Chapter 3 Molecules, Compounds, and Nomenclature

Multiple Choice Questions

1) An ionic bond is best described as
A) the sharing of electrons.
B) the transfer of electrons from one atom to another.
C) the attraction that holds the atoms together in a polyatomic ion.
D) the attraction between two nonmetal atoms.
E) the attraction between two metal atoms.
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.2

2) When forming ionic compounds, cations and anions form three-dimensional networks known as
A) a molecular compound.
B) a space-filling compound.
C) a lattice.
D) an empirical formula.
Answer: C
Diff: 1 Type: MC Var: 1 Page Ref: 3.2

3) A covalent bond is best described as
A) the sharing of electrons between atoms.
B) the transfer of electrons.
C) a bond between a metal and a nonmetal.
D) a bond between a metal and a polyatomic ion.
E) a bond between two polyatomic ions.
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.2

4) Identify the compound with (an) ionic bond(s).
A) Ne
B) CO
C) O_2
D) H_2O
E) KBr
Answer: E
Diff: 1 Type: MC Var: 1 Page Ref: 3.2

5) Identify the compound with (an) ionic bond(s).
A) CO_2
B) H_2O
C) CH_4
D) LiBr
E) H_2
Answer: D
Diff: 1 Type: MC Var: 1 Page Ref: 3.2

6) Identify the compound with (a) covalent bond(s).
A) CH_4
B) Ne
C) KBr
D) Mg
E) NaCl
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.2

7) Which of the following contains BOTH ionic and covalent bonds?
A) CaI_2
B) COS
C) $CaSO_4$
D) SF_6
E) C_2H_4
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.2

8) Which of the following contains BOTH ionic and covalent bonds?
A) KI
B) NH_4Cl
C) CaS
D) H_2S
E) SiF_4
Answer: B
Diff: 2 Type: MC Var: 1 Page Ref: 3.2

9) Which of the following is a possible molecular formula for C_4H_4O?
A) $C_8H_8O_2$
B) $C_{12}H_{12}O_2$
C) C_2H_2O
D) C_8H_8O
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

10) Identify a possible molecular formula for C_3H_5ClO.
A) $C_6H_{10}ClO_2$
B) $C_5H_{10}Cl_2O_2$
C) $C_6H_{10}Cl_2O_2$
D) $C_6H_{10}O_2$
E) $C_6H_{12}Cl_2O_2$
Answer: C
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

11) What is the empirical formula for $Hg_2(NO_3)_2$?
A) $Hg_2(NO_3)_2$
B) $HgNO_3$
C) $Hg(NO_3)_2$
D) Hg_2NO_3
E) $Hg_4(NO_3)_4$
Answer: B
Diff: 2 Type: MC Var: 1 Page Ref: 3.3

12) Which of the following is an atomic element?
A) Br
B) H
C) N
D) O
E) Mg
Answer: E
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

13) Which of the following is a molecular element?
A) Kr
B) Ag
C) S
D) Mg
E) Ti
Answer: C
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

14) Which of the following is a molecular element?
A) Mg
B) Ar
C) Xe
D) I
E) Li
Answer: D
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

15) Which of the following is a molecular compound?
A) $CuCl_2$
B) KCl
C) $NaNO_3$
D) CH_3Cl
E) RbBr
Answer: D
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

16) Which of the following is a molecular compound?
A) NaCN
B) LiOH
C) SrI_2
D) ZnS
E) P_4O_{10}
Answer: E
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

17) Which of the following exists as a diatomic molecule?
A) N
B) C
C) P
D) Na
E) Ne
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

18) Which of the following exists as a polyatomic molecule?
A) N
B) C
C) P
D) Na
E) Ne
Answer: C
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

19) Which of the following is an ionic compound?
A) LiCl
B) NO_2
C) PCl_3
D) CF_4
E) $SeBr_2$
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

20) Which of the following is an ionic compound?
A) SCl_2
B) $Mg_3(PO_4)_2$
C) Cl_2O
D) CH_2O
E) PF_5
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

21) Which of the following is a molecular compound?
A) $CuCl_2$
B) N_2O_4
C) $NaNO_3$
D) $SrSO_3$
E) RbBr
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.3

22) Which of the following is an acid in aqueous solution?
A) $CaCO_3$
B) $HClO_2$
C) CH_3OCH_3
D) NaCl
E) KNO_3
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

23) Which of the following is an acid in aqueous solution?
A) NH_3
B) NaF
C) $Ca(C_2H_3O_2)_2$
D) HI
E) KCl
Answer: D
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

24) Identify the cyanide ion.

A) MnO_4^-

B) HCO_3^-

C) CO_3^{2-}

D) HCN

E) CN^-

Answer: E
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

25) What is the empirical formula for $C_4H_{10}O_2$?

A) C_2H_5O

B) CHO

C) C_2H_4O

D) CHO_2

E) CH_2O

Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

26) Identify the formula for the compound formed between potassium and sulfur.

A) KS

B) KS_2

C) K_2S

D) K_2SO_3

E) K_3S_2

Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

27) Identify the charge, X, on the acetate ion $C_2H_3O_2^X$

A) +1

B) +2

C) +3

D) -2

E) -1

Answer: E
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

28) Identify the charge, X, on the phosphide ion P^X
A) -4
B) -3
C) -2
D) -1
E) +1
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

29) Identify the charge, X, on the barium ion Ba^X
A) +1
B) +2
C) +3
D) -1
E) -2
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

30) Identify the sulfite ion.

A) SO_3^{2-}

B) HSO_3^-

C) S^{2-}

D) SO_4^{2-}

E) HSO_4^-

Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

31) Identify the perchlorate ion.

A) ClO_2^-

B) ClO_3^-

C) ClO_4^-

D) ClO^-

E) Cl^-

Answer: C
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

32) Identify the nitrite ion.

A) NO_3^-

B) NO_2^-

C) NH_4^+

D) N_3^-

E) N^{3-}
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

33) Identify the name for SnO.
A) tin(I) oxide
B) tin(II) oxide
C) tin(III) oxide
D) tin(IV) oxide
Answer: B
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

34) Identify the formula for barium nitrite.
A) Ba_3N_2
B) $BaNO_3$
C) BN
D) $Ba(NO_2)_2$
E) $B(NO_2)_3$
Answer: D
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

35) Identify the formula for strontium nitride.
A) Sr_3N_2
B) $Sr(NO_3)_2$
C) SrN
D) Sr_2N_3
E) $Sr(NO_2)_2$
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

36) Determine the name for $TiCO_3$. Remember that titanium forms several ions.
A) titanium(II) carbonate
B) titanium carbide
C) titanium carbonite
D) titanium(II) carbonite
E) titanium(I) carbonate
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

37) Identify the formula for sodium chlorate.
A) NaClO
B) $NaClO_2$
C) $NaClO_3$
D) $NaClO_4$
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

38) Identify the formula for magnesium nitrate hexahydrate.
A) $Mg(NO_3)_2 \cdot 5H_2O$
B) $Mg(NO_3)_2 \cdot 6H_2O$
C) $Mg(NO_3)_2 \cdot 7H_2O$
D) $MgNO_3 \cdot 5H_2O$
E) $MgNO_3 \cdot 6H_2O$
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

39) Identify the formula for barium hydroxide octahydrate.
A) $Ba(OH)_2 \cdot 8H_2O$
B) $BaOH \cdot 8H_2O$
C) $B(OH)_3 \cdot 8H_2O$
D) $8Ba(OH)_2 \cdot H_2O$
E) $8BaOH \cdot H_2O$
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

40) Identify the name for $LiNO_3 \cdot 3H_2O$.
A) lithium nitrate
B) lithium nitrate hemihydrate
C) lithium nitrate monohydrate
D) lithium nitrate dihydrate
E) lithium nitrate trihydrate
Answer: E
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

41) Identify the name for $Sr(NO_3)_2 \cdot 4H_2O$.
A) tin(II) nitrate tetrahydrate
B) strontium nitrate tetrahydrate
C) scandium nitrate tetrahydrate
D) tin(III) nitrate tetrahydrate
E) tin(II) nitrate quadhydrate
Answer: B
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

42) Identify the name for $Sn(SO_4)_2$. Remember that Sn forms several ions.
A) tin(I) sulfite
B) tin(IV) sulfate
C) tin sulfide
D) tin(II) sulfite
E) tin(I) sulfate
Answer: B
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

43) Determine the name for $CoCl_2 \cdot 6H_2O$. Remember that Co forms several ions.
A) cobalt chloride hydrate
B) cobalt(I) chloride heptahydrate
C) cobalt(II) chloride heptahydrate
D) cobalt(II) chloride hexahydrate
E) cobalt(I) chloride
Answer: D
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

44) Identify the name for $Ca_3(PO_4)_2$.
A) calcium(III) phosphite
B) calcium(II) phosphite
C) calcium phosphate
D) tricalcium phosphorustetraoxide
E) calcium phosphite
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

45) Identify the name for FeS.
A) iron(I) sulfate
B) iron(I) sulfide
C) iron(II) sulfide
D) iron(II) sulfate
E) iron sulfide
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

46) Identify the formula for chromium(II) nitrate.
A) $Cr(NO_2)_3$
B) $Cr(NO_3)_3$
C) $Cr(NO_3)_2$
D) $Cr(NO_2)_2$
E) $Cr_2(NO_2)$
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

47) What is the correct formula for lead (II) chloride?
A) $LdCl_4$
B) $SbCl_4$
C) $PbCl_2$
D) $PbCl_4$
E) $LaCl_3$
Answer: C
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

48) Identify the correct formula for aluminum sulfate.
A) Al_2SO_4
B) $Al(SO_4)_3$
C) $Al_3(SO_4)_2$
D) $Al_2(SO_4)_3$
Answer: D
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

49) What is the charge on an aluminum ion?
A) +3
B) +2
C) +1
D) -1
E) -2
Answer: A
Diff: 1 Type: MC Var: 1 Page Ref: 3.4

50) Identify the correct formula for sodium chlorate.
A) NaClO
B) $NaClO_2$
C) $NaClO_3$
D) $NaClO_4$
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

51) Identify the formula for copper (II) sulfate pentahydrate.

A) $Cu_2SO_3 \cdot H_5$

B) $Cu_2S \cdot H_2O$

C) $CuS \cdot 5H_2O$

D) $(CuSO_4)_5$

E) $CuSO_4 \cdot 5H_2O$

Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

52) Determine the name for H_2CO_3.

A) carbonous acid
B) dihydrogen carbonate
C) carbonic acid
D) hydrocarbonic acid
E) hydrocarbide acid
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

53) Determine the name for aqueous HBr.

A) bromic acid
B) bromous acid
C) hydrobromous acid
D) hydrogen bromate
E) hydrobromic acid
Answer: E
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

54) Identify the formula for sulfurous acid.

A) H_2SO_3

B) HSO_3

C) H_2SO_4

D) HSO_4

Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

55) Identify the name for H_2SO_4.

A) sulfuric acid
B) persulfurous acid
C) sulfurous acid
D) hyposulfurous acid
E) persulfuric acid
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

56) Determine the name for P_4O_{10}.
A) phosphorus(IV) oxide
B) diphosphorus pentoxide
C) phosphorus oxide
D) phosphorus(II) oxide
E) tetraphosphorus decoxide
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

57) Determine the name for N_2O_5.
A) dinitrogen pentoxide
B) nitrogen oxide
C) nitrogen(IV) oxide
D) nitrogen(II) oxide
E) nitrogen tetroxide
Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

58) Determine the name for Cl_2O.
A) chlorine oxide
B) dichlorine monoxide
C) chlorine(I) oxide
D) chlorine(II) oxide
E) chlorate
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

59) Identify the name for PBr_3.
A) phosphorus tribromide
B) potassium tribromide
C) phosphorus(III) bromide
D) phosphorus(II) bromide
E) phosphorus bromide
Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

60) Determine the name for aqueous $HClO_3$.
A) hydrochloric acid
B) hydrochlorous acid
C) chlorate acid
D) chloric acid
E) perchloric acid
Answer: D
Diff: 3 Type: MC Var: 1 Page Ref: 3.4

61) Identify the name for the compound $Fe(C_2H_3O_2)_2$.
A) iron(II) hydrogen carbonate
B) iron(III) carbonate
C) iron acetate
D) iron(II) acetate
E) iron(II) dihydrogen phosphate
Answer: D
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

62) Which of the following is a formula for the compound disulfur tetrafluoride?
A) SF_4
B) $2SF_4$
C) S_2F_4
D) SF_6
E) S_2F_2
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

63) Which of the following is a formula for the compound iridium(III) bromide tetrahydrate?
A) $IrBr\cdot\frac{1}{2}H_2O$
B) $IrBr\cdot 4H_2O$
C) $IrBr_3\cdot 4H_2O$
D) $IBr_3\cdot 4H_2O$
E) $IBr_3\cdot 2H_2O$
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.4

64) Which of the following is one possible form of pentane?
A) $CH_3CH_2CH_2CH_2CH_3$
B) $CH_3CH{=}CHCH_2CH_3$
C) $CH_3CH_2CH_2CH_2CH_2CH_3$
D) $CH_3CH_2CH_2CH_2CH_2NH_2$
E) $CH_3CH_2\text{-}O\text{-}CH_2CH_2CH_3$
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.5

65) Which of the following compounds is ethanol?
A) C_2H_6
B) C_2H_5OH
C) CH_3CO_2H
D) $CH_3CO_2CH_3$
E) $CH_3\text{-}O\text{-}CH_3$
Answer: B
Diff: 2 Type: MC Var: 1 Page Ref: 3.5

66) Identify an amine.

A) $CH_3CH_2OCH_2CH_3$
B) CH_3CH_2OH
C) $CH_3CH_2NH_2$
D) $CH_3CH_2CH_2CH_3$
E) CH_3COOH
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.5

67) Identify an ether.
A) $CH_3CH_2OCH_2CH_3$
B) CH_3CH_2OH
C) $CH_3CH_2NH_2$
D) $CH_3CH_2CH_2CH_3$
E) CH_3COOH
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.5

68) Identify a carboxylic acid.
A) $CH_3CH_2OCH_2CH_3$
B) CH_3CH_2OH
C) $CH_3CH_2NH_2$
D) $CH_3CH_2CH_2CH_3$
E) CH_3COOH
Answer: E
Diff: 2 Type: MC Var: 1 Page Ref: 3.5

69) Identify a hydrocarbon.
A) $CH_3CH_2OCH_2CH_3$
B) CH_3CH_2OH
C) $CH_3CH_2NH_2$
D) $CH_3CH_2CH_2CH_3$
E) CH_3COOH
Answer: D
Diff: 2 Type: MC Var: 1 Page Ref: 3.5

70) Calculate the molar mass for $Mg(ClO_4)_2$.
A) 223.21 g mol^{-1}
B) 123.76 g mol^{-1}
C) 119.52 g mol^{-1}
D) 247.52 g mol^{-1}
E) 75.76 g mol^{-1}
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.6

71) Calculate the molar mass of $Al(C_2H_3O_2)_3$.
A) 86.03 g mol^{-1}

B) 204.13 g mol^{-1}
C) 56.00 g mol^{-1}
D) 258.09 g mol^{-1}
E) 139.99 g mol^{-1}
Answer: B
Diff: 2 Type: MC Var: 1 Page Ref: 3.6

72) Calculate the molar mass of $Ca_3(PO_4)_2$.
A) 87.05 g mol^{-1}
B) 215.21 g mol^{-1}
C) 310.18 g mol^{-1}
D) 279.21 g mol^{-1}
E) 246.18 g mol^{-1}
Answer: C
Diff: 2 Type: MC Var: 1 Page Ref: 3.6

73) Calculate the molar mass of H_2CO_3.
A) 62.03 g mol^{-1}
B) 29.02 g mol^{-1}
C) 61.02 g mol^{-1}
D) 60.01 g mol^{-1}
E) 74.04 g mol^{-1}
Answer: A
Diff: 2 Type: MC Var: 1 Page Ref: 3.6

74) How many millimoles of $Ca(NO_3)_2$ contain 4.78×10^{22} formula units of $Ca(NO_3)_2$? The molar mass of $Ca(NO_3)_2$ is 164.10 g mol^{-1}.
A) 12.6 mmol $Ca(NO_3)_2$
B) 13.0 mmol $Ca(NO_3)_2$
C) 20.7 mmol $Ca(NO_3)_2$
D) 79.4 mmol $Ca(NO_3)_2$
E) 57.0 mmol $Ca(NO_3)_2$
Answer: D
Diff: 2 Type: MC Var: 1 Page Ref: 3.6

75) How many moles of C_3H_8 contain 9.25×10^{24} molecules of C_3H_8?

A) 65.1 moles C_3H_8

B) 28.6 moles C_3H_8

C) 34.9 moles C_3H_8

D) 46.2 moles C_3H_8

E) 15.4 moles C_3H_8

Answer: E
Diff: 2 Type: MC Var: 1 Page Ref: 3.6

76) How many molecules of N_2O_4 are in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g mol^{-1}.

A) 5.54×10^{25} N_2O_4 molecules

B) 7.26×10^{23} N_2O_4 molecules

C) 1.38×10^{24} N_2O_4 molecules

D) 4.59×10^{25} N_2O_4 molecules

E) 4.99×10^{23} N_2O_4 molecules

Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

77) How many moles of N_2O_4 are in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g mol^{-1}.

A) 7.02×10^{3} moles N_2O_4

B) 1.42×10^{-4} moles N_2O_4

C) 1.00 mole N_2O_4

D) 1.21 moles N_2O_4

E) 0.829 moles N_2O_4

Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

78) How many C_2H_4 molecules are contained in 45.8 mg of C_2H_4? The molar mass of C_2H_4 is 28.05 g mol^{-1}.

A) 9.83×10^{20} C_2H_4 molecules

B) 7.74×10^{26} C_2H_4 molecules

C) 2.71×10^{20} C_2H_4 molecules

D) 3.69×10^{23} C_2H_4 molecules

E) 4.69×10^{23} C_2H_4 molecules

Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

79) What is the mass (in kg) of 6.89×10^{25} molecules of CO_2? The molar mass of CO_2 is 44.01 g mol^{-1}.
A) 3.85 kg
B) 5.04 kg
C) 2.60 kg
D) 3.03 kg
E) 6.39 kg
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

80) What is the mass of 9.44×10^{24} molecules of NO_2? The molar mass of NO_2 is 46.01 g mol^{-1}.
A) 205 g
B) 294 g
C) 721 g
D) 341 g
E) 685 g
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

81) How many molecules are in 114.86 g of vitamin C, $C_6H_8O_6$?
A) 1.218×10^{28}
B) 3.927×10^{23}
C) 2.546×10^{-24}
D) 2.977×10^{19}
E) 2.977×10^{22}
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

82) How many molecules are in 1.500 g of riboflavin, $C_{17}H_{20}N_4O_6$?
A) 1.066×10^{21}
B) 4.167×10^{-22}
C) 3.400×10^{26}
D) 1.067×10^{24}
E) 2.400×10^{21}
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

83) How many molecules are in 0.1339 kg of ethanol,C_2H_6O?
A) 1.750×10^{24}
B) 3.715×10^{27}
C) 5.712×10^{-25}
D) 9.763×10^{19}
E) 9.763×10^{22}
Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.6

84) How many molecules are in 16.61 g of acetic acid, $C_2H_4O_2$?

A) 6.007×10^{26}

B) 6.0375×10^{23}

C) 1.666×10^{23}

D) 6.0375×10^{20}

E) 6.004×10^{-24}

Answer: C

Diff: 3 Type: MC Var: 1 Page Ref: 3.6

85) A typical cup of coffee has about 100 mg of caffeine. Calculate the number of caffeine molecules in 100. mg $C_8H_{10}N_4O_2$.

A) 3.22×10^{-21}

B) 3.10×10^{20}

C) 1.17×10^{25}

D) 3.10×10^{22}

E) 3.10×10^{25}

Answer: B

Diff: 3 Type: MC Var: 1 Page Ref: 3.6

86) Calculate the mass percent composition of sulfur in $Al_2(SO_4)_3$.

A) 28.12%

B) 9.372%

C) 42.73%

D) 21.38%

E) 35.97%

Answer: A

Diff: 2 Type: MC Var: 1 Page Ref: 3.7

87) Calculate the mass percent composition of lithium in Li_3PO_4.

A) 26.75%

B) 17.98%

C) 30.72%

D) 55.27%

E) 20.82%

Answer: B

Diff: 2 Type: MC Var: 1 Page Ref: 3.7

88) How many moles of N_2O_3 contain 2.55×10^{24} oxygen atoms?

A) 1.41 moles N_2O_3

B) 4.23 moles N_2O_3

C) 12.7 moles N_2O_3

D) 7.87 moles N_2O_3

E) 2.82 moles N_2O_3

Answer: A

Diff: 2 Type: MC Var: 1 Page Ref: 3.7

89) Give the mass percent of carbon in $C_{14}H_{19}NO_2$.

A) 38.89%
B) 72 .07%
C) 5.17%
D) 2.78%
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

90) How many moles of PCl_3 contain 3.68×10^{25} chlorine atoms?
A) 61.1 moles PCl_3
B) 20.4 moles PCl_3
C) 16.4 moles PCl_3
D) 54.5 moles PCl_3
E) 49.1 moles PCl_3
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

91) How many moles of C_3H_8 contain 4.95×10^{24} hydrogen atoms?
A) 8.22 moles C_3H_8
B) 6.58 moles C_3H_8
C) 1.03 moles C_3H_8
D) 9.73 moles C_3H_8
E) 3.09 moles C_3H_8
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

92) How many atoms of oxygen are contained in 47.6 g of $Al_2(CO_3)_3$? The molar mass of $Al_2(CO_3)_3$ is 233.99 g mol^{-1}.
A) 1.23×10^{23} O atoms
B) 2.96×10^{24} O atoms
C) 2.87×10^{25} O atoms
D) 1.10×10^{24} O atoms
E) 3.68×10^{23} O atoms
Answer: D
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

93) How many atoms of carbon are contained in 47.6 g of $Al_2(CO_3)_3$? The molar mass of $Al_2(CO_3)_3$ is 233.99 g mol^{-1}.
A) 1.23×10^{23} C atoms
B) 2.96×10^{24} C atoms
C) 2.87×10^{25} C atoms
D) 1.10×10^{24} C atoms
E) 3.68×10^{23} C atoms
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

94) Hematite is the mineral form of iron(III) oxide. Calculate the number of iron ions in 20.0 kg of pure

hematite.
A) 1.51×10^{26}
B) 7.54×10^{25}
C) 3.77×10^{17}
D) 6.63×10^{-27}
E) 9.62×10^{21}
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

95) Calculate the number of oxygen atoms in 1.187 g of nickel(II) carbonate.
A) 1.807×10^{26}
B) 5.535×10^{23}
C) 6.022×10^{21}
D) 1.282×10^{22}
E) 1.807×10^{22}
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

96) Calculate the number of carbon atoms in 76.91 g of benzoic acid, C_6H_5COOH.
A) 6.693×10^{24}
B) 3.793×10^{23}
C) 2.655×10^{24}
D) 3.767×10^{25}
E) 4.488×10^{20}
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

97) Formic acid, HCOOH, is a major component in ant bites. Calculate the mass, in grams, of 3.14×10^{23} molecules of formic acid.
A) 0.0113 g
B) 0.0417 g
C) 24.0 g
D) 11.3 g
E) 0.0799 g
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

98) Formaldehyde, CH_2O, is the simplest aldehyde and is commonly used as an embalming fluid. Calculate the mass of 8.16×10^{24} molecules of formaldehyde.
A) 451 g
B) 407 g
C) 0.451 g
D) 246 g
E) 24.6 g
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

99) How many sodium ions are contained in 99.6 mg of Na_2SO_3? The molar mass of Na_2SO_3 is 126.05 g mol^{-1}.
A) 1.52×10^{27} sodium ions
B) 4.76×10^{20} sodium ions
C) 2.10×10^{21} sodium ions
D) 1.05×10^{21} sodium ions
E) 9.52×10^{20} sodium ions
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

100) How many SO_3^{2-} ions are contained in 99.6 mg of Na_2SO_3? The molar mass of Na_2SO_3 is 126.05 g mol^{-1}.
A) 1.52×10^{27} SO_3^{2-} ions
B) 4.76×10^{20} SO_3^{2-} ions
C) 2.10×10^{21} SO_3^{2-} ions
D) 1.05×10^{21} SO_3^{2-} ions
E) 9.52×10^{20} SO_3^{2-} ions
Answer: B
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

101) Determine the volume of hexane that contains 5.33×10^{22} molecules of hexane. The density of hexane is 0.6548 g mL^{-1} and its molar mass is 86.17 g mol^{-1}.
A) 8.59 mL
B) 13.5 mL
C) 7.40 mL
D) 12.4 mL
E) 11.6 mL
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.7

102) How many molecules of butane are contained in 25.0 mL of butane? The density of butane is 0.6011 g mL^{-1} and the molar mass is 58.12 g mol^{-1}.

A) 2.59×10^{23} molecules butane

B) 1.46×10^{27} molecules butane

C) 6.87×10^{23} molecules butane

D) 1.56×10^{23} molecules butane

E) 7.14×10^{25} molecules butane

Answer: D

Diff: 3 Type: MC Var: 1 Page Ref: 3.7

103) Determine the molecular formula of a compound that has a molar mass of 183.2 g mol^{-1} and an empirical formula of $C_2H_5O_2$.

A) $C_2H_5O_2$

B) $C_6H_{15}O_6$

C) $C_3H_7O_3$

D) $C_4H_{10}O_4$

E) $C_8H_{20}O_8$

Answer: B

Diff: 2 Type: MC Var: 1 Page Ref: 3.8

104) Determine the molecular formula of a compound that has a molar mass of 92.0 g mol^{-1} and an empirical formula of NO_2.

A) N_2O_3

B) N_3O_6

C) N_2O_4

D) NO_2

E) N_2O_5

Answer: C

Diff: 2 Type: MC Var: 1 Page Ref: 3.8

105) Determine the empirical formula for a compound that is 36.86% N and 63.14% O by mass.

A) NO

B) N_2O

C) NO_2

D) N_2O_3

E) NO_3

Answer: D

Diff: 3 Type: MC Var: 1 Page Ref: 3.8

106) Determine the empirical formula for a compound that is found to contain 10.15 mg P and 34.85 mg Cl.
A) P_3Cl
B) PCl
C) PCl_2
D) P_2Cl_3
E) PCl_3
Answer: E
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

107) Determine the empirical formula for a compound that contains C, H, and O. It contains 52.14% C and 34.73% O by mass.
A) C_2H_6O
B) CHO
C) $C_4H_{13}O_2$
D) CH_4O_3
E) CH_3O
Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

108) Determine the molecular formula for a compound that is 70.79% carbon, 8.91% hydrogen, 4.59% nitrogen, and 15.72% oxygen.
A) $C_{18}H_{27}NO_3$
B) $C_{18}H_{27}NO_2$
C) $C_{17}H_{27}NO_3$
D) $C_{17}H_{26}NO_3$
Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

109) Combustion analysis of an unknown hydrocarbon produced the following results: C 60.00%, H 4.48%, O 35.52%. Determine the empirical formula.
A) $C_9H_9O_5$
B) $C_9H_8O_3$
C) $C_8H_9O_4$
D) $C_9H_8O_4$
E) $C_8H_8O_4$
Answer: D
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

110) Combustion analysis of an unknown hydrocarbon produced the following results: C 52.14%, H 13.13%, O 34.73%. Determine the empirical formula.
A) $C_4H_8O_2$
B) $C_4H_{12}O_2$
C) C_2H_6O
D) $C_4H_6O_2$
E) $C_6H_8O_4$
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

111) Combustion analysis of an unknown hydrocarbon produced the following results: C 59.96%, H 13.42%, and O 26.62%. Determine the empirical formula.
A) C_3H_8O
B) $C_8H_8O_2$
C) $C_5H_8O_4$
D) $C_6H_{16}O_4$
E) $C_9H_{16}O_2$
Answer: A
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

112) Determine the molecular formula of a compound that is 49.48% carbon, 5.19% hydrogen, 28.85% nitrogen, and 16.48% oxygen. The molecular weight is 194.19 g mol^{-1}.
A) $C_8H_{12}N_4O_2$
B) $C_4H_5N_2O$
C) $C_8H_{10}N_4O_2$
D) $C_8H_{10}N_2O$
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

113) Combustion analysis of 63.8 mg of a C, H, and O-containing compound produced 145.0 mg of CO_2 and 59.38 mg of H_2O. What is the empirical formula for the compound?
A) C_5H_2O
B) CHO
C) C_3H_6O
D) C_3H_7O
E) C_6HO_3
Answer: C
Diff: 3 Type: MC Var: 1 Page Ref: 3.8

Algorithmic Questions

1) In which set do all elements tend to form anions in binary ionic compounds?
A) C, S, Pb
B) K, Fe, Br
C) Li, Na, K
D) N, O, I
Answer: D
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

2) What type of bonding is found in the compound OF_2?
A) covalent bonding
B) hydrogen bonding
C) ionic bonding
D) metallic bonding
Answer: A
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

3) Which one of the following compounds contains ionic bonds?
A) SrO
B) HBr
C) PBr_3
D) SiO_2
Answer: A
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

4) Which of the following is the correct chemical formula for a molecule of astatine?
A) At
B) At^-
C) At^+
D) At_2
Answer: D
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

5) Which of the compounds, Na H , HS , C_4H_{10}, BrF_3,are ionic compounds?
A) only C_4H_{10}
B) only Na H
C) Na H and HS
D) HS , C_4H_{10}, and BrF_3
Answer: B
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

6) Which of the compounds, C_4H_{10}, $BaCl_2$, $Ni(NO_3)_2$, SF_6, are expected to exist as molecules?
A) only C_4H_{10}
B) C_4H_{10} and SF_6
C) C_4H_{10}, $Ni(NO_3)_2$, and SF_6
D) $BaCl_2$ and $Ni(NO_3)_2$
Answer: B
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

7) Which of the following elements has the LEAST tendency to form an ion?
A) Ca
B) K
C) Kr
D) Se
Answer: C
Diff: 1 Type: MC Var: 5 Page Ref: 3.3

8) In which set do all elements tend to form cations in binary ionic compounds?
A) K, Ga, O
B) Sr, Ni, Hg
C) N, P, Bi
D) O, Br, I
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

9) The solid compound Na_2CO_3 contains
A) Na^+, C^{4+}, and O^{2-} ions.
B) Na^+ and CO_3^{-2} ions.
C) Na_2^+ and CO_3^{-2} ions.
D) Na_2CO_3 molecules.
Answer: B
Diff: 3 Type: MC Var: 4 Page Ref: 3.4

10) What is the chemical formula for iron(III) sulfate?
A) Fe_3S
B) Fe_3SO_4
C) Fe_2S_3
D) $Fe_2(SO_4)_3$
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

11) Rb_2S is named
A) rubidium disulfide.
B) rubidium sulfide.
C) rubidium(II) sulfide.
D) rubidium sulfur.
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

12) What is the chemical formula for calcium hydroxide?
A) CaH_2
B) CaOH
C) $CaOH_2$
D) $Ca(OH)_2$
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

13) What is the chemical formula for magnesium hydride?
A) MgH_2
B) MgOH
C) $MgOH_2$
D) $Mg(OH)_2$
Answer: A
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

14) The chemical formula for lithium peroxide is
A) LiOH.
B) LiO_2.
C) Li_2O.
D) Li_2O_2.
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

15) The compound $Cu(IO_3)_2$, is named
A) copper iodate(II).
B) copper(I) iodate.
C) copper(I) iodate(II).
D) copper(II) iodate.
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

16) The compound CO is named
A) carbonate.
B) carbonite.
C) carbon dioxide.
D) carbon(IV) oxide.
Answer: C
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

17) The chemical formula for calcium nitride is
A) $Ca(NO_3)_2$.
B) $Ca(NO_2)_2$.
C) Ca_3N_2.
D) CaN_2.
Answer: C
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

18) An aqueous solution of H_2S is named
A) hydrosulfuric acid.
B) hydrosulfurous acid.
C) sulfuric acid.
D) sulfurous acid.
Answer: A
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

19) The chemical formula for the selenite ion is
A) Se^-.
B) Se^{2-}.
C) SeO_3^{2-}.
D) SeO_4^{2-}.
Answer: C
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

20) The ion IO_2^- is named
A) iodate ion.
B) iodite ion.
C) iodine dioxide ion.
D) iodine(II) oxide ion.
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

21) The chemical formula for selenous acid is
A) $H_2Se(aq)$.
B) $HSeO_3(aq)$.
C) $HSeO_4(aq)$.
D) $H_2Se_2O_7(aq)$.
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.4

22) What is the charge on the Cr ions in Cr_2O_3?
A) 2-
B) 1+
C) 2+
D) 3+
Answer: D
Diff: 2 Type: MC Var: 5 Page Ref: 3..4

23) What is the molar mass of nitrogen gas?
A) 14.0 g mol^{-1}
B) 28.0 g mol^{-1}
C) 6.02×10^{23} g mol^{-1}
D) 1.20×10^{23} g mol^{-1}
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

24) What is the mass of a single fluorine molecule, F_2?
A) 3.155×10^{-23} g
B) 6.310×10^{-23} g
C) 19.00 g
D) 38.00 g
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

25) What is the mass of 0.500 mol of dichlorodifluoromethane, CCl_2F_2?
A) 4.14×10^{-3} g
B) 60.5 g
C) 121 g
D) 242 g
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

26) How many moles are there in 3.00 g of ethanol, CH_3CH_2OH?
A) 0.00725 mol
B) 0.0652 mol
C) 15.3 mol
D) 138 mol
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

27) What is the mass of 8.50×10^{22} molecules of NH_3?
A) 0.00829 g
B) 0.417 g
C) 2.40 g
D) 121 g
Answer: C
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

28) What is the molar mass of 1-butene if 5.38×10^{16} molecules of 1-butene weigh 5.00 μg?
A) 56.0 g mol^{-1}
B) 178 g mol^{-1}
C) 224 g mol^{-1}
D) 447 g mol^{-1}
Answer: A
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

29) What mass of ethane, CH_6, contains the same number of molecules as 3.00 g of trichlorofluoromethane, CCl_3F?
A) 0.0727 g
B) 0.655 g
C) 1.52 g
D) 13.7 g
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

30) What mass of phosphorus pentafluoride, PF_5, has the same number of fluorine atoms as 25.0 g of oxygen difluoride, OF_2?
A) 0.933 g
B) 10.0 g
C) 23.3 g
D) 146 g
Answer: C
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

31) How many anions are there in 2.50 g of $MgBr_2$?
A) 8.18×10^{21} anions
B) 1.64×10^{22} anions
C) 4.43×10^{25} anions
D) 8.87×10^{25} anions
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

32) Which of the following has the greatest mass?
A) 3.88×10^{22} molecules of O_2
B) 1.00 g of O_2
C) 0.0312 mol of O_2
D) All of the above have the same mass.
Answer: A
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

33) Which of the following has the smallest mass?
A) 3.50×10^{23} molecules of I_2
B) 85.0 g of Cl_2
C) 2.50 mol of F_2
D) 0.050 kg of Br_2
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.6

34) The molecular weight of sucrose ($C_{12}H_{22}O_{11}$), table sugar, is _____ amu (rounded to one decimal place).
A) 330.3
B) 29.0
C) 342.3
D) 45.0
E) 182.0
Answer: C
Diff: 3 Type: MC Var: 9 Page Ref: 3.6

35) A sample of pure lithium nitrate contains 10.1% lithium by mass. What is the % lithium by mass in a sample of pure lithium carbonate that has twice the mass of the first sample?
A) 5.05%
B) 10.1%
C) 20.2%
D) 40.4%
Answer: B
Diff: 2 Type: MC Var: 5 Page Ref: 3.7

36) A sample of pure calcium fluoride with a mass of 15.0 g contains 7.70 g of calcium. How much calcium is contained in 40.0 g of calcium fluoride?
A) 2.27 g
B) 7.70 g
C) 15.0 g
D) 20.5 g
Answer: D
Diff: 2 Type: MC Var: 5 Page Ref: 3.7

37) Which one of the following contains 39% carbon by mass?
A) C_2H_2
B) CH_4
C) CH_3NH_2
D) CO_2
Answer: C
Diff: 2 Type: MC Var: 5 Page Ref: 3.7

38) Determine the mass percent (to the hundredths place) of H in sodium bicarbonate ($NaHCO_3$).
Answer: 1.20
Diff: 2 Type: SA Var: 4 Page Ref: 3.7

39) What is the empirical formula of a compound that is 62.0% C, 10.4% H, and 27.5% O by mass?
A) C_3HO
B) C_6HO_3
C) $C_6H_{12}O_2$
D) $C_5H_{10}O_2$
E) C_3H_6O
Answer: E
Diff: 3 Type: MC Var: 11 Page Ref: 3.7

40) How many Fe(II) ions are there in 20.0 g of $FeSO_4$?
A) 2.19×10^{-25} iron(II) ions
B) 7.92×10^{22} iron(II) ions
C) 4.57×10^{24} iron(II) ions
D) 1.82×10^{27} iron(II) ions
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.7

41) How many oxygen atoms are there in 7.00 g of sodium dichromate, $Na_2Cr_2O_7$?
A) 0.187 oxygen atoms
B) 2.30×10^{21} oxygen atoms
C) 1.60×10^{22} oxygen atoms
D) 1.13×10^{23} oxygen atoms
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.7

42) How many chloride ions are there in 4.50 mol of aluminum chloride?
A) 3.00 chloride ions
B) 13.5 chloride ions
C) 2.71×10^{24} chloride ions
D) 8.13×10^{24} chloride ions
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.7

43) How many cations are there in 10.0 g of sodium phosphate?
A) 3.67×10^{22} cations
B) 1.10×10^{23} cations
C) 9.87×10^{24} cations
D) 2.96×10^{25} cations
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.7

44) What is the empirical formula of a substance that contains 2.64 g of C, 0.887 g of H, and 3.52 g of O?
A) CH_4O
B) $C_2H_4O_2$
C) $C_2H_4O_3$
D) $C_3H_4O_4$
Answer: A
Diff: 3 Type: MC Var: 5 Page Ref: 3.8

45) Which one of the following is NOT an empirical formula?
A) CHO
B) CH_2O
C) C_2H_4O
D) $C_2H_4O_2$
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.8

46) Methane and oxygen react to form carbon dioxide and water. What mass of water is formed if 0.80 g of methane reacts with 3.2 g of oxygen to produce 2.2 g of carbon dioxide?
A) 1.8 g
B) 2.2 g
C) 3.7 g
D) 4.0 g
Answer: A
Diff: 3 Type: MC Var: 5 Page Ref: 3.8

47) Combustion analysis of an unknown compound containing only carbon and hydrogen produced 0.2845 g of CO_2 and 0.1451 g of H_2O. What is the empirical formula of the compound?
A) CH_2
B) C_2H_5
C) C_4H_{10}
D) C_5H_2
Answer: B
Diff: 3 Type: MC Var: 5 Page Ref: 3.8

48) Combustion analysis of 1.200 g of an unknown compound containing carbon, hydrogen, and oxygen produced 2.086 g of CO_2 and 1.134 g of H_2O. What is the empirical formula of the compound?
A) C_2H_5O
B) $C_2H_5O_2$
C) $C_2H_{10}O_3$
D) $C_3H_8O_2$
Answer: D
Diff: 3 Type: MC Var: 5 Page Ref: 3.8

49) A certain alcohol contains only three elements, carbon, hydrogen, and oxygen. Combustion of a 50.00 g sample of the alcohol produced 95.50 g of CO_2 and 58.70 g of H_2O. What is the empirical formula of the alcohol?
Answer: C_2H_6O
Diff: 3 Type: SA Var: 6 Page Ref: 3.8

Matching Questions

Match the following.

A) H(*g*)
B) Ca_2(*s*)
C) I(*s*)
D) Ne_2(*g*)
E) I_2(*s*)
F) Ne(*g*)
G) Cl_2(*g*)
H) Cl(*g*)
I) Ca(*s*)
J) H_2(*g*)
K) O(*g*)
L) O_2(*g*)

1) oxygen
Diff: 1 Type: MA Var: 1 Page Ref: 3.1

2) hydrogen
Diff: 1 Type: MA Var: 1 Page Ref: 3.1

3) chlorine
Diff: 1 Type: MA Var: 1 Page Ref: 3.3

4) neon
Diff: 1 Type: MA Var: 1 Page Ref: 3.3

5) calcium
Diff: 1 Type: MA Var: 1 Page Ref: 3.3

6) iodine
Diff: 1 Type: MA Var: 1 Page Ref: 3.3

Answers: 1) L 2) J 3) G 4) F 5) I 6) E

Short Answer Questions

1) How can one compound contain both ionic and covalent bonds? Give an example.
Answer: An ionic compound that contains a polyatomic ion, such as $NaNO_3$, has both ionic bonds (that hold the sodium and nitrate ions together) as well as covalent bonds (that hold the atoms within the nitrate ion together).
Diff: 1 Type: SA Var: 1 Page Ref: 3.4

2) Describe the difference between a molecular formula and an empirical formula. Give an example.
Answer: A molecular formula is the exact number of each type of atom necessary to build a specific molecule. An empirical formula is simply the smallest whole number ratio between atoms in a compound. For example, C_2H_4 is the molecular formula for ethene. The empirical formula for ethene is CH_2, the smallest whole number ratio between the elements.
Diff: 1 Type: SA Var: 1 Page Ref: 3.4

3) Define empirical formula.
Answer: An empirical formula gives relative numbers of atoms of each element.
Diff: 2 Type: SA Var: 1 Page Ref: 3.4

4) Describe a structural formula
Answer: In a structural formula, lines are used to represent covalent bonds to show how the atoms in the molecule are connected to each other.
Diff: 2 Type: SA Var: 1 Page Ref: 3.4

5) Describe the difference between ionic and molecular compounds. Give an example of each.
Answer: An ionic compound is formed between a metal and a nonmetal (or polyatomic ions) and is held together through the attraction of opposite charges. An example is NaCl. A molecular compound is usually formed between two or more nonmetals and is held together through the sharing of electrons between atoms. An example is CO_2.
Diff: 1 Type: SA Var: 1 Page Ref: 3.4

6) Describe the difference between an atomic element and a molecular element.
Answer: Atomic elements exist in nature with a single atom as their basic unit; molecular elements do not exist in nature with a single atom as their basic unit.
Diff: 1 Type: SA Var: 1 Page Ref: 3.4

7) What is the structure of the covalent compound formed by nitrogen and oxygen? Is this the only possibility? Explain.
Answer: Since nitrogen and oxygen are both nonmetals, they combine by sharing electrons. This can be done in multiple ways. Some possible compounds are N_2O, N_2O_3, NO_2.

Diff: 2 Type: SA Var: 1 Page Ref: 3.4

8) Why aren't prefixes used in naming ionic compounds?
Answer: The charges on the ions dictate how many must be present to form a neutral unit. Molecular compounds do not have such constraints and therefore must use prefixes to denote the number of atoms present.
Diff: 1 Type: SA Var: 1 Page Ref: 3.4

9) Give the name for HNO_2.

Answer: nitrous acid
Diff: 2 Type: SA Var: 1 Page Ref: 3.4

10) Calculate the mass percent composition of oxygen in $Al_2(SO_4)_3$.

Answer: 56.11%
Diff: 2 Type: SA Var: 1 Page Ref: 3.8