 2.3

29) The nucleus of an atom does not contain _____.

- A) protons
- B) protons or neutrons
- C) neutrons
- D) subatomic particles
- E) electrons

Answer: E

Diff: 1 Page Ref: Sec. 2.3

30) The nucleus of an atom contains _____.

- A) electrons
- B) protons
- C) neutrons
- D) protons and neutrons
- E) protons, neutrons, and electrons

Answer: D

Diff: 1 Page Ref: Sec. 2.3

31) Different isotopes of a particular element contain the same number of _____.

- A) protons
- B) neutrons
- C) protons and neutrons
- D) protons, neutrons, and electrons
- E) subatomic particles

Answer: A

Diff: 1 Page Ref: Sec. 2.3

32) Different isotopes of a particular element contain different numbers of _____.

- A) protons
- B) neutrons
- C) protons and neutrons
- D) protons, neutrons, and electrons
- E) None of the above is correct.

Answer: B

Diff: 1 Page Ref: Sec. 2.3

33) In the symbol shown below, x = _____.



- A) 7
- B) 13
- C) 12
- D) 6
- E) not enough information to determine

Answer: D

Diff: 1 Page Ref: Sec. 2.3

34) In the symbol below, X = _____.



- A) N
- B) C
- C) Al
- D) K
- E) not enough information to determine

Answer: B

Diff: 1 Page Ref: Sec. 2.3

35) In the symbol below, x = _____.



- A) 19
- B) 13
- C) 6
- D) 7
- E) not enough information to determine

Answer: E

Diff: 2 Page Ref: Sec. 2.3

36) In the symbol below, x is _____.



- A) the number of neutrons
- B) the atomic number
- C) the mass number
- D) the isotope number
- E) the elemental symbol

Answer: C

Diff: 1 Page Ref: Sec. 2.3

37) Which one of the following basic forces is so small that it has no chemical significance?

- A) weak nuclear force
- B) strong nuclear force
- C) electromagnetism
- D) gravity
- E) Coulomb's law

Answer: D

Diff: 2 Page Ref: Sec. 2.3

38) Gravitational forces act between objects in proportion to their _____.

- A) volumes
- B) masses
- C) charges
- D) polarizability
- E) densities

Answer: B

Diff: 1 Page Ref: Sec. 2.3

39) Silver has two naturally occurring isotopes with the following isotopic masses:

$^{107}_{47}\text{Ar}$	$^{107}_{47}\text{Ar}$
106.90509	108.9047

The average atomic mass of silver is 107.8682 amu. The fractional abundance of the lighter of the two isotopes is _____.

- A) 0.24221
- B) 0.48168
- C) 0.51835
- D) 0.75783
- E) 0.90474

Answer: C

Diff: 4 Page Ref: Sec. 2.4

40) The atomic mass unit is presently based on assigning an exact integral mass (in amu) to an isotope of _____.

- A) hydrogen
- B) oxygen
- C) sodium
- D) carbon
- E) helium

Answer: D

Diff: 1 Page Ref: Sec. 2.4

41) The element X has three naturally occurring isotopes. The masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

Isotope	Abundance	Mass
221X	74.22	220.9
220X	12.78	220.0
218X	13.00	218.1

- A) 219.7
- B) 220.4
- C) 220.42
- D) 218.5
- E) 221.0

Answer: B

Diff: 1 Page Ref: Sec. 2.4

42) Element X has three naturally occurring isotopes. The masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

Isotope	Abundance	Mass
38X	5.07	37.919
39X	15.35	39.017
42X	79.85	42.111

- A) 41.54
- B) 39.68
- C) 39.07
- D) 38.64
- E) 33.33

Answer: A

Diff: 1 Page Ref: Sec. 2.4

43) The element X has three naturally occurring isotopes. The isotopic masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

Isotope	Abundance	Mass
159X	30.60	159.37
163X	15.79	162.79
164X	53.61	163.92

- A) 161.75
- B) 162.03
- C) 162.35
- D) 163.15
- E) 33.33

Answer: C

Diff: 1 Page Ref: Sec. 2.4

44) The element X has three naturally occurring isotopes. The isotopic masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

Isotope	Abundance	Mass
53X	19.61	52.62
56X	53.91	56.29
58X	26.48	58.31

- A) 33.33
- B) 55.74
- C) 56.11
- D) 57.23
- E) 56.29

Answer: C

Diff: 1 Page Ref: Sec. 2.4

45) The element X has two naturally occurring isotopes. The masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

isotope	Abundance (%)	Mass (amu)
^{31}X	35.16	31.16
^{34}X	64.84	34.30

- A) 30.20
- B) 33.20
- C) 34.02
- D) 35.22
- E) 32.73

Answer: B

Diff: 1 Page Ref: Sec. 2.4

46) The average atomic weight of copper, which has two naturally occurring isotopes, is 63.5. One of the isotopes has an atomic weight of 62.9 amu and constitutes 69.1% of the copper isotopes. The other isotope has an abundance of 30.9%. The atomic weight (amu) of the second isotope is _____ amu.

- A) 63.2
- B) 63.8
- C) 64.1
- D) 64.8
- E) 28.1

Answer: D

Diff: 4 Page Ref: Sec. 2.4

47) The element X has three naturally occurring isotopes. The masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

isotope	Abundance (%)	Mass (amu)
^{15}X	28.60	15.33
^{17}X	13.30	17.26
^{16}X	58.10	18.11

- A) 17.20
- B) 16.90
- C) 17.65
- D) 17.11
- E) 16.90

Answer: A

Diff: 1 Page Ref: Sec. 2.4

48) Vanadium has two naturally occurring isotopes, ^{50}V with an atomic mass of 49.9472 amu and ^{51}V with an atomic mass of 50.9440. The atomic weight of vanadium is 50.9415. The percent abundances of the vanadium isotopes are _____% ^{50}V and _____% ^{51}V .

- A) 0.25, 99.75
- B) 99.75, 0.25
- C) 49, 51
- D) 1.0, 99
- E) 99, 1.0

Answer: A

Diff: 4 Page Ref: Sec. 2.4

49) An unknown element is found to have three naturally occurring isotopes with atomic masses of 35.9675 (0.337%), 37.9627 (0.063%), and 39.9624 (99.600%). Which of the following is the unknown element?

- A) Ar
- B) K
- C) Cl
- D) Ca
- E) None of the above could be the unknown element.

Answer: A

Diff: 2 Page Ref: Sec. 2.4

50) In the periodic table, the elements are arranged in _____.

- A) alphabetical order
- B) order of increasing atomic number
- C) order of increasing metallic properties
- D) order of increasing neutron content
- E) reverse alphabetical order

Answer: B

Diff: 1 Page Ref: Sec. 2.5

51) Elements _____ exhibit similar physical and chemical properties.

- A) with similar chemical symbols
- B) with similar atomic masses
- C) in the same period of the periodic table
- D) on opposite sides of the periodic table
- E) in the same group of the periodic table

Answer: E

Diff: 1 Page Ref: Sec. 2.5

52) Which pair of elements would you expect to exhibit the greatest similarity in their physical and chemical properties?

- A) H, Li
- B) Cs, Ba
- C) Ca, Sr
- D) Ga, Ge
- E) C, O

Answer: C

Diff: 1 Page Ref: Sec. 2.5

53) Which pair of elements would you expect to exhibit the greatest similarity in their physical and chemical properties?

- A) O, S
- B) C, N
- C) K, Ca
- D) H, He
- E) Si, P

Answer: A

Diff: 1 Page Ref: Sec. 2.5

54) Which pair of elements would you expect to exhibit the greatest similarity in their physical and chemical properties?

- A) As, Br
- B) Mg, Al
- C) I, At
- D) Br, Kr
- E) N, O

Answer: C

Diff: 1 Page Ref: Sec. 2.5

55) The elements in groups 1A, 6A, and 7A are called, _____, respectively.

- A) alkaline earth metals, halogens, and chalcogens
- B) alkali metals, chalcogens, and halogens
- C) alkali metals, halogens, and noble gases
- D) alkaline earth metals, transition metals, and halogens
- E) halogens, transition metals, and alkali metals

Answer: B

Diff: 2 Page Ref: Sec. 2.5

56) Which pair of elements below should be the most similar in chemical properties?

- A) C and O
- B) B and As
- C) I and Br
- D) K and Kr
- E) Cs and He

Answer: C

Diff: 1 Page Ref: Sec. 2.5

57) An element in the upper right corner of the periodic table _____.

- A) is either a metal or metalloid
- B) is definitely a metal
- C) is either a metalloid or a non-metal
- D) is definitely a non-metal
- E) is definitely a metalloid

Answer: D

Diff: 1 Page Ref: Sec. 2.5

58) An element that appears in the lower left corner of the periodic table is _____.

- A) either a metal or metalloid
- B) definitely a metal
- C) either a metalloid or a non-metal
- D) definitely a non-metal
- E) definitely a metalloid

Answer: B

Diff: 1 Page Ref: Sec. 2.5

59) Elements in the same group of the periodic table typically have _____.

- A) similar mass numbers
- B) similar physical properties only
- C) similar chemical properties only
- D) similar atomic masses
- E) similar physical and chemical properties

Answer: E

Diff: 1 Page Ref: Sec. 2.5

60) Which one of the following does not occur as diatomic molecules in elemental form?

- A) oxygen
- B) nitrogen
- C) sulfur
- D) hydrogen
- E) bromine

Answer: C

Diff: 1 Page Ref: Sec. 2.6

61) Which one of the following molecular formulas is also an empirical formula?

- A) $C_6H_6O_2$
- B) C_2H_6SO
- C) H_2O_2
- D) $H_2P_4O_6$
- E) C_6H_6

Answer: B

Diff: 2 Page Ref: Sec. 2.6

62) Which compounds do not have the same empirical formula?

- A) C_2H_2 , C_6H_6
- B) CO , CO_2
- C) C_2H_4 , C_3H_6
- D) $C_2H_4O_2$, $C_6H_{12}O_6$
- E) $C_2H_5COOCH_3$, CH_3CHO

Answer: B

Diff: 2 Page Ref: Sec. 2.6

63) Of the choices below, which one is not an ionic compound?

- A) PCl_5
- B) $MoCl_6$
- C) $RbCl$
- D) $PbCl_2$
- E) $NaCl$

Answer: A

Diff: 1 Page Ref: Sec. 2.6

64) Which type of formula provides the most information about a compound?

- A) empirical
- B) molecular
- C) simplest
- D) structural
- E) chemical

Answer: D

Diff: 1 Page Ref: Sec. 2.6

65) A molecular formula always indicates _____.

- A) how many of each atom are in a molecule
- B) the simplest whole-number ratio of different atoms in a compound
- C) which atoms are attached to which in a molecule
- D) the isotope of each element in a compound
- E) the geometry of a molecule

Answer: A

Diff: 1 Page Ref: Sec. 2.6

66) An empirical formula always indicates _____.

- A) which atoms are attached to which in a molecule
- B) how many of each atom are in a molecule
- C) the simplest whole-number ratio of different atoms in a compound
- D) the isotope of each element in a compound
- E) the geometry of a molecule

Answer: C

Diff: 1 Page Ref: Sec. 2.6

67) The molecular formula of a compound is always _____ the empirical formula.

- A) more complex than
- B) different from
- C) an integral multiple of
- D) the same as
- E) simpler than

Answer: C

Diff: 1 Page Ref: Sec. 2.6

68) Formulas that show how atoms are attached in a molecule are called _____.

- A) molecular formulas
- B) ionic formulas
- C) empirical formulas
- D) diatomic formulas
- E) structural formulas

Answer: E

Diff: 1 Page Ref: Sec. 2.6

69) Of the following, _____ contains the greatest number of electrons.

- A) P^{3+}
- B) P
- C) P^{2-}
- D) P^{3-}
- E) P^{2+}

Answer: D

Diff: 1 Page Ref: Sec. 2.7

70) Which one of the following is most likely to lose electrons when forming an ion?

- A) F
- B) P
- C) Rh
- D) S
- E) N

Answer: C

Diff: 2 Page Ref: Sec. 2.7

71) Which species has 54 electrons?

- A) ${}_{54}^{132}\text{Xe}^+$
- B) ${}_{52}^{128}\text{Te}^{2-}$
- C) ${}_{50}^{118}\text{Sn}^{2+}$
- D) ${}_{48}^{112}\text{Cd}$
- E) ${}_{54}^{132}\text{Xe}^{2+}$

Answer: B

Diff: 1 Page Ref: Sec. 2.7

72) Which species has 16 protons?

- A) ^{31}P
- B) $^{34}\text{S}^{2-}$
- C) ^{36}Cl
- D) $^{80}\text{Br}^-$
- E) ^{16}O

Answer: B

Diff: 1 Page Ref: Sec. 2.7

73) Which species has 18 electrons?

- A) ^{39}K
- B) $^{32}\text{S}^{2-}$
- C) ^{35}Cl
- D) $^{27}\text{Al}^{+3}$
- E) $^{64}\text{Cu}^{+2}$

Answer: B

Diff: 2 Page Ref: Sec 2.7

74) The species _____ contains 16 neutrons.

- A) ^{31}P
- B) $^{34}\text{S}^{2-}$
- C) ^{36}Cl
- D) $^{80}\text{Br}^-$
- E) ^{16}O

Answer: A

Diff: 1 Page Ref: Sec. 2.7

75) Which species is an isotope of ^{39}Cl ?

- A) $^{40}\text{Ar}^+$
- B) $^{34}\text{S}^{2-}$
- C) $^{36}\text{Cl}^-$
- D) ^{80}Br
- E) ^{39}Ar

Answer: C

Diff: 1 Page Ref: Sec. 2.7

76) Which one of the following species has as many electrons as it has neutrons?

- A) ^1H
- B) $^{40}\text{Ca}^{2+}$
- C) ^{14}C
- D) $^{19}\text{F}^-$
- E) $^{14}\text{C}^{2+}$

Answer: D

Diff: 2 Page Ref: Sec. 2.7

77) There are _____ protons, _____ neutrons, and _____ electrons in $^{131}\text{I}^-$.

A) 131, 53, and 54

B) 131, 53, and 52

C) 53, 78, and 54

D) 53, 131, and 52

E) 78, 53, and 72

Answer: C

Diff: 2 Page Ref: Sec. 2.7

78) There are _____ protons, _____ neutrons, and _____ electrons in $^{238}\text{U}^{+5}$.

A) 146, 92, and 92

B) 92, 146, and 87

C) 92, 146, and 92

D) 92, 92, and 87

E) 146, 92, and 146

Answer: B

Diff: 2 Page Ref: Sec. 2.7

79) Which species has 48 electrons?

A) $^{118}_{50}\text{Sn}^{+2}$

B) $^{116}_{50}\text{Sn}^{+4}$

C) $^{112}_{48}\text{Cd}^{+2}$

D) $^{68}_{31}\text{Ga}$

E) $^{48}_{22}\text{Ti}$

Answer: A

Diff: 1 Page Ref: Sec. 2.7

80) Which of the following compounds would you expect to be ionic?

A) SF_6

B) H_2O

C) H_2O_2

D) NH_3

E) CaO

Answer: E

Diff: 1 Page Ref: Sec. 2.7

81) Which of the following compounds would you expect to be ionic?

- A) H_2O
- B) CO_2
- C) SrCl_2
- D) SO_2
- E) H_2S

Answer: C

Diff: 1 Page Ref: Sec. 2.7

82) Which pair of elements is most apt to form an ionic compound with each other?

- A) barium, bromine
- B) calcium, sodium
- C) oxygen, fluorine
- D) sulfur, fluorine
- E) nitrogen, hydrogen

Answer: A

Diff: 1 Page Ref: Sec. 2.7

83) Which pair of elements is most apt to form a molecular compound with each other?

- A) aluminum, oxygen
- B) magnesium, iodine
- C) sulfur, fluorine
- D) potassium, lithium
- E) barium, bromine

Answer: C

Diff: 1 Page Ref: Sec. 2.7

84) Which species below is the nitride ion?

- A) Na^+
- B) NO_3^-
- C) NO_2^-
- D) NH_4^+
- E) N^{3-}

Answer: E

Diff: 1 Page Ref: Sec. 2.8

85) Which species below is the sulfite ion?

- A) SO_2^{-2}
- B) S O_3^{-2}
- C) S^{2-}
- D) SO_4^{-2}
- E) HS^-

Answer: B

Diff: 1 Page Ref: Sec. 2.8

86) Which species below is the nitrate ion?

- A) NO_2^-
- B) NH_4^+
- C) NO_3^-
- D) N_3^-
- E) N^{3-}

Answer: C

Diff: 1 Page Ref: Sec. 2.8

87) Which species below is the nitrite ion?

- A) NO_2^-
- B) NH_4^+
- C) NO_3^-
- D) N_3^-
- E) N^{3-}

Answer: A

Diff: 1 Page Ref: Sec. 2.8

88) Barium reacts with a polyatomic ion to form a compound with the general formula $\text{Ba}_3(\text{X})_2$. What would be the most likely formula for the compound formed between sodium and the polyatomic ion X?

- A) NaX
- B) Na_2X
- C) Na_2X_2
- D) Na_3X
- E) Na_3X_2

Answer: D

Diff: 2 Page Ref: Sec. 2.8

89) Aluminum reacts with a certain nonmetallic element to form a compound with the general formula Al_2X_3 . Element X must be from Group _____ of the Periodic Table of Elements.

- A) 3A
- B) 4A
- C) 5A
- D) 6A
- E) 7A

Answer: D

Diff: 2 Page Ref: Sec. 2.8

90) The formula for a salt is XBr. The X-ion in this salt has 46 electrons. The metal X is _____.

- A) Ag
- B) Pd
- C) Cd
- D) Cu
- E) Cs

Answer: A

Diff: 2 Page Ref: Sec. 2.8

91) The charge on the copper ion in the salt CuO is _____.

- A) +1
- B) +2
- C) +3
- D) -1
- E) -2

Answer: B

Diff: 2 Page Ref: Sec. 2.8

92) The charge on the iron ion in the salt Fe₂O₃ is _____.

- A) +1
- B) +2
- C) +3
- D) -5
- E) -6

Answer: C

Diff: 2 Page Ref: Sec. 2.8

93) Which formula/name pair is incorrect?

- A) Mn(NO₂)₄ manganese(II) nitrite
- B) Mg(NO₃)₂ magnesium nitrate
- C) Mn(NO₃)₂ manganese(II) nitrate
- D) Mg₃N₂ magnesium nitrite
- E) Mg(MnO₄)₂ magnesium permanganate

Answer: D

Diff: 2 Page Ref: Sec. 2.8

94) Which formula/name pair is incorrect?

- A) FeSO₄ iron(II) sulfate
- B) Fe₂(SO₃)₃ iron(III) sulfite
- C) FeS iron(II) sulfide
- D) FeSO₃ iron(II) sulfite
- E) Fe₂(SO₄)₃ iron(III) sulfide

Answer: E

Diff: 1 Page Ref: Sec. 2.8

95) Which one of the following is the formula of hydrochloric acid?

- A) HClO_3
- B) HClO_4
- C) HClO
- D) HCl
- E) HClO_2

Answer: D

Diff: 1 Page Ref: Sec. 2.8

96) The suffix -ide is used primarily _____.

- A) for monatomic anion names
- B) for polyatomic cation names
- C) for the name of the first element in a molecular compound
- D) to indicate binary acids
- E) for monoatomic cations

Answer: A

Diff: 1 Page Ref: Sec. 2.8

97) Which one of the following compounds is chromium(III) oxide?

- A) Cr_2O_3
- B) CrO_3
- C) Cr_3O_2
- D) Cr_3O
- E) Cr_2O_4

Answer: A

Diff: 1 Page Ref: Sec. 2.8

98) Which one of the following compounds is copper(I) chloride?

- A) CuCl
- B) CuCl_2
- C) Cu_2Cl
- D) Cu_2Cl_3
- E) Cu_3Cl_2

Answer: A

Diff: 1 Page Ref: Sec. 2.8

99) The correct name for MgF_2 is _____.

- A) monomagnesium difluoride
- B) magnesium difluoride
- C) manganese difluoride
- D) manganese bifluoride
- E) magnesium fluoride

Answer: E

Diff: 2 Page Ref: Sec. 2.8

100) The correct name for NaHCO_3 is _____.

- A) sodium hydride
- B) persodium carbonate
- C) persodium hydroxide
- D) sodium bicarbonate
- E) carbonic acid

Answer: D

Diff: 2 Page Ref: Sec. 2.8

101) A correct name for $\text{Fe}(\text{NO}_3)_2$ is _____.

- A) iron nitrite
- B) ferrous nitrite
- C) ferrous nitrate
- D) ferric nitrite
- E) ferric nitrate

Answer: C

Diff: 3 Page Ref: Sec. 2.8

102) The correct name for HNO_2 is _____.

- A) nitrous acid
- B) nitric acid
- C) hydrogen nitrate
- D) hyponitrous acid
- E) pernitric acid

Answer: A

Diff: 3 Page Ref: Sec. 2.8

103) The proper formula for the hydronium ion is _____.

- A) H^-
- B) OH^-
- C) N^{-3}
- D) H_3O^+
- E) NH_4^+

Answer: D

Diff: 2 Page Ref: Sec. 2.8

104) The charge on the _____ ion is -3.

- A) sulfate
- B) acetate
- C) permanganate
- D) oxide
- E) nitride

Answer: E

Diff: 2 Page Ref: Sec. 2.8

105) Which one of the following polyatomic ions has the same charge as the hydroxide ion?

- A) ammonium
- B) carbonate
- C) nitrate
- D) sulfate
- E) phosphate

Answer: C

Diff: 1 Page Ref: Sec. 2.8

106) Which element forms an ion with the same charge as the ammonium ion?

- A) potassium
- B) chlorine
- C) calcium
- D) oxygen
- E) nitrogen

Answer: A

Diff: 1 Page Ref: Sec. 2.8

107) Which element forms an ion with the same charge as the sulfate ion?

- A) magnesium
- B) copper
- C) iron
- D) phosphorus
- E) oxygen

Answer: E

Diff: 2 Page Ref: Sec. 2.8

108) When a fluorine atom forms the fluoride ion, it has the same charge as the _____ ion.

- A) sulfide
- B) ammonium
- C) nitrate
- D) phosphate
- E) sulfite

Answer: C

Diff: 1 Page Ref: Sec. 2.8

109) The formula for the compound formed between aluminum ions and phosphate ions is _____.

- A) $\text{Al}_3(\text{PO}_4)_3$
- B) AlPO_4
- C) $\text{Al}(\text{PO}_4)_3$
- D) $\text{Al}_2(\text{PO}_4)_3$
- E) AlP

Answer: B

Diff: 1 Page Ref: Sec. 2.8

110) Which metal does not form cations of differing charges?

- A) Na
- B) Cu
- C) Co
- D) Fe
- E) Sn

Answer: A

Diff: 1 Page Ref: Sec. 2.8

111) Which metal forms cations of differing charges?

- A) K
- B) Cs
- C) Ba
- D) Al
- E) Sn

Answer: E

Diff: 1 Page Ref: Sec. 2.8

112) The correct name for $\text{Ni}(\text{CN})_2$ is _____.

- A) nickel (I) cyanide
- B) nickel cyanate
- C) nickel carbonate
- D) nickel (II) cyanide
- E) nickel (I) nitride

Answer: D

Diff: 1 Page Ref: Sec. 2.8

113) The correct name for Na_2O_2 is _____.

- A) sodium oxide
- B) sodium dioxide
- C) disodium oxide
- D) sodium peroxide
- E) disodium dioxide

Answer: D

Diff: 2 Page Ref: Sec. 2.8

114) Which metal is not required to have its charge specified in the names of ionic compounds it forms?

- A) Mn
- B) Fe
- C) Cu
- D) Ca
- E) Pb

Answer: D

Diff: 1 Page Ref: Sec. 2.8

115) What is the molecular formula for 1-propanol?

- A) CH₃OH
- B) C₂H₅OH
- C) C₃H₇OH
- D) C₄H₉OH
- E) C₅H₁₁OH

Answer: C

Diff: 3 Page Ref: Sec. 2.9

2.2 Bimodal Questions

1) Methane and ethane are both made up of carbon and hydrogen. In methane, there are 12.0 g of carbon for every 4.00 g of hydrogen, a ratio of 3:1 by mass. In ethane, there are 24.0 g of carbon for every 6.00 g of hydrogen, a ratio of 4:1 by mass. This is an illustration of the law of _____.

- A) constant composition
- B) multiple proportions
- C) conservation of matter
- D) conservation of mass
- E) octaves

Answer: B

Diff: 2 Page Ref: Sec. 2.1

2) _____ and _____ reside in the atomic nucleus.

- A) Protons, electrons
- B) Electrons, neutrons
- C) Protons, neutrons
- D) none of the above
- E) Neutrons, only neutrons

Answer: C

Diff: 1 Page Ref: Sec. 2.2

3) 200 pm is the same as _____ Å.

- A) 2000
- B) 20
- C) 200
- D) 2
- E) 0.0002

Answer: D

Diff: 1 Page Ref: Sec. 2.3

4) The atomic number indicates _____.

- A) the number of neutrons in a nucleus
- B) the total number of neutrons and protons in a nucleus
- C) the number of protons or electrons in a neutral atom
- D) the number of atoms in 1 g of an element
- E) the number of different isotopes of an element

Answer: C

Diff: 1 Page Ref: Sec. 2.3

5) The nucleus of an atom contains _____.

- A) electrons
- B) protons, neutrons, and electrons
- C) protons and neutrons
- D) protons and electrons
- E) protons

Answer: C

Diff: 1 Page Ref: Sec. 2.3

6) In the periodic table, the rows are called _____ and the columns are called _____.

- A) octaves, groups
- B) staffs, families
- C) periods, groups
- D) cogeners, families
- E) rows, groups

Answer: C

Diff: 1 Page Ref: Sec. 2.5

7) Which group in the periodic table contains only nonmetals?

- A) 1A
- B) 6A
- C) 2B
- D) 2A
- E) 8A

Answer: E

Diff: 1 Page Ref: Sec. 2.5

8) Horizontal rows of the periodic table are known as _____.

- A) periods
- B) groups
- C) metalloids
- D) metals
- E) nonmetals

Answer: A

Diff: 1 Page Ref: Sec. 2.5

9) Vertical columns of the periodic table are known as _____.

- A) metals
- B) periods
- C) nonmetals
- D) groups
- E) metalloids

Answer: D

Diff: 1 Page Ref: Sec. 2.5

10) Elements in Group 1A are known as the _____.

- A) chalcogens
- B) alkaline earth metals
- C) alkali metals
- D) halogens
- E) noble gases

Answer: C

Diff: 1 Page Ref: Sec. 2.5

11) Elements in Group 2A are known as the _____.

- A) alkaline earth metals
- B) alkali metals
- C) chalcogens
- D) halogens
- E) noble gases

Answer: A

Diff: 1 Page Ref: Sec. 2.5

12) Elements in Group 6A are known as the _____.

- A) alkali metals
- B) chalcogens
- C) alkaline earth metals
- D) halogens
- E) noble gases

Answer: B

Diff: 1 Page Ref: Sec. 2.5

13) Elements in Group 7A are known as the _____.

- A) chalcogens
- B) alkali metals
- C) alkaline earth metals
- D) halogens
- E) noble gases

Answer: D

Diff: 1 Page Ref: Sec. 2.5

14) Elements in Group 8A are known as the _____.

- A) halogens
- B) alkali metals
- C) alkaline earth metals
- D) chalcogens
- E) noble gases

Answer: E

Diff: 1 Page Ref: Sec. 2.5

15) Potassium is a _____ and chlorine is a _____.

- A) metal, nonmetal
- B) metal, metal
- C) metal, metalloid
- D) metalloid, nonmetal
- E) nonmetal, metal

Answer: A

Diff: 1 Page Ref: Sec. 2.5

16) Lithium is a _____ and magnesium is a _____.

- A) nonmetal, metal
- B) nonmetal, nonmetal
- C) metal, metal
- D) metal, metalloid
- E) metalloid, metalloid

Answer: C

Diff: 1 Page Ref: Sec. 2.5

17) Oxygen is a _____ and nitrogen is a _____.

- A) metal, metalloid
- B) nonmetal, metal
- C) metalloid, metalloid
- D) nonmetal, nonmetal
- E) nonmetal, metalloid

Answer: D

Diff: 1 Page Ref: Sec. 2.5

18) Calcium is a _____ and silver is a _____.

- A) nonmetal, metal
- B) metal, metal
- C) metalloid, metal
- D) metal, metalloid
- E) nonmetal, metalloid

Answer: B

Diff: 1 Page Ref: Sec. 2.5

19) _____ are found uncombined, as monatomic species in nature.

- A) Noble gases
- B) Chalcogens
- C) Alkali metals
- D) Alkaline earth metals
- E) Halogens

Answer: A

Diff: 1 Page Ref: Sec. 2.6

20) When a metal and a nonmetal react, the _____ tends to lose electrons and the _____ tends to gain electrons.

- A) metal, metal
- B) nonmetal, nonmetal
- C) metal, nonmetal
- D) nonmetal, metal
- E) None of the above, these elements share electrons.

Answer: C

Diff: 1 Page Ref: Sec. 2.6

21) The empirical formula of a compound with molecules containing 12 carbon atoms, 14 hydrogen atoms, and 6 oxygen atoms is _____.

- A) $C_{12}H_{14}O_6$
- B) CHO
- C) CH_2O
- D) $C_6H_7O_3$
- E) C_2H_4O

Answer: D

Diff: 2 Page Ref: Sec. 2.6

22) _____ typically form ions with a 2+ charge.

- A) Alkaline earth metals
- B) Halogens
- C) Chalcogens
- D) Alkali metals
- E) Transition metals

Answer: A

Diff: 2 Page Ref: Sec. 2.7

23) What is the formula of the compound formed between strontium ions and nitrogen ions?

- A) SrN
- B) Sr_3N_2
- C) Sr_2N_3
- D) SrN_2
- E) SrN_3

Answer: B

Diff: 3 Page Ref: Sec. 2.7

24) Magnesium reacts with a certain element to form a compound with the general formula MgX . What would the most likely formula be for the compound formed between potassium and element X?

- A) K_2X
- B) KX_2
- C) K_2X_3
- D) K_2X_2
- E) KX

Answer: A

Diff: 1 Page Ref: Sec. 2.7

25) The charge on the manganese in the salt MnF_3 is _____.

- A) 1+
- B) 1-
- C) 2+
- D) 2-
- E) 3+

Answer: E

Diff: 1 Page Ref: Sec. 2.7

26) Aluminum reacts with a certain nonmetallic element to form a compound with the general formula AlX . Element X is a diatomic gas at room temperature. Element X must be _____.

- A) oxygen
- B) fluorine
- C) chlorine
- D) nitrogen
- E) sulfur

Answer: D

Diff: 2 Page Ref: Sec. 2.7

27) Sodium forms an ion with a charge of _____.

- A) 1+
- B) 1-
- C) 2+
- D) 2-
- E) 0

Answer: A

Diff: 1 Page Ref: Sec. 2.7

28) Potassium forms an ion with a charge of _____.

- A) 2+
- B) 1-
- C) 1+
- D) 2-
- E) 0

Answer: C

Diff: 1 Page Ref: Sec. 2.7

29) Calcium forms an ion with a charge of _____.

- A) 1-
- B) 2-
- C) 1+
- D) 2+
- E) 0

Answer: D

Diff: 1 Page Ref: Sec. 2.7

30) Barium forms an ion with a charge of _____.

- A) 1+
- B) 2-
- C) 3+
- D) 3-
- E) 2+

Answer: E

Diff: 1 Page Ref: Sec. 2.7

31) Aluminum forms an ion with a charge of _____.

- A) 2+
- B) 3-
- C) 1+
- D) 3+
- E) 1-

Answer: D

Diff: 1 Page Ref: Sec. 2.7

32) Fluorine forms an ion with a charge of _____.

- A) 1-
- B) 1+
- C) 2+
- D) 3+
- E) 3-

Answer: A

Diff: 1 Page Ref: Sec. 2.7

33) Iodine forms an ion with a charge of _____.

- A) 7-
- B) 1+
- C) 2-
- D) 2+
- E) 1-

Answer: E

Diff: 1 Page Ref: Sec. 2.7

34) Oxygen forms an ion with a charge of _____.

- A) 2-
- B) 2+
- C) 3-
- D) 3+
- E) 6+

Answer: A

Diff: 1 Page Ref: Sec. 2.7

35) Sulfur forms an ion with a charge of _____.

- A) 2+
- B) 2-
- C) 3+
- D) 6-
- E) 6+

Answer: B

Diff: 2 Page Ref: Sec. 2.7

36) Predict the empirical formula of the ionic compound that forms from sodium and fluorine.

- A) NaF
- B) Na₂F
- C) Na F₂
- D) Na₂F₃
- E) Na₃F₂

Answer: A

Diff: 1 Page Ref: Sec. 2.7

37) Predict the empirical formula of the ionic compound that forms from magnesium and fluorine.

- A) Mg₂F₃
- B) MgF
- C) Mg₂F
- D) Mg₃F₂
- E) MgF₂

Answer: E

Diff: 1 Page Ref: Sec. 2.7

38) Predict the empirical formula of the ionic compound that forms from magnesium and oxygen.

- A) Mg₂O
- B) MgO
- C) MgO₂
- D) Mg₂O₂
- E) Mg₃O₂

Answer: B

Diff: 1 Page Ref: Sec. 2.7

39) Predict the empirical formula of the ionic compound that forms from aluminum and oxygen.

- A) AlO
- B) Al₃O₂
- C) Al₂O₃
- D) AlO₂
- E) Al₂O

Answer: C

Diff: 1 Page Ref: Sec. 2.7

40) The correct name for K₂S is _____.

- A) potassium sulfate
- B) potassium disulfide
- C) potassium bisulfide
- D) potassium sulfide
- E) dipotassium sulfate

Answer: D

Diff: 1 Page Ref: Sec. 2.8

41) The correct name for Al₂O₃ is _____.

- A) aluminum oxide
- B) dialuminum oxide
- C) dialuminum trioxide
- D) aluminum hydroxide
- E) aluminum trioxide

Answer: A

Diff: 2 Page Ref: Sec. 2.8

42) The correct name for Ca H₂ is _____.

- A) hydrocalcium
- B) calcium dihydride
- C) calcium hydroxide
- D) calcium dihydroxide
- E) calcium hydride

Answer: E

Diff: 1 Page Ref: Sec. 2.8

43) The correct name for SO is _____.

- A) sulfur oxide
- B) sulfur monoxide
- C) sulfoxide
- D) sulfate
- E) sulfite

Answer: B

Diff: 1 Page Ref: Sec. 2.8

44) The correct name for CCl_4 is _____.

- A) carbon chloride
- B) carbon tetrachlorate
- C) carbon perchlorate
- D) carbon tetrachloride
- E) carbon chlorate

Answer: D

Diff: 1 Page Ref: Sec. 2.8

45) The correct name for N_2O_5 is _____.

- A) nitrous oxide
- B) nitrogen pentoxide
- C) dinitrogen pentoxide
- D) nitric oxide
- E) nitrogen oxide

Answer: C

Diff: 1 Page Ref: Sec. 2.8

46) The correct name for H_2CO_3 is _____.

- A) carbonous acid
- B) hydrocarbonate
- C) carbonic acid
- D) carbohydrate
- E) carbohydric acid

Answer: C

Diff: 1 Page Ref: Sec. 2.8

47) The correct name for H_2SO_3 is _____.

- A) sulfuric acid
- B) sulfurous acid
- C) hydrosulfuric acid
- D) hydrosulfic acid
- E) sulfur hydroxide

Answer: B

Diff: 1 Page Ref: Sec. 2.8

48) The correct name for H_2SO_4 is _____.

- A) sulfuric acid
- B) sulfurous acid
- C) hydrosulfuric acid
- D) hydrosulfic acid
- E) sulfur hydroxide

Answer: A

Diff: 1 Page Ref: Sec. 2.8

49) The correct name for HNO_3 is _____.

- A) nitrous acid
- B) nitric acid
- C) hydronitroxide acid
- D) nitroxide acid
- E) nitrogen hydroxide

Answer: B

Diff: 1 Page Ref: Sec. 2.8

50) The correct name for HClO_3 is _____.

- A) hydrochloric acid
- B) perchloric acid
- C) chloric acid
- D) chlorous acid
- E) hydrochlorous acid

Answer: C

Diff: 1 Page Ref: Sec. 2.8

51) The correct name for HClO is _____.

- A) hydrochloric acid
- B) perchloric acid
- C) chloric acid
- D) chlorous acid
- E) hypochlorous acid

Answer: E

Diff: 1 Page Ref: Sec. 2.8

52) The correct name for HBrO_4 is _____.

- A) hydrobromic acid
- B) perbromic acid
- C) bromic acid
- D) bromous acid
- E) hydrobromous acid

Answer: B

Diff: 1 Page Ref: Sec. 2.8

53) The correct name for HBrO is _____.

- A) hydrobromic acid
- B) perbromic acid
- C) bromic acid
- D) bromous acid
- E) hypobromous acid

Answer: E

Diff: 1 Page Ref: Sec. 2.8

54) The correct name for HBrO_2 is _____.

- A) hydrobromic acid
- B) perbromic acid
- C) bromic acid
- D) bromous acid
- E) hydrobromous acid

Answer: D

Diff: 1 Page Ref: Sec. 2.8

55) The correct name for HClO_2 is _____.

- A) perchloric acid
- B) chloric acid
- C) hypochlorous acid
- D) hypochloric acid
- E) chlorous acid

Answer: E

Diff: 2 Page Ref: Sec. 2.8

56) The correct name of the compound Na_3N is _____.

- A) sodium nitride
- B) sodium azide
- C) sodium trinitride
- D) sodium(III) nitride
- E) trisodium nitride

Answer: A

Diff: 1 Page Ref: Sec. 2.8

57) The formula of bromic acid is _____.

- A) HBr
- B) HBrO_4
- C) HBrO
- D) HBrO_3
- E) HBrO_2

Answer: D

Diff: 1 Page Ref: Sec. 2.8

58) The correct formula for molybdenum(IV) hypochlorite is _____.

- A) $\text{Mo}(\text{ClO}_3)_4$
- B) $\text{Mo}(\text{ClO})_4$
- C) $\text{Mo}(\text{ClO}_2)_4$
- D) $\text{Mo}(\text{ClO}_4)_4$
- E) MoCl_4

Answer: B

Diff: 2 Page Ref: Sec. 2.8

59) The name of PCl_3 is _____.

- A) potassium chloride
- B) phosphorus trichloride
- C) phosphorous(III) chloride
- D) monophosphorous trichloride
- E) trichloro potassium

Answer: B

Diff: 1 Page Ref: Sec. 2.8

60) The ions Ca^{2+} and PO_4^{3-} form a salt with the formula _____.

- A) CaPO_4
- B) $\text{Ca}_2(\text{PO}_4)_3$
- C) Ca_2PO_4
- D) $\text{Ca}(\text{PO}_4)_2$
- E) $\text{Ca}_3(\text{PO}_4)_2$

Answer: E

Diff: 1 Page Ref: Sec. 2.8

61) The correct formula of iron(III) bromide is _____.

- A) FeBr_2
- B) FeBr_3
- C) FeBr
- D) Fe_3Br_3
- E) Fe_3Br

Answer: B

Diff: 1 Page Ref: Sec. 2.8

62) Magnesium and sulfur form an ionic compound with the formula _____.

- A) MgS
- B) Mg_2S
- C) Mg S_2
- D) Mg_2S_2
- E) Mg_2S_3

Answer: A

Diff: 1 Page Ref: Sec. 2.8

63) The formula of ammonium carbonate is _____.

- A) $(\text{NH}_4)_2\text{CO}_3$
- B) $\text{N H}_4\text{CO}_2$
- C) $(\text{NH}_3)_2\text{CO}_4$
- D) $(\text{NH}_3)_2\text{CO}_3$
- E) $\text{N}_2(\text{CO}_3)_3$

Answer: A

Diff: 1 Page Ref: Sec. 2.8

64) The formula of the chromate ion is _____.



Answer: A

Diff: 1 Page Ref: Sec. 2.8

65) The formula of the carbonate ion is _____.



Answer: B

Diff: 1 Page Ref: Sec. 2.8

66) The correct name for $\text{Mg}(\text{ClO}_3)_2$ is _____.

A) magnesium chlorate

B) manganese chlorate

C) magnesium chloroxide

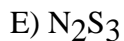
D) magnesium perchlorate

E) manganese perchlorate

Answer: A

Diff: 1 Page Ref: Sec. 2.8

67) What is the correct formula for ammonium sulfide?



Answer: C

Diff: 1 Page Ref: Sec. 2.8

68) When calcium reacts with sulfur the compound formed is _____.

- A) Ca_2S_2
- B) Ca_3S_2
- C) CaS_2
- D) CaS_2
- E) Ca_2S_3

Answer: C

Diff: 1 Page Ref: Sec. 2.8

69) Chromium and chlorine form an ionic compound whose formula is CrCl_3 . The name of this compound is _____.

- A) chromium chlorine
- B) chromium(III) chloride
- C) monochromium trichloride
- D) chromium(III) trichloride
- E) chromic trichloride

Answer: B

Diff: 1 Page Ref: Sec. 2.8

70) Iron and chlorine form an ionic compound whose formula is FeCl_3 . The name of this compound is _____.

- A) iron chlorine
- B) iron (III) chloride
- C) moniron trichloride
- D) iron (III) trichloride
- E) ferric trichloride

Answer: B

Diff: 1 Page Ref: Sec. 2.8

71) Copper and chlorine form an ionic compound whose formula is CuCl_2 . The name of this compound is _____.

- A) copper chlorine
- B) copper (III) dichloride
- C) monocopper dichloride
- D) copper (II) dichloride
- E) cupric chloride

Answer: E

Diff: 1 Page Ref: Sec. 2.8

72) The name of the binary compound N_2O_4 is _____.

- A) nitrogen oxide
- B) nitrous oxide
- C) nitrogen(IV) oxide
- D) dinitrogen tetroxide
- E) oxygen nitride

Answer: D

Diff: 2 Page Ref: Sec. 2.8

73) The formula for zinc phosphate is $\text{Zn}_3(\text{PO}_4)_2$. What is the formula for cadmium arsenate?

- A) $\text{Cd}_4(\text{AsO}_2)_3$
- B) $\text{Cd}_3(\text{AsO}_4)_2$
- C) $\text{Cd}_3(\text{AsO}_3)_4$
- D) $\text{Cd}_2(\text{AsO}_4)_3$
- E) $\text{Cd}_2(\text{AsO}_4)_4$

Answer: B

Diff: 1 Page Ref: Sec. 2.8

74) The formula for aluminum hydroxide is _____.

- A) AlOH
- B) Al_3OH
- C) $\text{Al}_2(\text{OH})_3$
- D) $\text{Al}(\text{OH})_3$
- E) Al_2O_3

Answer: D

Diff: 1 Page Ref: Sec. 2.8

75) The name of the ionic compound V_2O_3 is _____.

- A) vanadium(III) oxide
- B) vanadium oxide
- C) vanadium(II) oxide
- D) vanadium(III) trioxide
- E) divanadium trioxide

Answer: A

Diff: 1 Page Ref: Sec. 2.8

76) The name of the ionic compound NH_4CN is _____.

- A) nitrogen hydrogen cyanate
- B) ammonium carbonitride
- C) ammonium cyanide
- D) ammonium hydrogen cyanate
- E) cyanonitride

Answer: C

Diff: 1 Page Ref: Sec. 2.8

77) The name of the ionic compound $(\text{NH}_4)_3\text{PO}_4$ is _____.

- A) ammonium phosphate
- B) nitrogen hydrogen phosphate
- C) tetrammonium phosphate
- D) ammonia phosphide
- E) triammonium phosphate

Answer: A

Diff: 1 Page Ref: Sec. 2.8

78) What is the formula for perchloric acid?

- A) HClO
- B) HClO_3
- C) HClO_4
- D) HClO_2
- E) HCl

Answer: C

Diff: 1 Page Ref: Sec. 2.8

79) The correct name for HIO_2 is _____.

- A) hypoiodic acid
- B) hydriodic acid
- C) periodous acid
- D) iodic acid
- E) periodic acid

Answer: D

Diff: 2 Page Ref: Sec. 2.8

80) What is the molecular formula for propane?

- A) C_2H_8
- B) C_3H_6
- C) C_3H_8
- D) C_4H_8
- E) C_4H_{10}

Answer: C

Diff: 1 Page Ref: Sec. 2.9

81) What is the molecular formula for butane?

- A) C_2H_8
- B) C_3H_6
- C) C_3H_8
- D) C_4H_8
- E) C_4H_{10}

Answer: E

Diff: 1 Page Ref: Sec. 2.9

82) What is the molecular formula for octane?

- A) C_4H_{10}
- B) C_5H_{10}
- C) C_6H_{14}
- D) $\text{C}_{14}\text{H}_{28}$
- E) C_8H_{18}

Answer: E

Diff: 1 Page Ref: Sec. 2.9

83) What is the molecular formula for pentane?

- A) C_2H_8
- B) C_3H_6
- C) C_4H_8
- D) C_5H_{12}
- E) C_5H_{10}

Answer: D

Diff: 1 Page Ref: Sec. 2.9

84) What is the molecular formula for nonane?

- A) C_9H_{18}
- B) C_9H_{20}
- C) $C_{10}H_{20}$
- D) $C_{10}H_{22}$
- E) $C_{10}H_{24}$

Answer: B

Diff: 2 Page Ref: Sec. 2.9

85) What is the molecular formula for heptane?

- A) C_6H_{12}
- B) C_6H_{14}
- C) C_7H_{14}
- D) C_7H_{16}
- E) C_7H_{18}

Answer: D

Diff: 2 Page Ref: Sec. 2.9

86) What is the molecular formula for 1-hexanol?

- A) $C_6H_{12}OH$
- B) $C_6H_{13}OH$
- C) $C_6H_{14}OH$
- D) $C_7H_{13}OH$
- E) $C_7H_{14}OH$

Answer: B

Diff: 2 Page Ref: Sec. 2.9

2.3 Algorithmic Questions

1) A certain mass of carbon reacts with 23.3 g of oxygen to form carbon monoxide. _____ grams of oxygen would react with that same mass of carbon to form carbon dioxide, according to the law of multiple proportions?

- A) 25.6
- B) 11.7
- C) 23.3
- D) 233
- E) 46.6

Answer: E

Diff: 3 Page Ref: Sec. 2.1

2) An atom of ^{14}C contains _____ protons.

- A) 6
- B) 20
- C) 8
- D) 10
- E) 14

Answer: A

Diff: 1 Page Ref: Sec. 2.3

3) An atom of ^{118}Xe contains _____ neutrons.

- A) 54
- B) 172
- C) 64
- D) 110
- E) 118

Answer: C

Diff: 2 Page Ref: Sec. 2.3

4) An atom of ^{131}Xe contains _____ electrons.

- A) 131
- B) 185
- C) 77
- D) 123
- E) 54

Answer: E

Diff: 1 Page Ref: Sec. 2.3

5) 420 pm is the same as _____ Angstroms.

- A) 4200
- B) 42
- C) 420
- D) 4.2
- E) 0.42

Answer: D

Diff: 2 Page Ref: Sec. 2.3

6) 400 pm is the same as _____ Å.

- A) 4000
- B) 40
- C) 400
- D) 4
- E) 0.0004

Answer: D

Diff: 1 Page Ref: Sec. 2.3

7) The mass number of an atom of ^{128}Xe is _____.

- A) 54
- B) 182
- C) 74
- D) 128
- E) 120

Answer: D

Diff: 2 Page Ref: Sec. 2.3

8) The atomic number of an atom of ^{80}Br is _____.

- A) 115
- B) 35
- C) 45
- D) 73
- E) 80

Answer: B

Diff: 1 Page Ref: Sec. 2.3

9) An ion has 8 protons, 9 neutrons, and 10 electrons. The symbol for the ion is _____.

- A) $^{17}\text{O}^{2-}$
- B) $^{17}\text{O}^{2+}$
- C) $^{19}\text{F}^{+}$
- D) $^{19}\text{F}^{-}$
- E) $^{17}\text{Ne}^{2+}$

Answer: A

Diff: 1 Page Ref: Sec. 2.3

10) The element _____ is the most similar to chlorine in chemical and physical properties.

- A) Li
- B) Rb
- C) O
- D) Br
- E) Ba

Answer: D

Diff: 3 Page Ref: Sec. 2.5

11) Which one of the following is a metal?

- A) Sb
- B) Ge
- C) Br
- D) P
- E) W

Answer: E

Diff: 1 Page Ref: Sec. 2.5

12) Of the following, only _____ is not a metal.

- A) Hg
- B) Se
- C) V
- D) Lu
- E) Y

Answer: B

Diff: 1 Page Ref: Sec. 2.5

13) Which of the following elements is a nonmetal?

- A) P
- B) Si
- C) As
- D) B
- E) Sr

Answer: A

Diff: 3 Page Ref: Sec. 2.5

14) How many electrons does the Al^{3+} ion possess?

- A) 16
- B) 10
- C) 6
- D) 0
- E) 13

Answer: B

Diff: 1 Page Ref: Sec. 2.7

15) How many protons does the Br^- ion possess?

- A) 34
- B) 36
- C) 6
- D) 8
- E) 35

Answer: E

Diff: 1 Page Ref: Sec. 2.7

16) The formula of a salt is XCl_2 . The X-ion in this salt has 27 electrons. The metal X is _____.

- A) Ni
- B) Cu
- C) Co
- D) Fe
- E) Zn

Answer: B

Diff: 2 Page Ref: Sec. 2.7

17) Predict the charge of the most stable ion of bromine.

- A) 2+
- B) 1+
- C) 3+
- D) 1-
- E) 2-

Answer: D

Diff: 1 Page Ref: Sec. 2.7

18) Predict the charge of the most stable ion of potassium.

- A) 3+
- B) 1-
- C) 2+
- D) 2-
- E) 1+

Answer: E

Diff: 1 Page Ref: Sec. 2.7

19) The correct name for SrO is _____.

- A) strontium oxide
- B) strontium hydroxide
- C) strontium peroxide
- D) strontium monoxide
- E) strontium dioxide

Answer: A

Diff: 1 Page Ref: Sec. 2.8

20) Element M reacts with fluorine to form an ionic compound with the formula MF_3 . The M-ion has 22 electrons. Element M is _____.

- A) Al
- B) Mn
- C) Fe
- D) Sc
- E) Cr

Answer: B

Diff: 2 Page Ref: Sec. 2.8

21) The name of the ionic compound RbBrO_4 is _____.

- A) rubidium perbromate
- B) rubidium bromate
- C) rubidium hypobromate
- D) rubidium perbromite
- E) rubidium bromide

Answer: A

Diff: 2 Page Ref: Sec. 2.8

2.4 Short Answer Questions

1) What group in the periodic table would the fictitious element $:\overset{\cdot\cdot}{\text{X}}:$ be found?

Answer: VIIA

Diff: 2 Page Ref: Sec. 2.5

2) Which element in Group IA is the most electropositive?

Answer: francium

Diff: 2 Page Ref: Sec. 2.5

3) The formula for potassium sulfide is _____.

Answer: K_2S

Diff: 1 Page Ref: Sec. 2.8

4) What is the name of an alcohol derived from hexane?

Answer: hexanol

Diff: 2 Page Ref: Sec. 2.9

2.5 True/False Questions

1) The possible oxidation numbers for iron are +1 and +2.

Answer: FALSE

Diff: 1 Page Ref: Sec. 2.7

2) The formula for chromium (II) iodide is CrI_2 .

Answer: TRUE

Diff: 1 Page Ref: Sec. 2.8

3) H_2SeO_4 is called selenic acid.

Answer: TRUE

Diff: 2 Page Ref: Sec. 2.8

4) The correct name for Na_3N is sodium azide.

Answer: FALSE

Diff: 2 Page Ref: Sec. 2.8