

**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 Var: 1 Page Ref: Sec. 2.1

LO: 2.1

GO: G2

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 Var: 1 Page Ref: Sec. 2.1

LO: 2.1

GO: G2

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 Var: 1 Page Ref: Sec. 2.1

LO: 2.1

GO: G2

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

- A)  $\text{SO}_2$ ,  $\text{H}_2\text{SO}_4$
- B)  $\text{CO}$ ,  $\text{CO}_2$
- C)  $\text{H}_2\text{O}$ ,  $\text{O}_2$
- D)  $\text{CH}_4$ ,  $\text{C}_6\text{H}_{12}\text{O}_6$
- E)  $\text{NaCl}$ ,  $\text{KCl}$

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.1

LO: 2.1

GO: G2

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 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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

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

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

8) \_\_\_\_\_-rays consist of fast-moving electrons.

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

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

11) Cathode rays are \_\_\_\_\_.

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

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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

- A)  $\beta$ -rays
- B)  $\alpha$ -rays and  $\beta$ -rays
- C)  $\alpha$ -rays,  $\beta$ -rays, and  $\gamma$ -rays
- D)  $\alpha$ -rays
- E)  $\alpha$ -rays and  $\gamma$ -rays

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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

- A)  $\alpha$ -rays
- B)  $\alpha$ -rays,  $\beta$ -rays, and  $\gamma$ -rays
- C)  $\gamma$ -rays
- D)  $\alpha$ -rays and  $\beta$ -rays
- E)  $\alpha$ -rays and  $\gamma$ -rays

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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

- A)  $\beta$ -rays
- B)  $\alpha$ -rays,  $\beta$ -rays, and  $\gamma$ -rays
- C)  $\gamma$ -rays
- D)  $\alpha$ -rays and  $\gamma$ -rays
- E)  $\alpha$ -rays and  $\beta$ -rays

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

17) Of the three types of radioactivity characterized by Rutherford, which type does not become deflected by a electric field?

- A)  $\beta$ -rays
- B)  $\alpha$ -rays and  $\beta$ -rays
- C)  $\alpha$ -rays
- D)  $\gamma$ -rays
- E)  $\alpha$ -rays,  $\beta$ -rays, and  $\gamma$ -rays

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

21) Which of the following atoms has the smallest number of neutrons?

- A) carbon-14
- B) chlorine-35
- C) carbon-12
- D) carbon-13
- E) bromine-79

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

22) There are \_\_\_\_\_ electrons, \_\_\_\_\_ protons, and \_\_\_\_\_ neutrons in an atom of  $^{132}_{54}\text{Xe}$ .

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

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

- A) 29 p<sup>+</sup>, 34 n<sup>°</sup>, 29 e<sup>-</sup>
- B) 29 p<sup>+</sup>, 29 n<sup>°</sup>, 63 e<sup>-</sup>
- C) 63 p<sup>+</sup>, 29 n<sup>°</sup>, 63 e<sup>-</sup>
- D) 34 p<sup>+</sup>, 29 n<sup>°</sup>, 34 e<sup>-</sup>
- E) 34 p<sup>+</sup>, 34 n<sup>°</sup>, 29 e<sup>-</sup>

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

25) Which isotope has 45 neutrons?

- A)  $^{45}_{21}\text{Sc}$
- B)  $^{80}_{35}\text{Br}$
- C)  $^{78}_{34}\text{Se}$
- D)  $^{34}_{17}\text{Cl}$
- E)  $^{103}_{45}\text{Rh}$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

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)  $^{20}_{10}\text{X}$   $^{21}_{11}\text{X}$

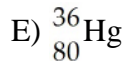
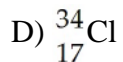
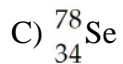
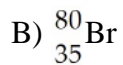
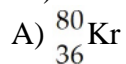
Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

27) Which isotope has 36 electrons in an atom?



Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

28) Isotopes are atoms that have the same \_\_\_\_\_ but differing \_\_\_\_\_.

A) atomic masses, charges

B) mass numbers, atomic numbers

C) atomic numbers, mass numbers

D) charges, atomic masses

E) mass numbers, charges

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2



30) The subatomic particles located in the nucleus with no overall charges are \_\_\_\_\_.

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

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

33) In the symbol shown below, x = \_\_\_\_\_.



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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

34) In the symbol below, X = \_\_\_\_\_.



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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

35) In the symbol below, x = \_\_\_\_\_.



- A) 17
- B) 8
- C) 6
- D) 7
- E) not enough information to determine

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

36) In the symbol below, x is \_\_\_\_\_.



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

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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

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

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

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 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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
$^{221}\text{X}$	74.22	220.9
$^{220}\text{X}$	12.78	220.0
$^{218}\text{X}$	13.00	218.1

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

Answer: B

Diff: 3 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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
$^{38}\text{X}$	5.07	37.919
$^{39}\text{X}$	15.35	39.017
$^{42}\text{X}$	79.85	42.111

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

Answer: A

Diff: 3 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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
$^{159}\text{X}$	30.60	159.37
$^{163}\text{X}$	15.79	162.79
$^{164}\text{X}$	53.61	163.92

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

Answer: C

Diff: 3 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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
$^{53}\text{X}$	19.61	52.62
$^{56}\text{X}$	53.91	56.29
$^{58}\text{X}$	26.48	58.31

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

Answer: C

Diff: 3 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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)
$^{31}\text{X}$	35.16	31.16
$^{34}\text{X}$	64.84	34.30

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

Answer: B

Diff: 3 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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)
$^{15}\text{X}$	28.60	15.33
$^{17}\text{X}$	13.30	17.26
$^{16}\text{X}$	58.10	18.11

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

Answer: A

Diff: 3 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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

- 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 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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 Var: 1 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

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) increasing atomic mass

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2



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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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, Br
- D) Br, Kr
- E) N, O

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 nonmetal
- D) is definitely a nonmetal
- E) is definitely a metalloid

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.11

GO: G2

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 nonmetal
- D) definitely a nonmetal
- E) definitely a metalloid

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.11

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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

- A)  $\text{C}_6\text{H}_6\text{O}_2$
- B)  $\text{C}_2\text{H}_6\text{SO}$
- C)  $\text{H}_2\text{O}_2$
- D)  $\text{H}_2\text{P}_4\text{O}_6$
- E)  $\text{C}_6\text{H}_6$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.6

LO: 2.9

GO: G2

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

- A)  $\text{C}_2\text{H}_2$ ,  $\text{C}_6\text{H}_6$
- B)  $\text{CO}$ ,  $\text{CO}_2$
- C)  $\text{C}_2\text{H}_4$ ,  $\text{C}_3\text{H}_6$
- D)  $\text{C}_2\text{H}_4\text{O}_2$ ,  $\text{C}_6\text{H}_{12}\text{O}_6$
- E)  $\text{C}_2\text{H}_5\text{COOCH}_3$ ,  $\text{CH}_3\text{CHO}$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.6

LO: 2.9

GO: G2

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

- A)  $\text{PCl}_5$
- B)  $\text{MoCl}_6$
- C)  $\text{RbCl}$
- D)  $\text{PbCl}_2$
- E)  $\text{NaCl}$

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.6, 2.7

LO: 2.8

GO: G2

63) 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 Var: 1 Page Ref: Sec. 2.6

LO: 2.10a

GO: G2

64) 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 Var: 1 Page Ref: Sec. 2.6

LO: 2.10a

GO: G2

65) 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 Var: 1 Page Ref: Sec. 2.6

LO: 2.9

GO: G2

66) 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 Var: 1 Page Ref: Sec. 2.6

LO: 2.10a

GO: G2

67) 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 Var: 1 Page Ref: Sec. 2.6

LO: 2.10a

GO: G2

68) 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: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

69) Which species has 54 electrons?

- A)  $^{132}_{54}\text{Xe}^+$
- B)  $^{128}_{52}\text{Te}^{2-}$
- C)  $^{118}_{50}\text{Sn}^{4+}$
- D)  $^{112}_{48}\text{Cd}$
- E)  $^{132}_{54}\text{Xe}^{2+}$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

70) Which species has 16 protons?

- A)  $^{31}\text{P}$
- B)  $^{34}_{16}\text{S}^{2-}$
- C)  $^{36}_{17}\text{Cl}$
- D)  $^{80}_{35}\text{Br}^-$
- E)  $^{16}_8\text{O}$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

71) Which species has 18 electrons?

- A)  $^{39}_{19}\text{K}$
- B)  $^{32}_{16}\text{S}^{2-}$
- C)  $^{35}_{17}\text{Cl}$
- D)  $^{27}_{13}\text{Al}^{3+}$
- E)  $^{45}_{21}\text{Sc}^{3+}$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec 2.7

LO: 2.11

GO: G2

72) Which of the following species contains 18 electrons?

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

73) Which of the following species is an isotope of  $^{79}\text{Br}$ ?

- A)  $^{40}\text{Ar}^+$
- B)  $^{34}\text{S}^{2-}$
- C)  $^{79}\text{Br}^-$
- D)  $^{80}\text{Br}$
- E)  $^{79}\text{Se}$

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

- A) 131, 53, 54
- B) 131, 53, 52
- C) 53, 78, 54
- D) 53, 131, 52
- E) 53, 78, 52

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

A) 146, 92, 92

B) 92, 146, 87

C) 92, 146, 92

D) 92, 92, 87

E) 146, 92, 97

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

77) Which species contains 68 neutrons?

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

B)  $^{116}_{50}\text{Sn}^{+2}$

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

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

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

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

A)  $\text{H}_2\text{O}$

B)  $\text{CO}_2$

C)  $\text{SrCl}_2$

D)  $\text{SO}_2$

E)  $\text{H}_2\text{S}$

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

79) 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 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

80) 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 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

81) Which species below is the nitride ion?

- A)  $\text{Na}^+$
- B)  $\text{NO}_3^-$
- C)  $\text{NO}_2^-$
- D)  $\text{NH}_4^+$
- E)  $\text{N}^{3-}$

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

82) 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)  $\text{NaX}$
- B)  $\text{Na}_2\text{X}$
- C)  $\text{Na}_2\text{X}_2$
- D)  $\text{Na}_3\text{X}$
- E)  $\text{Na}_3\text{X}_2$

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2



83) Aluminum reacts with a certain nonmetallic element to form a compound with the general formula  $\text{Al}_2\text{X}_3$ . 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 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

84) The formula for a salt is  $\text{XBr}$ . 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 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

85) Which formula/name pair is incorrect?

- A)  $\text{Mn}(\text{NO}_2)_2$  manganese(II) nitrite
- B)  $\text{Mg}(\text{NO}_3)_2$  magnesium nitrate
- C)  $\text{Mn}(\text{NO}_3)_2$  manganese(II) nitrate
- D)  $\text{Mg}_3\text{N}_2$  magnesium nitrite
- E)  $\text{Mg}(\text{MnO}_4)_2$  magnesium permanganate

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

86) Which formula/name pair is incorrect?

- A)  $\text{FeSO}_4$  iron(II) sulfate
- B)  $\text{Fe}_2(\text{SO}_3)_3$  iron(III) sulfite
- C)  $\text{FeS}$  iron(II) sulfide
- D)  $\text{FeSO}_3$  iron(II) sulfite
- E)  $\text{Fe}_2(\text{SO}_4)_3$  iron(III) sulfide

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

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

- A)  $\text{HClO}_3$
- B)  $\text{HClO}_4$
- C)  $\text{HClO}$
- D)  $\text{HCl}$
- E)  $\text{HClO}_2$

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

88) 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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

- A)  $\text{Cr}_2\text{O}_3$
- B)  $\text{CrO}_3$
- C)  $\text{Cr}_3\text{O}_2$
- D)  $\text{Cr}_3\text{O}$
- E)  $\text{Cr}_2\text{O}_4$

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

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

- A)  $\text{CuCl}$
- B)  $\text{CuCl}_2$
- C)  $\text{Cu}_2\text{Cl}$
- D)  $\text{Cu}_2\text{Cl}_3$
- E)  $\text{Cu}_3\text{Cl}_2$

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

91) The correct name for  $\text{MgF}_2$  is \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

92) The correct name for  $\text{NaHCO}_3$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

93) 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 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

94) The correct name for  $\text{HNO}_2$  is \_\_\_\_\_.

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

Answer: A

Diff: 3 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

95) The proper formula for the hydronium ion is \_\_\_\_\_.

- A)  $\text{H}^-$
- B)  $\text{OH}^-$
- C)  $\text{N}^{3-}$
- D)  $\text{H}_3\text{O}^+$
- E)  $\text{NH}_4^+$

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

96) The charge on the \_\_\_\_\_ ion is -3.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

97) 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

98) 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

99) The formula for the compound formed between aluminum ions and phosphate ions is \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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

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

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

101) Which metal forms cations of differing charges?

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

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

102) 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

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

- A) CH<sub>4</sub>O
- B) C<sub>2</sub>H<sub>6</sub>O
- C) C<sub>3</sub>H<sub>8</sub>O
- D) C<sub>4</sub>H<sub>10</sub>O
- E) C<sub>5</sub>H<sub>12</sub>O

Answer: C

Diff: 3 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

## 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 Var: 1 Page Ref: Sec. 2.1

LO: 2.1

GO: G2

2) \_\_\_\_\_ and \_\_\_\_\_ reside in the atomic nucleus.

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

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.2

LO: 2.2

GO: G2

3) 520 pm is the same as \_\_\_\_\_ Å.

- A) 5200
- B) 52
- C) 520
- D) 5.2
- E) 0.00052

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G4

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

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 Var: 1 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

6) In the periodic table, the elements touching the steplike line are known as \_\_\_\_\_.

- A) transition elements
- B) noble gases
- C) metalloids
- D) nonmetals
- E) metals

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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

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

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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

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

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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

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

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2



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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

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 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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 Var: 1 Page Ref: Sec. 2.6

LO: 2.9

GO: G2

22) \_\_\_\_\_ only form ions with a 2+ charge.

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

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

- A) SrN
- B) Sr<sub>3</sub>N<sub>2</sub>
- C) Sr<sub>2</sub>N<sub>3</sub>
- D) SrN<sub>2</sub>
- E) SrN<sub>3</sub>

Answer: B

Diff: 3 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

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<sub>2</sub>X
- B) KX<sub>2</sub>
- C) K<sub>2</sub>X<sub>3</sub>
- D) K<sub>2</sub>X<sub>2</sub>
- E) KX

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

25) The charge on the manganese in the salt MnF<sub>3</sub> is \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

27) Sodium forms an ion with a charge of \_\_\_\_\_.

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

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

28) Potassium forms an ion with a charge of \_\_\_\_\_.

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

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

29) Calcium forms an ion with a charge of \_\_\_\_\_.

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

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

30) Barium forms an ion with a charge of \_\_\_\_\_.

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

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

31) Aluminum forms an ion with a charge of \_\_\_\_\_.

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

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

32) Fluorine forms an ion with a charge of \_\_\_\_\_.

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

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

33) Iodine forms an ion with a charge of \_\_\_\_\_.

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

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

34) Oxygen forms an ion with a charge of \_\_\_\_\_.

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

Answer: A

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

35) Sulfur forms an ion with a charge of \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

- A) NaF
- B) Na<sub>2</sub>F
- C) NaF<sub>2</sub>
- D) Na<sub>2</sub>F<sub>3</sub>
- E) Na<sub>3</sub>F<sub>2</sub>

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

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

- A) Mg<sub>2</sub>F<sub>3</sub>
- B) MgF
- C) Mg<sub>2</sub>F
- D) Mg<sub>3</sub>F<sub>2</sub>
- E) MgF<sub>2</sub>

Answer: E

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

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

- A) Mg<sub>2</sub>O
- B) MgO
- C) MgO<sub>2</sub>
- D) Mg<sub>2</sub>O<sub>2</sub>
- E) Mg<sub>3</sub>O<sub>2</sub>

Answer: B

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

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

- A)  $\text{AlO}$
- B)  $\text{Al}_3\text{O}_2$
- C)  $\text{Al}_2\text{O}_3$
- D)  $\text{AlO}_2$
- E)  $\text{Al}_2\text{O}$

Answer: C

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

40) The correct name for  $\text{K}_2\text{S}$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

41) The correct name for  $\text{Al}_2\text{O}_3$  is \_\_\_\_\_.

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

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

42) The correct name for  $\text{CaH}_2$  is \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2



43) The correct name for SO is \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

44) The correct name for CCl<sub>4</sub> is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

45) The correct name for N<sub>2</sub>O<sub>5</sub> is \_\_\_\_\_.

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

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

46) The correct name for H<sub>2</sub>CO<sub>3</sub> is \_\_\_\_\_.

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

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

47) The correct name for  $\text{H}_2\text{SO}_3$  is \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

48) The correct name for  $\text{H}_2\text{SO}_4$  is \_\_\_\_\_.

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

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

49) The correct name for  $\text{HNO}_3$  is \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

50) The correct name for  $\text{HClO}_3$  is \_\_\_\_\_.

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

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

51) The correct name for  $\text{HClO}$  is \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

52) The correct name for  $\text{HBrO}_4$  is \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

53) The correct name for  $\text{HBrO}$  is \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

54) The correct name for  $\text{HBrO}_2$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

55) The correct name for  $\text{HClO}_2$  is \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

56) The correct name of the compound  $\text{Na}_3\text{N}$  is \_\_\_\_\_.

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

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

57) The formula of bromic acid is \_\_\_\_\_.

- A)  $\text{HBr}$
- B)  $\text{HBrO}_4$
- C)  $\text{HBrO}$
- D)  $\text{HBrO}_3$
- E)  $\text{HBrO}_2$

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

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)  $\text{MoCl}_4$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

59) The name of  $\text{PCl}_3$  is \_\_\_\_\_.

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

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

60) The ions  $\text{Ca}^{2+}$  and  $\text{PO}_4^{3-}$  form a salt with the formula \_\_\_\_\_.

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

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

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

- A)  $\text{FeBr}_2$
- B)  $\text{FeBr}_3$
- C)  $\text{FeBr}$
- D)  $\text{Fe}_3\text{Br}_3$
- E)  $\text{Fe}_3\text{Br}$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

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

- A)  $\text{MgS}$
- B)  $\text{Mg}_2\text{S}$
- C)  $\text{MgS}_2$
- D)  $\text{Mg}_2\text{S}_2$
- E)  $\text{Mg}_2\text{S}_3$

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

63) The formula of ammonium carbonate is \_\_\_\_\_.

A)  $(\text{NH}_4)_2\text{CO}_3$

B)  $\text{NH}_4\text{CO}_2$

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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

64) The formula of the chromate ion is \_\_\_\_\_.

A)  $\text{CrO}_4^{2-}$

B)  $\text{CrO}_2^{3-}$

C)  $\text{CrO}^-$

D)  $\text{CrO}_3^{2-}$

E)  $\text{CrO}^{2-}$

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

65) The formula of the carbonate ion is \_\_\_\_\_.

A)  $\text{CO}_2^{2-}$

B)  $\text{CO}_3^{2-}$

C)  $\text{CO}_3^{3-}$

D)  $\text{CO}_2^-$

E)  $\text{CO}^-$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

67) What is the correct formula for ammonium sulfide?

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

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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

- A)  $\text{Ca}_2\text{S}_2$
- B)  $\text{Ca}_3\text{S}_2$
- C)  $\text{CaS}$
- D)  $\text{CaS}_2$
- E)  $\text{Ca}_2\text{S}_3$

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

69) Chromium and chlorine form an ionic compound whose formula is  $\text{CrCl}_3$ . 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

70) Iron and chlorine form an ionic compound whose formula is  $\text{FeCl}_3$ . 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

71) Copper and chlorine form an ionic compound whose formula is  $\text{CuCl}_2$ . 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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

72) The name of the binary compound  $\text{N}_2\text{O}_4$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

74) The formula for aluminum hydroxide is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2



75) The name of the ionic compound  $\text{V}_2\text{O}_3$  is \_\_\_\_\_.

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

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

76) The name of the ionic compound  $\text{NH}_4\text{CN}$  is \_\_\_\_\_.

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

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

78) What is the formula for perchloric acid?

- A)  $\text{HClO}$
- B)  $\text{HClO}_3$
- C)  $\text{HClO}_4$
- D)  $\text{HClO}_2$
- E)  $\text{HCl}$

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

79) The correct name for  $\text{HIO}_2$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

80) What is the molecular formula for propane?

- A)  $\text{C}_2\text{H}_8$
- B)  $\text{C}_3\text{H}_6$
- C)  $\text{C}_3\text{H}_8$
- D)  $\text{C}_4\text{H}_8$
- E)  $\text{C}_4\text{H}_{10}$

Answer: C

Diff: 2 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

81) What is the molecular formula for butane?

- A)  $\text{C}_2\text{H}_8$
- B)  $\text{C}_3\text{H}_6$
- C)  $\text{C}_3\text{H}_8$
- D)  $\text{C}_4\text{H}_8$
- E)  $\text{C}_4\text{H}_{10}$

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

82) What are the primary atoms found in alkanes?

- A) carbon, hydrogen, and oxygen
- B) carbon and nitrogen
- C) oxygen and hydrogen
- D) carbon and oxygen
- E) carbon and hydrogen

Answer: E

Diff: 2 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

83) What is the correct name for the following alkane,  $C_5H_{12}$ ?

- A) heptane
- B) propane
- C) hexane
- D) pentane
- E) butane

Answer: D

Diff: 1 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

84) How many carbon and hydrogen atoms are found in decane?

- A) 10 carbons and 22 hydrogens
- B) 9 carbons and 20 hydrogens
- C) 10 carbons and 20 hydrogens
- D) 9 carbons and 18 hydrogens
- E) 10 carbons and 24 hydrogens

Answer: A

Diff: 2 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

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 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

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

- A)  $C_6H_{13}O$
- B)  $C_6H_{14}O$
- C)  $C_6H_{15}O$
- D)  $C_7H_{14}O$
- E)  $C_7H_{15}O$

Answer: B

Diff: 2 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

## 2.3 Algorithmic Questions

1) A certain mass of carbon reacts with 128 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) 64.0
- C) 128
- D) 1280
- E) 256

Answer: E

Diff: 3 Var: 5 Page Ref: Sec. 2.1

LO: 2.1

GO: G4

2) An atom of  $^{13}\text{C}$  contains \_\_\_\_\_ protons.

- A) 6
- B) 19
- C) 7
- D) 9
- E) 13

Answer: A

Diff: 2 Var: 17 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

3) Of the following, the subatomic particle with the smallest mass is the \_\_\_\_\_.

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

Answer: C

Diff: 1 Var: 15 Page Ref: Sec. 2.3

LO: 2.3

GO: G2

4) An atom of  $^{118}\text{Xe}$  contains \_\_\_\_\_ neutrons.

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

Answer: C

Diff: 2 Var: 17 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

5) There are \_\_\_\_\_ protons, \_\_\_\_\_ electrons, and \_\_\_\_\_ neutrons in an atom of  $^{129}_{54}\text{Xe}$ .

- A) 129, 129, 129
- B) 129, 129, 75
- C) 54, 75, 129
- D) 54, 54, 75
- E) 54, 54, 129

Answer: D

Diff: 2 Var: 5 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

6) An atom of  $^{14}\text{C}$  contains \_\_\_\_\_ electrons.

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

Answer: E

Diff: 1 Var: 17 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

7) 87 pm is the same as \_\_\_\_\_ Angstroms.

- A) 870
- B) 8.7
- C) 87
- D) .87
- E) .087

Answer: D

Diff: 2 Var: 5 Page Ref: Sec. 2.3

LO: 2.3

GO: G4

8) 200 pm is the same as \_\_\_\_\_ Å.

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

Answer: D

Diff: 1 Var: 5 Page Ref: Sec. 2.3

LO: 2.3

GO: G4

9) In the symbol below, X = \_\_\_\_\_.



- A) Zr
- B) K
- C) Sc
- D) Br
- E) not enough information to determine

Answer: B

Diff: 1 Var: 5 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

10) In the symbol below, x = \_\_\_\_\_.



- A) 17
- B) 34
- C) 16
- D) 36
- E) not enough information to determine

Answer: E

Diff: 2 Var: 5 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

11) The mass number of an atom of  ${}^{14}\text{C}$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 17 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

12) Which atom has the largest number of neutrons?

- A) silicon-30
- B) sulfur-36
- C) argon-38
- D) calcium-44
- E) magnesium-24

Answer: D

Diff: 3 Var: 50+ Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

13) How many neutrons are there in one atom of  $^{184}\text{W}$ ?

- A) 74
- B) 112
- C) 258
- D) 110
- E) 184

Answer: D

Diff: 3 Var: 4 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

14) How many protons are there in one atom of  $^{71}\text{Ga}$ ?

- A) 40
- B) 70
- C) 71
- D) 31
- E) 13

Answer: D

Diff: 3 Var: 5 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

15) How many electrons are there in one atom of  $^{71}\text{Ga}$ ?

- A) 40
- B) 70
- C) 71
- D) 31
- E) 13

Answer: D

Diff: 3 Var: 5 Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

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

- A)  $^{28}_{13}\text{X}$        $^{29}_{14}\text{X}$   
B)  $^{59}_{26}\text{X}$        $^{58}_{26}\text{X}$   
C)  $^{10}_2\text{X}$        $^{13}_3\text{X}$   
D)  $^{107}_{43}\text{X}$        $^{109}_{44}\text{X}$   
E)  $^{16}_6\text{X}$   $^{16}_7\text{X}$

Answer: B

Diff: 1    Var: 50+    Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

17) The atomic number of an atom of  $^{80}\text{Br}$  is \_\_\_\_\_.

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

Answer: B

Diff: 1    Var: 17    Page Ref: Sec. 2.3

LO: 2.3, 2.4

GO: G2

18) How many total electrons are in the  $\text{Li}^+$  ion?

- A) 2  
B) 3  
C) 4  
D) 7  
E) 8

Answer: A

Diff: 1    Var: 5    Page Ref: Sec. 2.7

LO: 2.11

GO: G2



19) How many total electrons are in the  $\text{O}^{2-}$  ion?

- A) 10
- B) 8
- C) 6
- D) 16
- E) 4

Answer: A

Diff: 1 Var: 5 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

20) If a iron atom loses 2 electrons to make an ion, what is the charge on that ion?

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

Answer: A

Diff: 1 Var: 5 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

21) If an atom gains 3 electrons to make an ion, what is the charge on that ion?

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

Answer: E

Diff: 1 Var: 3 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

22) 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
$^{221}\text{X}$	55.700	220.90
$^{220}\text{X}$	38.800	220.00
$^{218}\text{X}$	5.5000	218.10

A) 33.333

B) 220.40

C) 220.24

D) 219.00

E) 219.67

Answer: B

Diff: 3 Var: 5 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

23) 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
$^{159}\text{X}$	40.80	159.37
$^{163}\text{X}$	8.000	162.79
$^{164}\text{X}$	51.20	163.92

A) 159.4

B) 162.0

C) 163.1

D) 161.5

E) 163.0

Answer: B

Diff: 3 Var: 5 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

24) 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
$^{53}\text{X}$	25.00	52.62
$^{56}\text{X}$	37.00	56.29
$^{58}\text{X}$	38.00	58.31

- A) 52.62
- B) 56.14
- C) 55.70
- D) 55.40
- E) 55.74

Answer: B

Diff: 3 Var: 5 Page Ref: Sec. 2.4

LO: 2.5

GO: G4

25) The element \_\_\_\_\_ is the most similar to helium in chemical and physical properties.

- A) O
- B) Mg
- C) Be
- D) Ar
- E) Sr

Answer: D

Diff: 3 Var: 4 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

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

- A) Li, F
- B) Sr, Te
- C) O, S
- D) In, Sb
- E) Ti, Ne

Answer: C

Diff: 1 Var: 50+ Page Ref: Sec. 2.5

LO: 2.6

GO: G2

27) Which one of the following is a metalloid?

- A) Se
- B) Hf
- C) Zr
- D) Xe
- E) Si

Answer: E

Diff: 1 Var: 5 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

28) The element lithium is in a group known as the \_\_\_\_\_.

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

Answer: E

Diff: 1 Var: 4 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

29) The element chlorine is in a group known as the \_\_\_\_\_.

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

Answer: E

Diff: 1 Var: 4 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

30) The element calcium is in a group known as the \_\_\_\_\_.

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

Answer: E

Diff: 1 Var: 4 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

31) Of the following, only \_\_\_\_\_ is not a metalloid.

- A) B
- B) Po
- C) Si
- D) Ge
- E) As

Answer: B

Diff: 1 Var: 4 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

32) Which of the following elements is a nonmetal?

- A) At
- B) Rh
- C) Tc
- D) Mo
- E) Zr

Answer: A

Diff: 1 Var: 4 Page Ref: Sec. 2.5

LO: 2.7

GO: G2

33) Which one of the following will occur as diatomic molecules in elemental form?

- A) helium
- B) argon
- C) chlorine
- D) phosphorous
- E) sodium

Answer: C

Diff: 1 Var: 50+ Page Ref: Sec. 2.6

LO: 2.8

GO: G2

34) How many electrons does the  $\text{Al}^{3+}$  ion possess?

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

Answer: B

Diff: 1 Var: 10 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

35) How many protons does the  $\text{Br}^-$  ion possess?

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

Answer: E

Diff: 1 Var: 10 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

- A) Mn
- B) Zn
- C) F
- D) Li
- E) Al

Answer: C

Diff: 2 Var: 50+ Page Ref: Sec. 2.7

LO: 2.11

GO: G2

37) The formula of a salt is  $\text{XCl}_2$ . The X-ion in this salt has 24 electrons. The metal X is

- \_\_\_\_\_.
- A) Ni
  - B) Fe
  - C) Zn
  - D) Cr
  - E) Ti

Answer: B

Diff: 2 Var: 5 Page Ref: Sec. 2.7

LO: 2.12

GO: G2

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

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

Answer: D

Diff: 1 Var: 10 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

39) Predict the charge of the most stable ion of aluminum.

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

Answer: E

Diff: 1 Var: 10 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

- A)  $\text{C}_2\text{H}_6$
- B)  $\text{NH}_3$
- C)  $\text{H}_2\text{O}_2$
- D)  $\text{LiBr}$
- E) None of the above.

Answer: D

Diff: 1 Var: 50+ Page Ref: Sec. 2.6, 2.7

LO: 2.8

GO: G2

41) Which species below is the sulfate ion?

- A)  $\text{CN}^-$
- B)  $\text{SO}_4^{2-}$
- C)  $\text{OH}^-$
- D)  $\text{SO}_3^{2-}$
- E) None of the above

Answer: B

Diff: 1 Var: 4 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

42) Which species below is the nitrate ion?

- A)  $\text{NO}_2^-$
- B)  $\text{NO}_3^-$
- C)  $\text{ClO}_3^-$
- D)  $\text{ClO}_4^-$
- E)  $\text{MnO}_4^-$

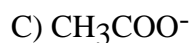
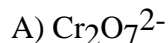
Answer: B

Diff: 1 Var: 5 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

43) Which species below is the chromate ion?



E) None of the above

Answer: B

Diff: 1 Var: 4 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

44) The correct name for  $\text{CaO}$  is \_\_\_\_\_.

A) calcium oxide

B) calcium hydroxide

C) calcium peroxide

D) calcium monoxide

E) calcium dioxide

Answer: A

Diff: 2 Var: 4 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

45) Element M reacts with fluorine to form an ionic compound with the formula  $\text{MF}_3$ . The M-ion has 21 electrons. Element M is \_\_\_\_\_.

A) Al

B) Cr

C) Mn

D) Fe

E) Sc

Answer: B

Diff: 2 Var: 5 Page Ref: Sec. 2.8

LO: 2.12

GO: G2

46) The charge on the copper ion in the salt  $\text{CuO}$  is \_\_\_\_\_.

A) +1

B) +2

C) +4

D) +3

E) +5

Answer: B

Diff: 2 Var: 5 Page Ref: Sec. 2.8

LO: 2.12

GO: G2



47) The charge on the silver ion in the salt AgCl is \_\_\_\_\_.

- A) +2
- B) +1
- C) +3
- D) +4
- E) +5

Answer: B

Diff: 2 Var: 4 Page Ref: Sec. 2.8

LO: 2.12

GO: G2

48) The name of the ionic compound NaBrO<sub>4</sub> is \_\_\_\_\_.

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

Answer: A

Diff: 2 Var: 4 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

49) When a bromine atom forms the bromide ion, it has the same charge as the \_\_\_\_\_ ion.

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

Answer: C

Diff: 1 Var: 4 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

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

- A) magnesium
- B) sodium
- C) fluorine
- D) vanadium
- E) sulfur

Answer: E

Diff: 2 Var: 50+ Page Ref: Sec. 2.7

LO: 2.11

GO: G2

51) The correct name for  $\text{Na}_2\text{O}_2$  is \_\_\_\_\_.

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

Answer: D

Diff: 2 Var: 4 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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

- A) Cr
- B) Ni
- C) Zr
- D) Na
- E) Mo

Answer: D

Diff: 1 Var: 50+ Page Ref: Sec. 2.7

LO: 2.11

GO: G2

## 2.4 Short Answer Questions

1) The following hypothetical element  $\begin{array}{c} \cdot \\ \text{X} \\ \cdot \end{array}$  can be found in which group on the periodic table?

Answer: VIA

Diff: 2 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

2) Which element is found in Period 2 and Group VIIA?

Answer: fluorine

Diff: 2 Var: 1 Page Ref: Sec. 2.5

LO: 2.6

GO: G2

3) The formula for potassium sulfide is \_\_\_\_\_.

Answer:  $\text{K}_2\text{S}$

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2

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

Answer: hexanol

Diff: 2 Var: 1 Page Ref: Sec. 2.9

LO: 2.15

GO: G2

## 2.5 True/False Questions

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

Answer: FALSE

Diff: 1 Var: 1 Page Ref: Sec. 2.7

LO: 2.11

GO: G2

2) The formula for chromium (II) iodide is  $\text{CrI}_2$ .

Answer: TRUE

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

3)  $\text{H}_2\text{SeO}_4$  is called selenic acid.

Answer: TRUE

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.14

GO: G2

4) The correct name for  $\text{Na}_3\text{N}$  is sodium azide.

Answer: FALSE

Diff: 2 Var: 1 Page Ref: Sec. 2.8

LO: 2.13

GO: G2