Chemistry Final Review

All Concepts as written in Lesson Objective. There will be 25 randomly selected. Write out answer.

50 Matching question will be on final.

25 Multiple Choice will be on Final.

Questions for Chapters 24 and 25 will be dual counted as Final Exam and as the last Test for the Fourth Quarter

Matching

Match each item with the correct statement below.

a. solvation
b. weak electrolyte
c. aqueous solution
d. solvent
e. electrolyte
f. colloid
g. surfactant

____ 1. interferes with hydrogen bonding between water molecules

____ 2. dissolving medium

____ 3. homogeneous mixture of water and dissolved substances

____ 4. Solute ions or molecules are surrounded by solvent molecules.

____ 5. compound that will conduct current in the liquid state or in aqueous solution

____ 6. compound that ionizes incompletely in aqueous solution

____ 7. mixture in which particle size averages between 1 nm and 1000 nm

Match each item with the correct statement below.

a. dispersed phase
b. surface tension
c. Brownian motion
d. dispersion medium
e. Tyndall effect
f. suspension
g. solute
h. emulsion

____ 8. inward force tending to minimize surface area of a liquid

____ 9. dissolved particle

____ 10. mixture in which particle size averages greater that 1000 nm in diameter

____ 11. Colloidal particles spread throughout a suspension.

____ 12. phenomenon observed when beam of light passes through a colloid

____ 13. chaotic movement of colloidal particles

____ 14. colloid of a liquid in a liquid

Match each item with the correct statement below.

a. Henry's law
d. supersaturated solution

b. immiscible
c. saturated solution
e. concentration

____ 15. describes liquids that are insoluble in one another

____ 16. solution containing maximum amount of solute

____ 17. solution containing more solute than can theoretically dissolve at a given temperature

____ 18. At a given temperature, the solubility of a gas in a liquid is directly proportional to the pressure of the gas above the liquid.

____ 19. measure of the amount of solute dissolved in a specified quantity of solvent

Match each item with the correct statement below.

a. boiling point elevation
b. molality
c. mole fraction
d. molarity
e. freezing point depression

____ 20. number of moles of solute dissolved in 1 L of solution

____ 21. a colligative property related to the fact that ice will form at higher temperatures in the Great Lakes than in the ocean

____ 22. a colligative property related to a decrease in the vapor pressure of a solution

____ 23. number of moles of solute dissolved in 1 kg of solvent

____ 24. ratio of moles of solute in solution to total number of moles of both solvent and solute

Match each item with the correct statement below.

a. calorimeter
b. calorie
c. joule
d. enthalpy
e. specific heat
f. heat capacity

____ 25. quantity of heat needed to raise the temperature of 1 g of water by 1°C

____ 26. SI unit of energy

____ 27. quantity of heat needed to change the temperature of 1 g of a substance by 1°C

____ 28. quantity of heat needed to change the temperature of an object by 1°C

____ 29. device used to measure the heat absorbed or released during a chemical or physical process

____ 30. heat content of a system

Match each item with the correct statement below.

a. heat of reaction
b. heat of formation
c. Hess's law of heat summation
d. heat of fusion
e. heat of solution

____ 31. the enthalpy change for a chemical reaction

____ 32. the enthalpy change caused by dissolving a substance

____ 33. the energy required to melt a solid at its melting point

____ 34. the change in enthalpy that accompanies making a compound from its elements

____ 35. if you add two or more thermochemical equations to give a final equation, you can also add the heats of reaction to give the final heat of reaction

Match each item with the correct statement below.

a. activated complex
b. reaction rate
c. inhibitor
d. activation energy
e. free energy

____ 36. the minimum energy colliding particles must have in order to react

____ 37. arrangement of atoms at the peak of an energy barrier

____ 38. the number of atoms, ions, or molecules that react in a given time to form products

____ 39. a substance that interferes with a catalyst

____ 40. energy available to do work

Match each item with the correct statement below.

a. spontaneous reaction
b. entropy
c. chemical equilibrium
d. reaction mechanism
e. elementary reaction

____ 41. when the forward and reverse reactions take place at the same rate

____ 42. a reaction that releases free energy

____ 43. the measure of disorder

____ 44. Reactants are converted to products in a single step.

____ 45. includes all elementary reactions of a complex reaction

Match each item with the correct statement below.

a. acid dissociation constant
b. diprotic acid
c. hydrogen-ion donor
d. Lewis acid
e. pH

____ 46. can accept an electron pair

____ 47. acid with two ionizable protons

____ 48. Brønsted-Lowry acid

____ 49. negative logarithm of the hydrogen ion concentration

____ 50. ratio of the concentration of the dissociated to the undissociated form

Match each item with the correct statement below.

a. salt hydrolysis
b. end point
c. titration
d. equivalence point
e. buffer capacity

____ 51. process of adding a known amount of solution of known concentration to determine the concentration of another solution

____ 52. The number of moles of hydrogen ions equals the number of moles of hydroxide ions.

____ 53. Indicator changes color.

____ 54. Cations or anions of a dissociated salt remove hydrogen ions from or donate hydrogen ions to water.

____ 55. the amount of acid or base that can be added to a buffer solution before a significant change in pH occurs

Match each item with the correct statement below.

a. oxidation number
b. half-reaction
c. oxidizing agent
d. reducing agent

____ 56. substance that accepts electrons

____ 57. substance that donates electrons

____ 58. integer related to the number of electrons under an atom's control

____ 59. reaction showing either the reduction or the oxidation reaction

Match each item with the correct statement below.

a. Choose coefficients to make the change in oxidation number equal to 0.
b. Make the electron changes of both half-reactions equal.
c. Assign oxidation numbers to all the atoms.
d. Write the equation showing ions separately.

____ 60. the first step in balancing a redox reaction by the oxidation-number-change method

____ 61. the next-to-the-last step in balancing a redox reaction by the oxidation-number-change method

____ 62. the first step in balancing a redox reaction by the half-reaction method

____ 63. the next-to-the-last step in balancing a redox reaction by the half-reaction method

Match each item with the correct statement below.

a. anode
b. battery
c. fuel cell
d. half-cell
e. cathode

____ 64. the electrode at which oxidation occurs

____ 65. one part of a voltaic cell in which either oxidation or reduction occurs

____ 66. the electrode at which reduction occurs

____ 67. a group of cells that are connected together

____ 68. a voltaic cell in which a fuel substance undergoes oxidation and from which electrical energy is obtained continuously

Match each item with the correct statement below.

a. electrode
b. electrolysis
c. salt bridge
d. voltaic cell
e. dry cell

____ 69. a tube containing a conducting solution

____ 70. a conductor in a circuit that carries electrons to or from a substance other than a metal

____ 71. an electrochemical cell that is used to convert chemical energy to electrical energy

____ 72. a voltaic cell in which the electrolyte is a paste

____ 73. a process in which electrical energy is used to bring about a chemical change

Match each item with the correct statement below.

a. substituent
b. constitutional isomers
c. geometric isomers
d. stereoisomers
e. asymmetric carbon
f. *trans* configuration
g. *cis* configuration

____ 74. atom or group of atoms that can take the place of a hydrogen in a parent hydrocarbon molecule

____ 75. compounds that have the same molecular formula, but the atoms are joined in a different order

____ 76. arrangement in which substituted groups are on the same side of a double bond

____ 77. molecules in which atoms are joined in the same order but differ in the arrangements of their atoms in space

____ 78. arrangement in which substituted groups are on opposite sides of a double bond

____ 79. compounds that differ in the orientation of groups around a double bond

____ 80. carbon atom to which four different atoms or groups are attached

Match each item with the correct statement below.

a. condensed structural formula
b. homologous series
c. unsaturated compound
d. saturated compound
e. complete structural formula

____ 81. group of compounds in which there is a constant increment of change in molecular structure from one compound in the series to the next

____ 82. formula showing all the atoms and bonds in a molecule

____ 83. structural formula in which some bonds and/or atoms are left out

____ 84. organic compound that contains the maximum number of hydrogens per carbon atom

____ 85. organic compound that contains at least one double or triple carbon-carbon bond

Match each item with the correct statement below.

a. aromatic compound
b. aliphatic hydrocarbon
c. anthracite coal
d. lignite
e. bituminous coal

____ 86. any straight-chain or branched-chain alkane, alkene, or alkyne

____ 87. any hydrocarbon compound in which a ring has bonding similar to benzene

____ 88. hard coal, having a carbon content of over 80%

____ 89. brown coal, having a carbon content of approximately 50%

____ 90. soft coal, having a carbon content of 70–80%

Match each item with the correct statement below.

a. functional group
b. hydroxyl group
c. carbonyl group
d. carboxyl group
e. ether
f. halogen
g. fatty acids
h. alcohol
i. amine

____ 91. a specific arrangement of atoms in an organic compound that is capable of characteristic chemical reactions

____ 92. reacts with an alkane by a substitution reaction

____ 93. the OH functional group in alcohols

____ 94. an organic compound containing a nitrogen atom

____ 95. a compound in which oxygen is bonded to two carbon atoms

____ 96. a carbon atom and an oxygen atom joined by a double bond

____ 97. a carbonyl group attached to a hydroxyl group

____ 98. carboxylic acids with long hydrocarbon chains

____ 99. reacts with a carboxylic acid to form an ester

Match each item with the correct statement below.

a. substitution reaction
b. addition reaction
c. hydration reaction
d. hydrogenation reaction
e. dehydrogenation reaction

____ 100. a reaction in which an atom or group of atoms replaces another atom or group of atoms

____ 101. a reaction in which a substance is added at the double or triple bond of an alkene or alkyne

____ 102. a reaction involving the addition of hydrogen to a carbon—carbon double bond to produce an alkane

____ 103. a reaction involving the addition of water to an alkene

____ 104. a reaction involving the loss of hydrogen

Match each item with the correct statement below.

a. peptide
b. monosaccharide
c. protein
d. nucleotides
e. disaccharide
f. polysaccharide
g. amino acid
h. nucleic acid

____ 105. a simple carbohydrate molecule

____ 106. polymers produced by the linkage of monosaccharide monomers

____ 107. a sugar that forms from two monosaccharides

____ 108. any compound that contains an amino group and a carboxyl group in the same molecule

____ 109. a peptide with more than 100 amino acids

____ 110. any combination of amino acids in which the amino group of one acid is united with the carboxyl group of another through an amide bond

____ 111. nitrogen-containing polymers found primarily in cell nuclei

____ 112. monomers that make up DNA and RNA

Match each item with the correct statement below.

a. positron
b. alpha particle
c. beta particle
d. radioactivity
e. gamma radiation
f. transmutation

____ 113. spontaneous emission from the nucleus of an atom

____ 114. emitted helium nucleus

____ 115. energetic electron from decomposed neutron

____ 116. high-energy photons emitted by a radioisotope

____ 117. particle of charge +1 and mass equal to that of an electron

____ 118. conversion of an atom of one element to an atom of another element

Match each item with the correct statement below.

a. fission
b. fusion
c. Geiger counter
d. radioisotope
e. scintillation counter
f. neutron absorption
g. neutron moderation

____ 119. atom with unstable nucleus

____ 120. combination of two nuclei to form a nucleus of greater mass

____ 121. process that decreases the number of slow-moving neutrons

____ 122. splitting of nucleus into smaller fragments

____ 123. process that slows down neutrons so a reactor fuel can capture them to continue a chain reaction

____ 124. radiation detector that makes use of a phosphor-coated surface

____ 125. radiation detector that makes use of a gas-filled metal tube

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 126. How much heat is absorbed when 6.30 g of water melts?

a. 21 kJ
b. 0.210 kJ
c. 2.10 kJ
d. 21.0 J

____ 127. An electric current can be best conducted by ____.

a. methane gas
b. a sugar solution

c. a salt solution
d. rubbing alcohol

____ 128. The solute in a colloidal suspension is designated as the _____.
a. dissolving phase
b. dispersed phase
c. dispensing phase
d. dispersion medium

____ 129. If adding of a crystal of the solute to an aqueous solution causes many particles to come out of the solution, the original solution was ____.
a. unsaturated
b. saturated
c. an emulsion
d. supersaturated

____ 130. To increase the solubility of a gas at constant temperature from 1.20 g/L, at 1.4 atm, to 2.3 g/L, the pressure would have to be increased to ____.
a. 0.37 atm
b. 0.7 atm
c. 1.37 atm
d. 2.7 atm

____ 131. What is the molarity of a solution containing 7.0 moles of solute in 569 mL of solution?
a. 81*M*
b. 0.081*M*
c. 12*M*
d. 4.0*M*

____ 132. What is the molarity of a solution containing 56 grams of solute in 959 mL of solution? (molar mass of solute = 26 g/mol)
a. 1.5*M*
b. 2.2*M*
c. 2.1*M*
d. 0.0022*M*

____ 133. The volume of 6.00*M* HCl needed to make 319 mL of 6.80*M* HCl is ____.
a. 0.128 mL
b. 7.8 mL
c. 281 mL
d. 362 mL

____ 134. The volume of alcohol present in 620 mL of a 40.0% (v/v) solution of alcohol is ____.
a. 372 mL
b. 40.0 mL
c. 248 mL
d. 580 mL

____ 135. The molality of a solution containing 8.1 moles of solute in 4847 g of solvent is ____.
a. 39*m*
b. 1.7*m*
c. 0.17*m*
d. 598*m*

____ 136. The freezing point of a solution that contains 0.550 moles of NaI in 615 g of water is ____. (K_f = 1.86°C/*m*; molar mass of water = 18 g)
a. 1.66°C
b. –1.66°C
c. 3.33°C
d. –3.33°C

____ 137. A process that absorbs heat is a(n) ____.
a. endothermic process
b. polythermic process
c. exothermic process
d. ectothermic process

____ 138. If a reaction rate decreases by a factor of one-ninth when a reactant concentration is decreased by one-third, what is the order of the reaction with respect to that reactant?
a. fourth
b. third
c. second
d. first

____ 139. In which of the following types of reaction are electrons gained?
a. decomposition
b. oxidation
c. neutralization
d. reduction

____ 140. What change occurs during oxidation?
a. gain of hydrogen
b. loss of oxygen
c. gain of electrons
d. loss of electrons

____ 141. $Cu \rightarrow Cu^{2+} + 2\ e^-$
The equation above represents a reaction that can be classified as ____.
a. redox
b. hydrolysis
c. reduction
d. oxidation

____ 142. The oxidation number of bromine in bromine gas is ____.
a. +1
b. –1
c. 0
d. –2

____ 143. Which of these metal's ions are most easily reduced ?
a. iron
b. mercury
c. aluminum
d. potassium

____ 144. In a zinc-copper cell, $Zn \mid Zn^{2+}(1M) \parallel Cu^{2+}(1M) \mid Cu$, of which material is the negative made?

a. $Cu^{2+}(aq)$
b. Cu(s)
c. Zn(s)
d. $Zn^{2+}(aq)$

____ 145. What substance is reduced in a lead storage battery?
a. lead(IV) oxide
b. sulfate ion
c. sulfuric acid
d. lead

____ 146. The substance reduced in a hydrogen-oxygen fuel cell is ____.
a. water
b. hydrogen
c. hydrogen peroxide
d. oxygen

____ 147. What is the standard cell potential of a cell made of theoretical metals Ma/Ma^{2+} and Mb/Mb^{2+} if the reduction potentials are –0.14 V and –0.41 V, respectively?
a. –0.27 V
b. +0.27 V
c. –0.55 V
d. +0.55 V

____ 148. The gas produced at the cathode in the electrolysis of brine is ____.
a. hydroxide
b. chlorines
c. oxygen
d. hydrogen

____ 149. In which of the following compounds does rotation occur around all covalent bonds between carbons?
a. octene
b. octyne
c. octane
d. all of the above

____ 150. A saturated straight-chain hydrocarbon with two carbons is ____.
a. ethene
b. decane
c. propane
d. ethane

____ 151. The general name for hydrocarbons with at least one triple covalent bond is ____.
a. alkenes
b. alkyls
c. alkanes
d. alkynes

____ 152. In the *cis* configuration, the methyl groups are placed ____.
a. in between the double bonds
b. on opposite sides of the double bond
c. to the left of the double bond

d. on the same side of the double bond

____ 153. Based on your knowledge of intermolecular forces, which of the following would you expect to have the highest boiling point?
a. hexanol
b. hexane
c. hexanal
d. hexanone

____ 154. The IUPAC name for a carboxylic acid with two carbons in a straight chain would be ____.
a. ethanalic acid
b. dimethylmethanoic acid
c. methacarboxylic acid
d. ethanoic acid

____ 155. If a primary alcohol is oxidized, the type of molecule it becomes is called a(n) ____.
a. carboxylic acid
b. ketone
c. alcohol
d. aldehyde

____ 156. Which of the following compounds will produce the least energy when completely oxidized?
a. hexanoic acid
b. hexanol
c. hexane
d. hexanal

____ 157. The two products of photosynthesis are ____.
a. heat and oxygen
b. heat and light
c. glucose and oxygen
d. carbon dioxide and water

____ 158. The repeating unit of cellulose is ____.
a. glucose
b. lactose
c. fructose
d. sucrose

____ 159. The reaction responsible for producing the heat that maintains the temperature of your body is ____.
a. metabolism
b. catabolism
c. anabolism
d. photosynthesis

____ 160. The charge on a gamma ray is ____.
a. +2
b. +1
c. 0
d. −2

____ 161. The least penetrating form of radiation is ____.
a. beta radiation

b. gamma radiation
c. alpha radiation
d. X rays

____ 162. When radium-226 (atomic number 88) decays by emitting an alpha particle, it becomes ____.
a. polonium-222
b. polonium-224
c. radium-222
d. radon-222

____ 163. A reaction that results in the combining of smaller atomic nuclei is ____.
a. chemical
b. fission
c. fusion
d. ionization

Short Answer

164. How many grams of copper sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$) would you heat to produce 29.8 g of water?

165. How many joules are equivalent to 215 kilocalories? (1 cal = 4.184 J)

166. How much heat is required to raise the temperature of 5.5×10^2 g of aluminum by 10°C? (specific heat of aluminum = 0.21 $\frac{\text{cal}}{\text{g°C}}$)

167. If you supply 36 kJ of heat, how many moles of ice at 0°C can be melted, heated to its boiling point, and completely vaporized? (ΔH_{vap} = 40.5 kJ/mol; ΔH_{fus} = 6.0 kJ/mol; specific heat$_{water}$ = 0.0753 $\frac{\text{kJ}}{\text{mol °C}}$)

168. What is the equilibrium constant for the following reaction?
$3A + 2B \rightleftharpoons 2C$

169. Calculate the value of K_{eq} for the following reaction at equilibrium.
$2NClO(g) \rightleftharpoons 2NO(g) + Cl_2(g)$
An analysis of the equilibrium mixture in a 1-L flask gives the following results: NClO, 1.6 mol; NO, 6.4 mol; Cl_2, 0.49 mol

Chemistry Final Review
Answer Section

MATCHING

1. ANS: G PTS: 1 DIF: L1 REF: p. 490
   OBJ: 15.1.1 Identify the factor that causes the high surface tension, low vapor pressure, and high boiling point of water. STA: PRS.5.2.2 | PI.5.2.m BLM: knowledge
2. ANS: D PTS: 1 DIF: L1 REF: p. 494
   OBJ: 15.2.1 Identify the types of substances that dissolve most readily in water.
   STA: PRS.3.1.26 | PI.3.1.oo | PI.5.2.h BLM: knowledge
3. ANS: C PTS: 1 DIF: L1 REF: p. 494
   OBJ: 15.2.1 Identify the types of substances that dissolve most readily in water.
   STA: PRS.3.1.26 | PI.3.1.oo | PI.5.2.h BLM: knowledge
4. ANS: A PTS: 1 DIF: L1 REF: p. 495
   OBJ: 15.2.1 Identify the types of substances that dissolve most readily in water.
   STA: PRS.3.1.26 | PI.3.1.oo | PI.5.2.h BLM: knowledge
5. ANS: E PTS: 1 DIF: L1 REF: p. 496
   OBJ: 15.2.2 Explain why all ionic compounds are electrolytes. STA: PI.3.1.rr
   BLM: knowledge
6. ANS: B PTS: 1 DIF: L1 REF: p. 497
   OBJ: 15.2.2 Explain why all ionic compounds are electrolytes. STA: PI.3.1.rr
   BLM: knowledge
7. ANS: F PTS: 1 DIF: L1 REF: p. 505
   OBJ: 15.3.2 Identify how to distinguish a colloid from a suspension and a solution.
   STA: PRS.3.1.26 BLM: knowledge

8. ANS: B PTS: 1 DIF: L1 REF: p. 490
   OBJ: 15.1.1 Identify the factor that causes the high surface tension, low vapor pressure, and high boiling point of water. STA: PRS.5.2.2 | PI.5.2.m BLM: knowledge
9. ANS: G PTS: 1 DIF: L1 REF: p. 494
   OBJ: 15.2.1 Identify the types of substances that dissolve most readily in water.
   STA: PRS.3.1.26 | PI.3.1.oo | PI.5.2.h BLM: knowledge
10. ANS: F PTS: 1 DIF: L1 REF: p. 504
    OBJ: 15.3.1 Distinguish between a suspension and a solution. STA: PRS.3.1.26
    BLM: knowledge
11. ANS: A PTS: 1 DIF: L1 REF: p. 505
    OBJ: 15.3.2 Identify how to distinguish a colloid from a suspension and a solution.
    STA: PRS.3.1.26 BLM: knowledge
12. ANS: E PTS: 1 DIF: L1 REF: p. 506
    OBJ: 15.3.2 Identify how to distinguish a colloid from a suspension and a solution.
    STA: PRS.3.1.26 BLM: knowledge
13. ANS: C PTS: 1 DIF: L1 REF: p. 506
    OBJ: 15.3.2 Identify how to distinguish a colloid from a suspension and a solution.
    STA: PRS.3.1.26 BLM: knowledge
14. ANS: H PTS: 1 DIF: L1 REF: p. 507
    OBJ: 15.3.2 Identify how to distinguish a colloid from a suspension and a solution.
    STA: PRS.3.1.26 BLM: knowledge

15. ANS: B PTS: 1 DIF: L1 REF: p. 521
OBJ: 16.1.2 Describe the equilibrium in a saturated solution. STA: PRS.3.4.7
BLM: knowledge
16. ANS: C PTS: 1 DIF: L1 REF: p. 521
OBJ: 16.1.2 Describe the equilibrium in a saturated solution. STA: PRS.3.4.7
BLM: knowledge
17. ANS: D PTS: 1 DIF: L1 REF: p. 522
OBJ: 16.1.3 Describe the factors that affect the solubility of a substance.
STA: PRS.3.1.25 | PRS.3.1.28 | PI.3.1.oo BLM: knowledge
18. ANS: A PTS: 1 DIF: L1 REF: p. 523
OBJ: 16.1.3 Describe the factors that affect the solubility of a substance.
STA: PRS.3.1.25 | PRS.3.1.28 | PI.3.1.oo BLM: knowledge
19. ANS: E PTS: 1 DIF: L1 REF: p. 525
OBJ: 16.2.1 Calculate the molarity of a solution. STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp
BLM: knowledge

20. ANS: D PTS: 1 DIF: L1 REF: p. 525
OBJ: 16.2.1 Calculate the molarity of a solution. STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp
BLM: knowledge
21. ANS: E PTS: 1 DIF: L1 REF: p. 534 | p. 536
OBJ: 16.3.1 Explain how colligative properties can be explained on a particle basis.
STA: PRS.5.2.3 BLM: knowledge
22. ANS: A PTS: 1 DIF: L1 REF: p. 534 | p. 537
OBJ: 16.3.1 Explain how colligative properties can be explained on a particle basis.
STA: PRS.5.2.3 BLM: knowledge
23. ANS: B PTS: 1 DIF: L1 REF: p. 538
OBJ: 16.4.1 Identify the two ways of expressing the ratio of solute to solvent in a solution.
STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp BLM: knowledge
24. ANS: C PTS: 1 DIF: L1 REF: p. 540
OBJ: 16.4.1 Identify the two ways of expressing the ratio of solute to solvent in a solution.
STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp BLM: knowledge

25. ANS: B PTS: 1 DIF: L1 REF: p. 558
OBJ: 17.1.1 Explain the ways in which energy changes can occur.
STA: PRS.4.2.1 | PI.4.1.a | PI.4.2.a BLM: knowledge
26. ANS: C PTS: 1 DIF: L1 REF: p. 559
OBJ: 17.1.1 Explain the ways in which energy changes can occur.
STA: PRS.4.2.1 | PI.4.1.a | PI.4.2.a BLM: knowledge
27. ANS: E PTS: 1 DIF: L1 REF: p. 559
OBJ: 17.1.3 Identify two factors on which the heat capacity of an object depends.
STA: M1.1.2.b | PRS.4.2.4 BLM: knowledge
28. ANS: F PTS: 1 DIF: L1 REF: p. 559
OBJ: 17.1.3 Identify two factors on which the heat capacity of an object depends.
STA: M1.1.2.b | PRS.4.2.4 BLM: knowledge
29. ANS: A PTS: 1 DIF: L1 REF: p. 562
OBJ: 17.2.1 Describe how you measure the change in enthalpy of a reaction.
STA: M1.1.2.b | PRS.4.2.4 BLM: knowledge
30. ANS: D PTS: 1 DIF: L1 REF: p. 562
OBJ: 17.2.1 Describe how you measure the change in enthalpy of a reaction.
STA: M1.1.2.b | PRS.4.2.4 BLM: knowledge

31. ANS: A PTS: 1 DIF: L1 REF: p. 565
OBJ: 17.2.2 Describe how you express the enthalpy change for a reaction in a chemical equation.
STA: PRS.4.1.2 | PRS.4.2.4 | PI.4.1.d BLM: knowledge

32. ANS: E PTS: 1 DIF: L1 REF: p. 574
OBJ: 17.3.3 Describe thermochemical changes that occur when a solution forms.
STA: PRS.4.2.3 | PRS.4.2.4 BLM: knowledge

33. ANS: D PTS: 1 DIF: L1 REF: p. 569
OBJ: 17.3.1 Compare the quantity of heat absorbed by a melting solid to the quantity of heat released when the liquid solidifies. STA: PRS.4.2.3 | PRS.4.2.4 BLM: knowledge

34. ANS: B PTS: 1 DIF: L1 REF: p. 530
OBJ: 17.4.1 Identify two ways that you can determine the heat of reaction when it cannot be directly measured. STA: PRS.4.2.3 | PRS.4.2.4 BLM: knowledge

35. ANS: C PTS: 1 DIF: L1 REF: p. 578
OBJ: 17.4.1 Identify two ways that you can determine the heat of reaction when it cannot be directly measured. STA: PRS.4.2.3 | PRS.4.2.4 BLM: knowledge

36. ANS: D PTS: 1 DIF: L1 REF: p. 596
OBJ: 18.1.1 Describe how to express the rate of a chemical reaction.
STA: ES4.1.1 | PRS.3.4.6 | PRS.4.1.2 BLM: knowledge

37. ANS: A PTS: 1 DIF: L1 REF: p. 596
OBJ: 18.1.1 Describe how to express the rate of a chemical reaction.
STA: ES4.1.1 | PRS.3.4.6 | PRS.4.1.2 BLM: knowledge

38. ANS: B PTS: 1 DIF: L1 REF: p. 595
OBJ: 18.1.1 Describe how to express the rate of a chemical reaction.
STA: ES4.1.1 | PRS.3.4.6 | PRS.4.1.2 BLM: knowledge

39. ANS: C PTS: 1 DIF: L1 REF: p. 601
OBJ: 18.1.2 Identify four factors that influence the rate of a chemical reaction.
STA: PRS.3.4.6 | PI.3.4.d | PI.3.4.f BLM: knowledge

40. ANS: E PTS: 1 DIF: L1 REF: p. 627
OBJ: 18.5.1 Identify the two characteristics of spontaneous reactions.
STA: PRS.3.3.2 | PI.3.2.b | PI.3.3.a BLM: knowledge

41. ANS: C PTS: 1 DIF: L1 REF: p. 610
OBJ: 18.3.1 Describe what happens at the molecular level in a chemical system at equilibrium.
STA: ES4.2.1 | PRS.3.4.4 | PI.3.4.i BLM: knowledge

42. ANS: A PTS: 1 DIF: L1 REF: p. 628
OBJ: 18.5.1 Identify the two characteristics of spontaneous reactions.
STA: PRS.3.3.2 | PI.3.2.b | PI.3.3.a BLM: knowledge

43. ANS: B PTS: 1 DIF: L1 REF: p. 630
OBJ: 18.5.2 Identify the part entropy plays in a chemical reaction.
STA: PRS.3.1.23 | PI.3.1.ll | PI.3.1.mm BLM: knowledge

44. ANS: E PTS: 1 DIF: L1 REF: p. 607
OBJ: 18.2.2 Describe how most reactions progress from start to finish.
STA: PC5.1 | PRS.3.4.6 | PI.3.4.f BLM: knowledge

45. ANS: D PTS: 1 DIF: L1 REF: p. 607
OBJ: 18.2.2 Describe how most reactions progress from start to finish.
STA: PC5.1 | PRS.3.4.6 | PI.3.4.f BLM: knowledge

46. ANS: D PTS: 1 DIF: L1 REF: p. 651

OBJ: 19.1.3 Define an acid and a base according to Lewis. STA: PRS.3.1.8 | PI.3.1.yy | PI.5.2.d
BLM: knowledge

47. ANS: B PTS: 1 DIF: L1 REF: p. 647
OBJ: 19.1.1 Define an acid and a base according to Arrhenius. STA: PRS.3.1.31 | PI.3.1.uu | PI.3.1.vv
BLM: knowledge

48. ANS: C PTS: 1 DIF: L1 REF: p. 649
OBJ: 19.1.2 Distinguish an acid from a base in the Bronsted-Lowry theory.
STA: PI.3.1.oo | PI.3.1.yy BLM: knowledge

49. ANS: E PTS: 1 DIF: L1 REF: p. 656
OBJ: 19.2.2 Classify a solution as neutral, acidic, or basic using pH.
STA: PRS.3.1.32 | PI.3.1.ss | PI.3.1.tt BLM: knowledge

50. ANS: A PTS: 1 DIF: L1 REF: p. 667
OBJ: 19.3.1 Identify the property used to classify acids and bases as strong or weak.
STA: PRS.3.1.32 | PI.3.1.ss | PI.3.1.yy BLM: knowledge

51. ANS: C PTS: 1 DIF: L1 REF: p. 673
OBJ: 19.4.2 Identify the point in a titration when neutralization will occur.
STA: PRS.3.1.29 | PRS.3.1.35 | PI.3.1.zz BLM: knowledge

52. ANS: D PTS: 1 DIF: L1 REF: p. 674
OBJ: 19.4.2 Identify the point in a titration when neutralization will occur.
STA: PRS.3.1.29 | PRS.3.1.35 | PI.3.1.zz BLM: knowledge

53. ANS: B PTS: 1 DIF: L1 REF: p. 674
OBJ: 19.4.2 Identify the point in a titration when neutralization will occur.
STA: PRS.3.1.29 | PRS.3.1.35 | PI.3.1.zz BLM: knowledge

54. ANS: A PTS: 1 DIF: L1 REF: p. 676
OBJ: 19.5.1 Describe when a solution of a salt is acidic or basic.
STA: PRS.3.1.35 | PI.3.1.yy | PI.3.1.zz BLM: knowledge

55. ANS: E PTS: 1 DIF: L1 REF: p. 678
OBJ: 19.5.2 Identify the components of a buffer. STA: PRS.3.1.32 | PI.3.1.ss | PI.3.1.yy
BLM: knowledge

56. ANS: C PTS: 1 DIF: L1 REF: p. 695
OBJ: 20.1.1 Describe what happens to a substance that undergoes oxidation and a substance that undergoes reduction. STA: PRS.3.2.6 | PI.3.2.e | PI.3.2.g BLM: knowledge

57. ANS: D PTS: 1 DIF: L1 REF: p. 695
OBJ: 20.1.1 Describe what happens to a substance that undergoes oxidation and a substance that undergoes reduction. STA: PRS.3.2.6 | PI.3.2.e | PI.3.2.g BLM: knowledge

58. ANS: A PTS: 1 DIF: L1 REF: p. 701
OBJ: 20.2.1 State the general rule for assigning oxidation numbers.
STA: M1.1.2.b | PI.3.2.i BLM: knowledge

59. ANS: B PTS: 1 DIF: L1 REF: p. 712
OBJ: 20.3.2 Balance a redox equation using the oxidation-number-change method.
STA: PRS.3.2.6 | PI.3.2.f | PI.3.2.h BLM: knowledge

60. ANS: C PTS: 1 DIF: L1 REF: p. 710
OBJ: 20.3.2 Balance a redox equation using the oxidation-number-change method.
STA: PRS.3.2.6 | PI.3.2.f | PI.3.2.h BLM: knowledge

61. ANS: A PTS: 1 DIF: L1 REF: p. 710
OBJ: 20.3.2 Balance a redox equation using the oxidation-number-change method.
STA: PRS.3.2.6 | PI.3.2.f | PI.3.2.h BLM: knowledge

62. ANS: D PTS: 1 DIF: L1 REF: p. 712
OBJ: 20.3.2 Balance a redox equation using the oxidation-number-change method.
STA: PRS.3.2.6 | PI.3.2.f | PI.3.2.h BLM: knowledge
63. ANS: B PTS: 1 DIF: L1 REF: p. 712
OBJ: 20.3.2 Balance a redox equation using the oxidation-number-change method.
STA: PRS.3.2.6 | PI.3.2.f | PI.3.2.h BLM: knowledge

64. ANS: A PTS: 1 DIF: L1 REF: p. 730
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: knowledge
65. ANS: D PTS: 1 DIF: L1 REF: p. 730
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: knowledge
66. ANS: E PTS: 1 DIF: L1 REF: p. 730
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: knowledge
67. ANS: B PTS: 1 DIF: L1 REF: p. 733
OBJ: 21.1.3 Identify the current applications that use electrochemical processes to produce electrical energy.
STA: PI.3.2.j | PI.3.2.k BLM: knowledge
68. ANS: C PTS: 1 DIF: L1 REF: p. 734
OBJ: 21.1.3 Identify the current applications that use electrochemical processes to produce electrical energy.
STA: PI.3.2.j | PI.3.2.k BLM: knowledge

69. ANS: C PTS: 1 DIF: L1 REF: p. 730
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: knowledge
70. ANS: A PTS: 1 DIF: L1 REF: p. 730
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: knowledge
71. ANS: D PTS: 1 DIF: L1 REF: p. 731
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: knowledge
72. ANS: E PTS: 1 DIF: L1 REF: p. 732
OBJ: 21.1.3 Identify the current applications that use electrochemical processes to produce electrical energy.
STA: PI.3.2.j | PI.3.2.k BLM: knowledge
73. ANS: B PTS: 1 DIF: L1 REF: p. 746
OBJ: 21.3.2 Describe some applications that use electrolytic cells.
STA: PRS.3.2.8 | PI.3.2.j | PI.3.2.l BLM: knowledge

74. ANS: A PTS: 1 DIF: L1 REF: p. 767
OBJ: 22.1.2 Identify two possible arrangements of carbon atoms in an alkane.
STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg BLM: knowledge
75. ANS: B PTS: 1 DIF: L1 REF: p. 775
OBJ: 22.3.1 Explain how the properties of constitutional isomers differ.
STA: PRS.5.2.2 | PI.3.1.ii | PI.5.2.n BLM: knowledge
76. ANS: G PTS: 1 DIF: L1 REF: p. 776
OBJ: 22.3.2 Identify the two types of stereoisomers. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.ii
BLM: knowledge
77. ANS: D PTS: 1 DIF: L1 REF: p. 776
OBJ: 22.3.2 Identify the two types of stereoisomers. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.ii

BLM: knowledge

78. ANS: F PTS: 1 DIF: L1 REF: p. 776
OBJ: 22.3.2 Identify the two types of stereoisomers. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.ii
BLM: knowledge

79. ANS: C PTS: 1 DIF: L1 REF: p. 776
OBJ: 22.3.2 Identify the two types of stereoisomers. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.ii
BLM: knowledge

80. ANS: E PTS: 1 DIF: L1 REF: p. 776
OBJ: 22.3.2 Identify the two types of stereoisomers. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.ii
BLM: knowledge

81. ANS: B PTS: 1 DIF: L1 REF: p. 765
OBJ: 22.1.1 Explain why a carbon atom forms four covalent bonds.
STA: PRS.3.1.20 | PI.3.1.ff | PI.3.1.gg BLM: knowledge

82. ANS: E PTS: 1 DIF: L1 REF: p. 766
OBJ: 22.1.2 Identify two possible arrangements of carbon atoms in an alkane.
STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg BLM: knowledge

83. ANS: A PTS: 1 DIF: L1 REF: p. 766
OBJ: 22.1.2 Identify two possible arrangements of carbon atoms in an alkane.
STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg BLM: knowledge

84. ANS: D PTS: 1 DIF: L1 REF: p. 772
OBJ: 22.2.1 Describe the structural characteristics of alkenes. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg
BLM: knowledge

85. ANS: C PTS: 1 DIF: L1 REF: p. 772
OBJ: 22.2.1 Describe the structural characteristics of alkenes. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg
BLM: knowledge

86. ANS: B PTS: 1 DIF: L1 REF: p. 780
OBJ: 22.4.2 Describe bonding in a benzene ring. STA: PRS.3.1.20 | PRS.3.1.21 | PI.3.1.gg
BLM: knowledge

87. ANS: A PTS: 1 DIF: L1 REF: p. 780
OBJ: 22.4.2 Describe bonding in a benzene ring. STA: PRS.3.1.20 | PRS.3.1.21 | PI.3.1.gg
BLM: knowledge

88. ANS: C PTS: 1 DIF: L1 REF: p. 785
OBJ: 22.5.3 Classify coal. STA: PI.3.1.gg BLM: knowledge

89. ANS: D PTS: 1 DIF: L1 REF: p. 785
BLM: knowledge

90. ANS: E PTS: 1 DIF: L1 REF: p. 785
OBJ: 22.5.3 Classify coal. STA: PI.3.1.gg BLM: knowledge

91. ANS: A PTS: 1 DIF: L1 REF: p. 798
OBJ: 23.1.1 Explain how organic compounds are classified. STA: PRS.3.1.20 | PI.3.1.ff | PI.3.1.hh
BLM: knowledge

92. ANS: F PTS: 1 DIF: L1 REF: p. 800
OBJ: 23.1.2 Identify the general formula of a halocarbon. STA: PRS.3.1.20 | PI.3.1.ff | PI.3.1.hh
BLM: knowledge

93. ANS: B PTS: 1 DIF: L1 REF: p. 804
OBJ: 23.2.1 Identify the general formula of an alcohol. STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh
BLM: knowledge

94. ANS: I PTS: 1 DIF: L1 REF: p. 811
OBJ: 23.2.4 Identify the general formula of an amine. STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh
BLM: knowledge
95. ANS: E PTS: 1 DIF: L1 REF: p. 810
OBJ: 23.2.3 Identify the general formula of an ether. STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh
BLM: knowledge
96. ANS: C PTS: 1 DIF: L1 REF: p. 812
OBJ: 23.3.1 Identify the structural characteristic that an aldehyde and a ketone share.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: knowledge
97. ANS: D PTS: 1 DIF: L1 REF: p. 815
OBJ: 23.3.2 Construct the general formula of a carboxylic acid.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: knowledge
98. ANS: G PTS: 1 DIF: L1 REF: p. 816
OBJ: 23.3.2 Construct the general formula of a carboxylic acid.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: knowledge
99. ANS: H PTS: 1 DIF: L1 REF: p. 819
OBJ: 23.3.4 Identify the general formula of an ester. STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh
BLM: knowledge

100. ANS: A PTS: 1 DIF: L1 REF: p. 801
OBJ: 23.1.3 Describe how substitution reactions are used in organic chemistry.
STA: PRS.3.2.2 | PI.3.1.ff | PI.3.2.c BLM: knowledge
101. ANS: B PTS: 1 DIF: L1 REF: p. 807
OBJ: 23.2.2 Explain how addition reactions are used in organic chemistry.
STA: PRS.3.2.2 | PI.3.1.ff | PI.3.2.c BLM: knowledge
102. ANS: D PTS: 1 DIF: L1 REF: p. 809
OBJ: 23.2.2 Explain how addition reactions are used in organic chemistry.
STA: PRS.3.2.2 | PI.3.1.ff | PI.3.2.c BLM: knowledge
103. ANS: C PTS: 1 DIF: L1 REF: p. 808
OBJ: 23.2.2 Explain how addition reactions are used in organic chemistry.
STA: PRS.3.2.2 | PI.3.1.ff | PI.3.2.c BLM: knowledge
104. ANS: E PTS: 1 DIF: L1 REF: p. 816
OBJ: 23.3.3 Explain why dehydrogenation is classified as an oxidation reaction.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: knowledge

105. ANS: B PTS: 1 DIF: L1 REF: p. 841
OBJ: 24.2.1 Construct the general formula for carbohydrates. STA: PI.3.1.cc
BLM: knowledge
106. ANS: F PTS: 1 DIF: L1 REF: p. 843
OBJ: 24.2.1 Construct the general formula for carbohydrates. STA: PI.3.1.cc
BLM: knowledge
107. ANS: E PTS: 1 DIF: L1 REF: p. 842
OBJ: 24.2.1 Construct the general formula for carbohydrates. STA: PI.3.1.cc
BLM: knowledge
108. ANS: G PTS: 1 DIF: L1 REF: p. 844
OBJ: 24.3.1 Diagram the general structure of an amino acid. STA: PRS.3.1.17 | PI.3.1.cc | PI.3.1.hh
BLM: knowledge
109. ANS: C PTS: 1 DIF: L1 REF: p. 845
OBJ: 24.3.2 Identify what determines the differences in the chemical and physiological properties of peptides and proteins. STA: PRS.3.1.17 | PI.3.1.cc | PI.3.1.hh

BLM: knowledge

110. ANS: A PTS: 1 DIF: L1 REF: p. 845
OBJ: 24.3.2 Identify what determines the differences in the chemical and physiological properties of peptides and proteins. STA: PRS.3.1.17 | PI.3.1.cc | PI.3.1.hh
BLM: knowledge

111. ANS: H PTS: 1 DIF: L1 REF: p. 854
OBJ: 24.5.1 Identify the functions of DNA and RNA. BLM: knowledge

112. ANS: D PTS: 1 DIF: L1 REF: p. 854
OBJ: 24.5.1 Identify the functions of DNA and RNA. BLM: knowledge

113. ANS: D PTS: 1 DIF: L1 REF: p. 876
OBJ: 25.1.1 Explain how an unstable nucleus releases energy. STA: PRS.3.1.9 | PI.3.1.p | PI.5.3.c
BLM: knowledge

114. ANS: B PTS: 1 DIF: L1 REF: p. 877
OBJ: 25.1.2 Describe the three main types of nuclear radiation.
STA: PRS.3.1.9 | PI.3.1.p | PI.4.4.c BLM: knowledge

115. ANS: C PTS: 1 DIF: L1 REF: p. 878
OBJ: 25.1.2 Describe the three main types of nuclear radiation.
STA: PRS.3.1.9 | PI.3.1.p | PI.4.4.c BLM: knowledge

116. ANS: E PTS: 1 DIF: L1 REF: p. 879
OBJ: 25.1.2 Describe the three main types of nuclear radiation.
STA: PRS.3.1.9 | PI.3.1.p | PI.4.4.c BLM: knowledge

117. ANS: A PTS: 1 DIF: L1 REF: p. 881
OBJ: 25.2.1 Describe the type of decay a radioisotope undergoes.
STA: PRS.3.1.9 | PI.3.1.o | PI.4.4.a BLM: knowledge

118. ANS: F PTS: 1 DIF: L1 REF: p. 885
OBJ: 25.2.3 Identify the two ways transmutations can occur. STA: PRS.3.1.9 | PI.4.4.b | PI.5.3.a
BLM: knowledge

119. ANS: D PTS: 1 DIF: L1 REF: p. 876
OBJ: 25.1.1 Explain how an unstable nucleus releases energy. STA: PRS.3.1.9 | PI.3.1.p | PI.5.3.c
BLM: knowledge

120. ANS: B PTS: 1 DIF: L1 REF: p. 891
OBJ: 25.3.3 Distinguish fission reactions from fusion reactions.
STA: PRS.4.4.2 | PI.4.4.b | PI.5.3.b BLM: knowledge

121. ANS: F PTS: 1 DIF: L1 REF: p. 889
OBJ: 25.3.3 Distinguish fission reactions from fusion reactions.
STA: PRS.4.4.2 | PI.4.4.b | PI.5.3.b BLM: knowledge

122. ANS: A PTS: 1 DIF: L1 REF: p. 888
OBJ: 25.3.3 Distinguish fission reactions from fusion reactions.
STA: PRS.4.4.2 | PI.4.4.b | PI.5.3.b BLM: knowledge

123. ANS: G PTS: 1 DIF: L1 REF: p. 889
OBJ: 25.3.3 Distinguish fission reactions from fusion reactions.
STA: PRS.4.4.2 | PI.4.4.b | PI.5.3.b BLM: knowledge

124. ANS: E PTS: 1 DIF: L1 REF: p. 895
OBJ: 25.4.1 Identify three devices that are used to detect radiation.
STA: PRS.4.4.4 | PI.4.4.d | PI.4.4.e BLM: knowledge

125. ANS: C PTS: 1 DIF: L1 REF: p. 895
OBJ: 25.4.1 Identify three devices that are used to detect radiation.

STA: PRS.4.4.4 | PI.4.4.d | PI.4.4.e BLM: knowledge

MULTIPLE CHOICE

126. ANS: C PTS: 1 DIF: L2 REF: p. 493
OBJ: 15.1.2 Describe the structure of ice. STA: PRS.5.2.2
BLM: analysis
127. ANS: C PTS: 1 DIF: L2 REF: p. 497
OBJ: 15.2.2 Explain why all ionic compounds are electrolytes. STA: PI.3.1.rr
BLM: application
128. ANS: B PTS: 1 DIF: L1 REF: p. 505
OBJ: 15.3.2 Identify how to distinguish a colloid from a suspension and a solution.
STA: PRS.3.1.26 BLM: comprehension
129. ANS: D PTS: 1 DIF: L2 REF: p. 522
OBJ: 16.1.3 Describe the factors that affect the solubility of a substance.
STA: PRS.3.1.25 | PRS.3.1.28 | PI.3.1.oo BLM: comprehension
130. ANS: D PTS: 1 DIF: L2 REF: p. 523 | p. 524
OBJ: 16.1.3 Describe the factors that affect the solubility of a substance.
STA: PRS.3.1.25 | PRS.3.1.28 | PI.3.1.oo BLM: analysis
131. ANS: C PTS: 1 DIF: L2 REF: p. 526
OBJ: 16.2.1 Calculate the molarity of a solution. STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp
BLM: analysis
132. ANS: B PTS: 1 DIF: L3 REF: p. 526
OBJ: 16.2.1 Calculate the molarity of a solution. STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp
BLM: analysis
133. ANS: D PTS: 1 DIF: L2 REF: p. 528 | p. 529
OBJ: 16.2.2 Describe the effect of dilution on the total moles of solute in solution.
STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp BLM: analysis
134. ANS: C PTS: 1 DIF: L2 REF: p. 530
OBJ: 16.2.3 Express solution concentration as a percent by volume or percent by mass.
STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp BLM: analysis
135. ANS: B PTS: 1 DIF: L2 REF: p. 538
OBJ: 16.4.1 Identify the two ways of expressing the ratio of solute to solvent in a solution.
STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp BLM: analysis
136. ANS: D PTS: 1 DIF: L2 REF: p. 542 | p. 543
OBJ: 16.4.2 Describe how the freezing-point depression and boiling-point elevation are related to molality.
STA: PRS.3.1.29 | PRS.3.1.30 | PI.3.1.pp BLM: analysis
137. ANS: A PTS: 1 DIF: L1 REF: p. 557
OBJ: 17.1.2 Explain how the energy of the universe before a chemical or physical process is related to the energy of the universe after a chemical or physical process. STA: PRS.4.1.1 | PI.4.1.b | PI.4.2.a
BLM: knowledge
138. ANS: C PTS: 1 DIF: L2 REF: p. 606
OBJ: 18.2.1 Identify what information a rate law provides about a reaction.
STA: PC5.1 | PRS.3.4.6 | PI.3.4.f BLM: analysis
139. ANS: D PTS: 1 DIF: L1 REF: p. 694
OBJ: 20.1.1 Describe what happens to a substance that undergoes oxidation and a substance that undergoes reduction. STA: PRS.3.2.6 | PI.3.2.e | PI.3.2.g BLM: knowledge
140. ANS: D PTS: 1 DIF: L1 REF: p. 694
OBJ: 20.1.1 Describe what happens to a substance that undergoes oxidation and a substance that undergoes

reduction. STA: PRS.3.2.6 | PI.3.2.e | PI.3.2.g BLM: knowledge

141. ANS: D PTS: 1 DIF: L2 REF: p. 694
OBJ: 20.1.1 Describe what happens to a substance that undergoes oxidation and a substance that undergoes reduction. STA: PRS.3.2.6 | PI.3.2.e | PI.3.2.g BLM: application

142. ANS: C PTS: 1 DIF: L2 REF: p. 702
OBJ: 20.2.1 State the general rule for assigning oxidation numbers.
STA: M1.1.2.b | PI.3.2.i BLM: comprehension

143. ANS: B PTS: 1 DIF: L2 REF: p. 729
OBJ: 21.1.1 Identify the type of chemical reaction involved in all electrochemical processes.
STA: PRS.3.2.10 | PI.3.2.j | PI.3.2.l BLM: comprehension

144. ANS: C PTS: 1 DIF: L2 REF: p. 731
OBJ: 21.1.2 Describe how a voltaic cell produces electrical energy.
STA: PI.3.2.k BLM: comprehension

145. ANS: A PTS: 1 DIF: L2 REF: p. 734
OBJ: 21.1.3 Identify the current applications that use electrochemical processes to produce electrical energy.
STA: PI.3.2.j | PI.3.2.k BLM: comprehension

146. ANS: D PTS: 1 DIF: L2 REF: p. 735
OBJ: 21.1.3 Identify the current applications that use electrochemical processes to produce electrical energy.
STA: PI.3.2.j | PI.3.2.k BLM: comprehension

147. ANS: B PTS: 1 DIF: L2 REF: p. 739
OBJ: 21.2.2 Determine the standard reduction potential of a half-cell.
STA: PI.3.2.d | PI.3.2.e | PI.3.2.g BLM: analysis

148. ANS: D PTS: 1 DIF: L2 REF: p. 748
OBJ: 21.3.2 Describe some applications that use electrolytic cells.
STA: PRS.3.2.8 | PI.3.2.j | PI.3.2.l BLM: comprehension

149. ANS: C PTS: 1 DIF: L2 REF: p. 772 | p. 773
OBJ: 22.2.1 Describe the structural characteristics of alkenes. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg
BLM: application

150. ANS: D PTS: 1 DIF: L1 REF: p. 772
OBJ: 22.2.1 Describe the structural characteristics of alkenes. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg
BLM: comprehension

151. ANS: D PTS: 1 DIF: L1 REF: p. 773
OBJ: 22.2.2 Define the structural characteristics of alkynes. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.gg
BLM: knowledge

152. ANS: D PTS: 1 DIF: L1 REF: p. 776
OBJ: 22.3.2 Identify the two types of stereoisomers. STA: PRS.3.1.21 | PI.3.1.ff | PI.3.1.ii
BLM: knowledge

153. ANS: A PTS: 1 DIF: L2 REF: p. 804
OBJ: 23.3.1 Identify the structural characteristic that an aldehyde and a ketone share.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: application

154. ANS: D PTS: 1 DIF: L2 REF: p. 815
OBJ: 23.3.2 Construct the general formula of a carboxylic acid.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: comprehension

155. ANS: D PTS: 1 DIF: L2 REF: p. 817
OBJ: 23.3.3 Explain why dehydrogenation is classified as an oxidation reaction.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: comprehension

156. ANS: A PTS: 1 DIF: L2 REF: p. 817
OBJ: 23.3.3 Explain why dehydrogenation is classified as an oxidation reaction.
STA: PRS.3.1.17 | PI.3.1.ff | PI.3.1.hh BLM: comprehension

157. ANS: C PTS: 1 DIF: L1 REF: p. 839
OBJ: 24.1.2 Identify the compound that is reduced during photosynthesis and the compounds formed.
STA: PI.3.1.cc BLM: knowledge

158. ANS: A PTS: 1 DIF: L2 REF: p. 843
OBJ: 24.2.1 Construct the general formula for carbohydrates. STA: PI.3.1.cc
BLM: comprehension

159. ANS: B PTS: 1 DIF: L2 REF: p. 863
OBJ: 24.6.2 Describe what happens to biological molecules and energy during catabolism and anabolism.
BLM: comprehension

160. ANS: C PTS: 1 DIF: L1 REF: p. 877
OBJ: 25.1.2 Describe the three main types of nuclear radiation.
STA: PRS.3.1.9 | PI.3.1.p | PI.4.4.c BLM: knowledge

161. ANS: C PTS: 1 DIF: L2 REF: p. 877
OBJ: 25.1.2 Describe the three main types of nuclear radiation.
STA: PRS.3.1.9 | PI.3.1.p | PI.4.4.c BLM: comprehension

162. ANS: D PTS: 1 DIF: L2 REF: p. 881
OBJ: 25.2.1 Describe the type of decay a radioisotope undergoes.
STA: PRS.3.1.9 | PI.3.1.o | PI.4.4.a BLM: application

163. ANS: C PTS: 1 DIF: L1 REF: p. 891
OBJ: 25.3.3 Distinguish fission reactions from fusion reactions.
STA: PRS.4.4.2 | PI.4.4.b | PI.5.3.b BLM: knowledge

SHORT ANSWER

164. ANS:
29.8 g H_2O = 1.66 mol H_2O
molar mass $CuSO_4 \cdot 5H_2O$ = 249.6 g
mol $CuSO_4 \cdot 5H_2O \rightarrow 5$ mol H_2O

$$\frac{249.6 \text{ g } CuSO_4\,5H_2O}{1 \text{ mol } CuSO_4\,5H_2O} \times \frac{1 \text{ mol } CuSO_4\,5H_2O}{5 \text{ mol } H_2O} \times 1.66 \text{ mol } H_2O = 82.6 \text{ g } CuSO_4 \cdot 5H_2O$$

PTS: 1 DIF: L3 REF: p. 500
OBJ: 15.2.3 Explain why hydrates easily lose and regain water.
STA: PI.3.1.cc BLM: analysis

165. ANS:

$$215 \text{ kcal} \times \frac{1000 \text{ cal}}{1 \text{ kcal}} \times \frac{4.184 \text{ J}}{1 \text{ cal}} = 9.00 \times 10^5 \text{ J}$$

PTS: 1 DIF: L2 REF: p. 559
OBJ: 17.1.1 Explain the ways in which energy changes can occur.
STA: PRS.4.2.1 | PI.4.1.a | PI.4.2.a BLM: comprehension

166. ANS:
Heat energy = mass $\times$ specific heat $\times$ temperature change

$$= 550 \text{ g} \times 0.21 \frac{\text{cal}}{\text{g°C}} \times 10\text{°C}$$

$= 1.2 \times 10^3$ cal

PTS: 1 DIF: L2 REF: p. 560

OBJ: 17.1.3 Identify two factors on which the heat capacity of an object depends.
STA: M1.1.2.b | PRS.4.2.4 BLM: analysis

167. ANS:

Total heat = heat to melt ice + heat to warm water to 100°C + heat to evaporate water
Total heat = (moles ice $\times$ ΔH_{fus}) + (moles water $\times$ CΔT) + (moles water $\times$ ΔH_{vap})

36 kJ = (moles of H_2O $\times$ 6.0 kJ/mol) + (moles of H_2O $\times$ 0.0753 $\frac{\text{kJ}}{\text{mol °C}}$ $\times$ 100°C) + (moles of H_2O $\times$ 40.5 kJ/mol)

36 kJ = moles H_2O (6.0 kJ/mol + 0.0753 $\frac{\text{kJ}}{\text{mol °C}}$ $\times$ 100°C + 40.5 kJ/mol)

36 kJ = moles H_2O (54.0 kJ/mol)

moles H_2O = $\frac{\text{36 kJ}}{\text{54.0 kJ/mol}}$

moles H_2O = 0.67 mol

PTS: 1 DIF: L3 REF: p. 573
OBJ: 17.3.2 Compare the quantity of heat absorbed by a vaporizing liquid to the quantity of heat released when the vapor condenses. STA: PC5.2 | PRS.4.2.3 | PRS.4.2.4
BLM: analysis

168. ANS:

$$K_{eq} = \frac{[C]^2}{[A]^3[B]^2}$$

PTS: 1 DIF: L2 REF: p. 616
OBJ: 18.3.3 Describe what the size of an equilibrium constant indicates about a system at equilibrium.
STA: MS3.2.1 | ES4.2.1 | PRS.3.4.5 BLM: analysis

169. ANS:

$$K_{eq} = \frac{[NO]^2[Cl_2]}{[NClO]^2}$$

$$= \frac{(6.4)^2 \times 0.49}{(1.6)^2} = 7.8$$

PTS: 1 DIF: L2 REF: p. 618
OBJ: 18.3.3 Describe what the size of an equilibrium constant indicates about a system at equilibrium.
STA: MS3.2.1 | ES4.2.1 | PRS.3.4.5 BLM: analysis