

Student name: \_\_\_\_\_

**TRUE/FALSE - Write 'T' if the statement is true and 'F' if the statement is false.**

- 1) The mass of a neutron is equal to the mass of a proton plus the mass of an electron.  
 true  
 false
  
- 2) All neutral atoms of tin have 50 protons and 50 electrons.  
 true  
 false
  
- 3) Copper (Cu) is a transition metal.  
 true  
 false
  
- 4) Lead (Pb) is a main group element.  
 true  
 false
  
- 5) Almost all the mass of an atom is concentrated in the nucleus.  
 true  
 false
  
- 6) When a beam of alpha particles passes between two electrically charged plates, the beam is deflected toward the positive plate.  
 true  
 false
  
- 7) J. J. Thomson suggested the term "radioactivity" to describe the spontaneous emission of particles and/or radiation.  
 true  
 false
  
- 8) The energy of a photon is directly proportional to the wavelength of the radiation.  
 true  
 false
  
- 9) The frequency of a photon is inversely proportional to the wavelength of the radiation.  
 true  
 false

- 10) The principal quantum number designates the size of the orbital.  
 true  
 false
- 11) The magnetic quantum number designates the shape of the atomic orbital.  
 true  
 false
- 12) If  $n = 2$  then  $l = 0, -1,$  and  $1$ .  
 true  
 false
- 13) An electron in a  $3p$  orbital could have a value of  $2$  for its angular momentum quantum number ( $l$ ).  
 true  
 false
- 14) Each shell (principal energy level) of quantum number  $n$  contains  $n$  subshells.  
 true  
 false
- 15) For all atoms of the same element, the  $2s$  orbital is larger than the  $1s$  orbital.  
 true  
 false
- 16) The periodic table was first arranged according to increasing atomic masses.  
 true  
 false
- 17) Coulomb's law is the attractive force ( $F$ ) between two oppositely charged particles ( $Q_1$  and  $Q_2$ ). It is directly proportional to the product of the charges and inversely proportional to the distance ( $d$ ) between the objects cubed.  
 true  
 false
- 18) In Mendeleev's version of the periodic table, the elements were arranged in order of increasing atomic number.  
 true  
 false

- 19) Moseley's measurements of nuclear charges of the elements provided the basis for arranging the elements of the periodic table in order of increasing atomic number.
- true
  - false
- 20) In neutral atoms, the 3 *d* orbitals have higher energy than the 4 *s* orbitals.
- true
  - false
- 21) The electron configuration of atomic argon is the same as the chloride ion (Cl<sup>-</sup>).
- true
  - false
- 22) Elements in which the outermost electron has the same principal quantum number, *n*, show similar chemical properties.
- true
  - false
- 23) Electrons will not pair in degenerate orbitals if an empty orbital is available and, according to Hund's rule, the degenerate orbitals must all contain one electron before any of them can contain two electrons.
- true
  - false
- 24) According to the Aufbau principle, the most stable arrangement of electrons places them in degenerate orbitals.
- true
  - false
- 25) The electron configuration for chlorine is [Ne]3*s*<sup>2</sup> 3*p*<sup>5</sup>.
- true
  - false
- 26) The radii of ions are always smaller than the radii of the corresponding atoms of the same element.
- true
  - false

- 27) Atomic size decreases across a period due to an increase in the effective nuclear charge,  $Z_{\text{eff}}$ .
- true
  - false
- 28) Ionic compounds tend to form between metals and nonmetals when electrons are transferred from an element with high ionization energy (metal) to an element with a low electron affinity (nonmetal).
- true
  - false
- 29) Ionic compounds may carry a net positive or net negative charge.
- true
  - false
- 30) When an alkali metal combines with a nonmetal, a covalent bond is normally formed.
- true
  - false
- 31) The empirical formula of  $\text{C}_6\text{H}_6$  is CH.
- true
  - false
- 32) The empirical formula is the simplest whole number ratio of atoms representing a chemical formula of a molecule.
- true
  - false
- 33) Many compounds can be represented with the same empirical formula.
- true
  - false
- 34) There is only one distinct empirical formula for each compound that exists.
- true
  - false
- 35) The molecular formula is a whole number multiple of the empirical formula.
- true
  - false

- 36) Ionic compounds tend to form between metals and nonmetals when electrons are transferred from an element with high ionization energy (metal) to an element with a low electron affinity (nonmetal).
- true
  - false
- 37) Lewis theorized the *octet rule* to describe chemical bonding where atoms lose, gain, or share electrons in order to achieve a noble gas configuration.
- true
  - false
- 38) Only valence electrons are shown in the Lewis structure held together by covalent bonds.
- true
  - false
- 39) A double bond cannot exist between a carbon atom and an oxygen atom.
- true
  - false
- 40) A triple bond cannot exist between a carbon atom and a hydrogen atom.
- true
  - false
- 41) Unshared electrons are always shown in pairs around an atom.
- true
  - false
- 42) The octet rule works best for elements in the 3rd period of the periodic table.
- true
  - false
- 43) Multiple bonds are longer than single bonds.
- true
  - false
- 44) Single bonds are stronger than multiple bonds.
- true
  - false

- 45) Octane,  $C_8H_{18}$ , boils at  $125^\circ C$ , whereas water boils at  $100^\circ C$ . This information suggests that the dispersion forces in nonpolar octane molecules are stronger than the dispersion forces and hydrogen bonding in water.
- true
  - false
- 46) The energy of a hydrogen bond is greater than that of a typical covalent bond.
- true
  - false
- 47) Only molecules which do not have dipole moments can experience dispersion forces.
- true
  - false
- 48) To correctly determine the molecular shape of a molecule requires that you first draw the Lewis structure for the molecule.
- true
  - false
- 49) According to molecular orbital theory, all diatomic molecules with an even number of electrons are diamagnetic.
- true
  - false
- 50) In the valence bond treatment, a  $\pi$  bond is formed when two  $p$  orbitals overlap side to side.
- true
  - false
- 51) In the valence bond treatment, overlap of an  $s$  orbital on one atom with a  $sp^3$  orbital on another atom gives rise to a  $\sigma$  bond.
- true
  - false
- 52) Atoms of period 3 and beyond can undergo  $sp^3 d^2$  hybridization, but atoms of period 2 cannot.
- true
  - false

- 53) The angles between  $sp^2$  hybrid orbitals are  $109.5^\circ$ .
- true
  - false
- 54) The bond angle for a  $sp$  hybrid orbital is smaller than the bond angle for an  $sp^2$  hybrid orbital.
- true
  - false
- 55) To make a  $sp^3$  hybrid orbital, one  $s$  atomic orbital is mixed with three  $p$  atomic orbitals.
- true
  - false
- 56) A molecule that contains polar bonds will always have a dipole moment.
- true
  - false
- 57) According to the VSEPR model, a molecule with the general formula  $AB_3$  possessing two lone pairs on the central atom has a trigonal planar molecular geometry.
- true
  - false
- 58) The number of lone pairs of electrons on the central atoms is an important factor used to determine the molecular shape or molecular geometry.
- true
  - false
- 59) Pi bonds are covalent bonds in which the electron density is concentrated above and below the plane of the nuclei of the bonding atoms.
- true
  - false
- 60) The  $BrF_5$  molecule has polar bonds and has a net dipole moment.
- true
  - false
- 61) In a correctly balanced equation, the number of reactant molecules must equal the number of product molecules.
- true
  - false

- 62) The limiting reactant is the reactant with the smallest initial mass.
- true
  - false
- 63) The empirical formula is the simplest whole number ratio of atoms representing a chemical formula of a molecule.
- true
  - false
- 64) Many compounds can be represented with the same empirical formula.
- true
  - false
- 65) There is only one distinct empirical formula for each compound that exists.
- true
  - false
- 66) The molecular formula is a whole number multiple of the empirical formula.
- true
  - false
- 67) The percent yield can be determined by dividing the actual yield by the theoretical yield and multiplying this value by 100%.
- true
  - false
- 68) An electrolyte is a substance that dissolves in water to yield a solution that conducts electricity.
- true
  - false
- 69) Hydration is the process in which organic solvent molecules surround a solute particle.
- true
  - false
- 70) Ammonium carbonate is not water-soluble.
- true
  - false

- 71) Sodium hydroxide is water-soluble.  
 true  
 false
- 72)  $\text{H}_3\text{PO}_4$  is a strong acid.  
 true  
 false
- 73) The spectator ion is always included in the net ionic equation.  
 true  
 false
- 74) The oxidation number for oxygen in  $\text{O}_2$  is zero.  
 true  
 false
- 75) The oxidation number for a pure element is always zero.  
 true  
 false
- 76) The following reaction will occur  $\text{Na}(s) + \text{AgCl}(aq) \rightarrow \text{Ag}(s) + \text{NaCl}(aq)$   
 true  
 false
- 77) Phenolphthalein is a universal indicator and maybe used as an indicator for all acid-base titrations.  
 true  
 false
- 78) The ripening of fruit, once picked, is an example of physical change.  
 true  
 false
- 79) When applying the scientific method, it is important to avoid any form of hypothesis.  
 true  
 false

- 80) When applying the scientific method, a model or theory should be based on experimental data.
- true
  - false
- 81) Matter is anything that has mass and occupies space.
- true
  - false
- 82) The density of a substance is an intensive property.
- true
  - false
- 83) The volume of a substance is an intensive property.
- true
  - false
- 84) Boiling point and melting point are extensive properties.
- true
  - false
- 85) The rusting of a piece of iron under environmental conditions is a physical change.
- true
  - false
- 86) The number 6.0448, rounded to 3 decimal places, becomes 6.045.
- true
  - false
- 87) A scoop of vanilla ice cream is a pure substance.
- true
  - false
- 88) A particular temperature in degrees Celsius is larger than the temperature in kelvins.
- true
  - false
- 89) Zero kelvin  $0\text{ K} < 0^\circ\text{F} < 0^\circ\text{C}$
- true
  - false

- 90) 77 K is colder than 4 K.
- true
  - false
- 91) The juice from an orange is a mixture.
- true
  - false
- 92) Chemical reactions in a bomb calorimeter occur at constant pressure.
- true
  - false
- 93) The work done on the surroundings by the expansion of a gas is  $w = -P\Delta V$ .
- true
  - false
- 94) The heat absorbed by a system at constant pressure is equal to  $\Delta U + P\Delta V$ .
- true
  - false
- 95) In an endothermic process, heat is absorbed by the system.
- true
  - false
- 96) The enthalpy of vaporization of a compound is always positive.
- true
  - false
- 97) A home aquarium is an example of an open system.
- true
  - false
- 98) All elements in their standard state have an enthalpy of formation equal to zero.
- true
  - false
- 99)  $\Delta H$  does not depend on the path of a reaction, but  $\Delta U$  does.
- true
  - false

- 100) The enthalpy of formation of a liquid is always larger than the enthalpy of formation of the gas of the same compound.
- true
  - false
- 101) In an endothermic reaction, in going from the reactants to the products at the same temperature, the value of  $q$  is negative.
- true
  - false
- 102) Chemical reactions in a bomb calorimeter occur at constant pressure.
- true
  - false
- 103) The work done on the surroundings by the expansion of a gas is  $w = -P\Delta V$ .
- true
  - false
- 104) The heat absorbed by a system at constant pressure is equal to  $\Delta U + P\Delta V$ .
- true
  - false
- 105) In an endothermic process, heat is absorbed by the system.
- true
  - false
- 106) The enthalpy of vaporization of a compound is always positive.
- true
  - false
- 107) A home aquarium is an example of an open system.
- true
  - false
- 108) All elements in their standard state have an enthalpy of formation equal to zero.
- true
  - false

- 109)  $\Delta H$  does not depend on the path of a reaction, but  $\Delta U$  does.
- true
  - false
- 110) The enthalpy of formation of a liquid is always larger than the enthalpy of formation of the gas of the same compound.
- true
  - false
- 111) In an endothermic reaction, in going from the reactants to the products at the same temperature, the value of  $q$  is negative.
- true
  - false
- 112) Gases form heterogeneous mixtures or solutions with one another.
- true
  - false
- 113) Gases are compressible and have a density that is much higher than liquids and solids.
- true
  - false
- 114) When a closed-ended manometer is used for pressure measurements, and the closed end is under vacuum, the level of manometer liquid in the closed arm can never be lower than that in the other arm.
- true
  - false
- 115) At a temperature of absolute zero, the volume of an ideal gas is zero.
- true
  - false
- 116) According to the postulates of kinetic molecular theory, the molecules of all gases at a given temperature have the same average speed.
- true
  - false
- 117) The rate of diffusion of a gas is inversely proportional to its molar mass.
- true
  - false

- 118) For real gases,  $PV > nRT$ .
- true
  - false
- 119) For a gas obeying Boyle's law, a plot of  $V$  versus  $1/P$  will give a straight line passing through the origin.
- true
  - false
- 120) Ethanol ( $C_2H_5-OH$ ) will have a greater viscosity than ethylene glycol ( $HO-CH_2CH_2-OH$ ) at the same temperature.
- true
  - false
- 121) The shape of the water-to-glass meniscus results from the strong adhesive forces between glass and water.
- true
  - false
- 122) Ice is less dense than water due to the formation of hydrogen bonds.
- true
  - false
- 123) The maximum number of phases of a single substance that can coexist in equilibrium is two.
- true
  - false
- 124) The surface tension of water is lowered when a detergent is present in solution.
- true
  - false
- 125) In the packing of identical atoms with cubic unit cells, the packing efficiency increases as the coordination number increases.
- true
  - false
- 126) Ionic crystals are composed of charged spheres that are held together by covalent bonds.
- true
  - false

- 127) Solids are generally most stable in crystalline form.  
 true  
 false
- 128) A face-centered crystal lattice has one atom in the center of the unit cell.  
 true  
 false
- 129) Molecular crystals are held together by the intermolecular forces of dispersion and dipole-dipole forces and by hydrogen bonding.  
 true  
 false
- 130) Colligative properties are properties that depend on the number of solvent particles in solution, but not on the nature of the solvent.  
 true  
 false
- 131) When a nonvolatile solute is dissolved in a liquid, the vapor pressure exerted by the liquid decreases.  
 true  
 false
- 132) An "ideal solution" is a solution that obeys Raoult's law.  
 true  
 false
- 133) Colloidal particles may be solids, liquids, or gases.  
 true  
 false
- 134) Osmosis is the selective passage of solvent molecules through a porous membrane from a more concentrated solution to a more dilute one.  
 true  
 false
- 135) The solubility of gases in water *always* decreases with increasing temperature.  
 true  
 false

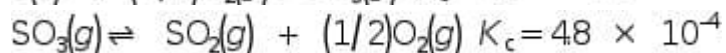
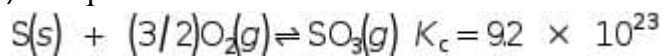
- 136) The solubility of a solid *always* increases with increasing solvent temperature.  
 true  
 false
- 137) A catalyst increases the rate of the reaction and is recovered completely at the end of the reaction.  
 true  
 false
- 138) The rate law predicted by the following two-step mechanism is  $\text{Rate} = k[\text{A}][\text{B}]$ .  
 $\text{A} \rightarrow \text{C} + \text{B}$  (slow)  
 $\text{A} + \text{B} \rightarrow \text{C} + \text{E}$  (fast)  
 true  
 false
- 139) The rate of a reaction is determined by the rate of the fastest step in the mechanism.  
 true  
 false
- 140) A transition state is a species (or state) corresponding to an energy maximum on a reaction energy diagram.  
 true  
 false
- 141) A reaction intermediate is a species corresponding to a local energy maximum on a reaction energy diagram.  
 true  
 false
- 142) The rate law cannot be predicted from the stoichiometry of a reaction.  
 true  
 false
- 143) The units of the rate constant depend on the order of the reaction.  
 true  
 false
- 144) The units of the rate of reaction depend on the order of the reaction.  
 true  
 false

- 145) The intermediate in a reaction appears in the mechanism of the reaction and in the overall balanced equation.
- true
  - false
- 146) The higher the pressure of a gas sample, the greater is its entropy.
- true
  - false
- 147) The entropy of vaporization of a compound is always positive.
- true
  - false
- 148) The entropy change  $\Delta S^\circ$  at 298 K for the reaction  $\text{NH}_4\text{Cl}(s) \rightarrow \text{NH}_3(g) + \text{HCl}(g)$  is negative.
- true
  - false
- 149) All elements in their standard state have standard entropies of formation equal to zero.
- true
  - false
- 150) The following reaction is spontaneous under standard state conditions at 25°C:  
 $\text{AgCl}(s) \rightarrow \text{Ag}^+(aq) + \text{Cl}^-(aq)$  ( $\Delta G^\circ = 55 \text{ kJ/mol}$ )
- true
  - false
- 151)  $\Delta S_{\text{univ}} = -1$  for a spontaneous reaction.
- true
  - false
- 152) For a given reaction, a change in the temperature may result in a change in the sign of  $\Delta G$ .
- true
  - false
- 153) At equilibrium,  $\Delta G^\circ = 0$ .
- true
  - false

- 154) As a chemical reaction proceeds toward equilibrium, the free energy of the system decreases at constant temperature and constant pressure.
- true  
 false
- 155) In living systems, thermodynamically favorable reactions provide the free energy needed to drive necessary but thermodynamically unfavorable reactions.
- true  
 false
- 156) The reaction  $\text{SiO}_2(s) + \text{Pb}(s) \rightarrow \text{PbO}_2(s) + \text{Si}(s)$  is spontaneous:  
 $\Delta G^\circ_f(\text{PbO}_2(s)) = -217 \text{ kJ/mol}$   
 $\Delta G^\circ_f(\text{SiO}_2(s)) = -856 \text{ kJ/mol}$
- true  
 false
- 157) At equilibrium, the rate of the forward reaction is equal to the rate of the reverse reaction.
- true  
 false
- 158) When the following reaction is at equilibrium
- $$2\text{NOCl}(g) \rightleftharpoons 2\text{NO}(g) + \text{Cl}_2(g)$$
- then  $[\text{NO}]^2 [\text{Cl}_2] = K_c [\text{NOCl}]^2$
- true  
 false
- 159) The equilibrium constant expression for the reaction
- $$\text{CuO}(s) + \text{H}_2(g) \rightleftharpoons \text{Cu}(s) + \text{H}_2\text{O}(g)$$
- is  $K_c = [\text{H}_2]/[\text{H}_2\text{O}]$
- true  
 false
- 160) If the system  $3\text{H}_2(g) + \text{N}_2(g) \rightleftharpoons 2\text{NH}_3(g)$  is at equilibrium and more  $\text{N}_2$  is added, a net reaction that consumes some of the added  $\text{N}_2$  will occur until a new equilibrium is reached.
- true  
 false

- 161) When a reaction system reaches equilibrium, the forward and reverse reactions stop.  
 true  
 false
- 162) Changing the amount of reactant or product in an equilibrium reaction will always change the equilibrium position, regardless of the physical state of the substance involved.  
 true  
 false
- 163) For any reaction, if  $\Delta G^\circ > 0$ , then  $K < 1$ .  
 true  
 false
- 164) A change in a concentration will not change the position of equilibrium.  
 true  
 false
- 165) A change in the temperature can change the value of the equilibrium constant.  
 true  
 false
- 166) Increasing the temperature of an exothermic reaction causes the equilibrium constant to increase and shifts the equilibrium toward products.  
 true  
 false
- 167) For the reaction of  $A + B \rightleftharpoons C + D + \text{heat}$ , the reverse reaction is exothermic.  
 true  
 false
- 168) A temperature increase favors an endothermic reaction.  
 true  
 false

169) Equilibrium constants are known for the following reactions:



Thus, for the reaction  $S(s) + O_2(g) \rightleftharpoons SO_2(g)$ ,  $K_c = 4.4 \times 10^{20}$ .

- true
- false

170) If a strong acid such as HCl is diluted sufficiently with water, the pH will be higher than 7.

- true
- false

171) Weak acids have weak conjugate bases.

- true
- false

172) All strong acids have weak conjugate bases.

- true
- false

173) The stronger the acid, the weaker its conjugate base.

- true
- false

174) The ammonium ion,  $NH_4^+$ , is a weak acid.

- true
- false

175) In aqueous solutions at  $25^\circ C$ , the sum of the hydroxide ion and hydronium ion concentrations ( $[H_3O^+] + [OH^-]$ ) equals  $1 \times 10^{-14}$ .

- true
- false

176) The first ionization constant  $K_{a1}$  is always smaller than the second ionization constant  $K_{a2}$  for the ionization of a diprotic acid.

- true
- false

- 177) A hydrohalic acid is a binary acid containing a halogen.  
 true  
 false
- 178)  $\text{NH}_3$  is a typical Lewis base.  
 true  
 false
- 179) A solution of sodium acetate ( $\text{CH}_3\text{COONa}$ ) in water is weakly basic.  
 true  
 false
- 180)  $K_w = 1.0 \times 10^{-14}$  under all conditions.  
 true  
 false
- 181) The following is the correct order for the acid strength for these oxoacids.  $\text{HClO} > \text{HClO}_2 > \text{HClO}_3 > \text{HClO}_4$   
 true  
 false
- 182) Amphoteric oxides exhibit both acidic and basic properties.  
 true  
 false
- 183) Amphoteric oxides are compounds that exhibit both acidic and basic behavior.  
 true  
 false
- 184) The amount of strong acid added to a buffer solution cannot exceed the original amount of conjugate base present in order for the buffer to still work.  
 true  
 false
- 185) A mixture made of 100 mL of 0.5 M  $\text{CH}_3\text{COOH}$  and 100 mL of 0.5 M  $\text{CH}_3\text{COONa}$  is classified as a buffer solution.  
 true  
 false

- 186) Indicators are weak acids that are one color in acidic solution and another color in basic solution.
- true
  - false
- 187) The pH of a solution that is 0.20 M CH<sub>3</sub>COOH and 0.20 M CH<sub>3</sub>COONa should be higher than the pH of a 0.20 M CH<sub>3</sub>COOH solution.
- true
  - false
- 188) Increasing the concentrations of the components of a buffer solution will increase the buffer range.
- true
  - false
- 189) Increasing the concentrations of the components of a buffer solution will increase the buffer capacity.
- true
  - false
- 190) If the pH of a buffer solution is greater than the pK<sub>a</sub> value of the buffer acid, the buffer will have more capacity to neutralize added base than added acid.
- true
  - false
- 191) The endpoint in a titration is defined as the point when the appropriate indicator changes color.
- true
  - false
- 192) The endpoint is used to estimate the equivalence point.
- true
  - false
- 193) A CH<sub>3</sub>COOH/CH<sub>3</sub>COO<sup>-</sup> buffer can be produced by adding a strong acid to a solution of CH<sub>3</sub>COO<sup>-</sup> ions.
- true
  - false

- 194) For a conjugate acid-base pair,  $K_w = K_a / K_b$
- true
  - false
- 195) Reduction occurs at the anode of a galvanic cell.
- true
  - false
- 196) At equilibrium  $E^\circ = 0$ .
- true
  - false
- 197) Electrons flow to the cathode in a voltaic cell.
- true
  - false
- 198) In the electrolyte of an electrochemical cell, current is carried by electrons moving from the anode to the cathode.
- true
  - false
- 199) A salt bridge allows movement of cations and anions from one half-cell to the other.
- true
  - false
- 200)  $E > 0$  and  $\Delta G < 0$  for a spontaneous process.
- true
  - false
- 201) The Faraday constant represents the charge of 1 mole of electrons.
- true
  - false
- 202) A SHE has the acid concentration of 1 M and the  $H_2$  pressure is 1 atm.
- true
  - false
- 203) A lead-storage battery is not rechargeable.
- true
  - false

- 204) Lithium-ion batteries can be recharged many times.  
 true  
 false
- 205) In a fuel cell, an external source of electrical power is used to drive a nonspontaneous reaction in which a fuel is produced.  
 true  
 false
- 206) In a nuclear reaction elements are converted to other elements.  
 true  
 false
- 207) A nuclear reaction's reaction rate is affected by temperature, pressure, and catalysts.  
 true  
 false
- 208) A plot of the number of neutrons versus the number of protons in various isotopes produces a "belt of stability." Isotopes below the belt of stability (i.e., with a smaller neutron-to-proton ratio) decay by beta particle emission.  
 true  
 false
- 209) For stable atoms of elements having low atomic numbers ( $\leq 20$ ), the neutron-to-proton ratio is close to zero.  
 true  
 false
- 210) All isotopes of elements with atomic numbers higher than 83 (Bi) are radioactive.  
 true  
 false
- 211) Naturally occurring uranium contains approximately 1%  $^{235}\text{U}$  and 99%  $^{238}\text{U}$ . Of these, the isotope that undergoes fission in a nuclear reactor is U-238.  
 true  
 false
- 212) Alpha decay is not observed for isotopes of elements with atomic numbers less than 83.  
 true  
 false

- 213) Gamma rays are not deflected by an electric field.  
 true  
 false
- 214) Gamma rays are high energy electrons.  
 true  
 false
- 215) An alpha particle is a helium atom.  
 true  
 false
- 216) A beta particle is a proton.  
 true  
 false
- 217) A gamma particle has a charge of  $-1$ .  
 true  
 false
- 218) Nuclear fission is the process in which a heavy nucleus (mass number  $> 200$ ) divides to form smaller nuclei of intermediate mass and one or more protons.  
 true  
 false
- 219) Nuclear fusion is the combination of small nuclei into larger ones.  
 true  
 false
- 220) The wavelengths of light that are absorbed by stratospheric ozone are known to cause cancer.  
 true  
 false
- 221) Ozone is destroyed naturally by the absorption of short-wavelength light.  
 true  
 false

- 222) Mars has an atmosphere made mostly of oxygen.  
 true  
 false
- 223) Jupiter has no solid surface and is 90% hydrogen gas and 9% helium gas.  
 true  
 false
- 224) The air at sea level is ~80% oxygen and ~20% nitrogen.  
 true  
 false
- 225) There is more argon in the air at sea level than there is CO<sub>2</sub>.  
 true  
 false
- 226) The gases spewed into the atmosphere when a volcano erupts are N<sub>2</sub>, H<sub>2</sub>S, HCl, HF, CO<sub>2</sub>, and water vapor.  
 true  
 false
- 227) The major contributor to the greenhouse effect is H<sub>2</sub>S.  
 true  
 false
- 228) Ethylenediaminetetraacetic acid (EDTA) is an effective antidote for heavy metal poisoning (e.g., Pb<sup>2+</sup> and Hg<sup>2+</sup>).  
 true  
 false
- 229) The correct formula for the dibromobis(oxalato)cobaltate(III) ion is [Co(C<sub>2</sub>O<sub>4</sub>)Br<sub>2</sub>]<sup>3-</sup>.  
 true  
 false
- 230) The systematic name of the coordination compound K<sub>2</sub>[Co(H<sub>2</sub>O)<sub>2</sub>I<sub>4</sub>] is potassium diaquatetraiodocobaltate(II).  
 true  
 false

- 231) The oxidation number of Co in  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$  is +1.  
 true  
 false
- 232) The maximum oxidation state of an element in the first transition series never exceeds its group number.  
 true  
 false
- 233) In complexes of transition metals, the maximum coordination number of the metal is equal to its number of d electrons.  
 true  
 false
- 234) A complex ion that undergoes a very slow exchange reaction is called an inert complex.  
 true  
 false
- 235) Octahedral complexes can exhibit geometric and optical isomerism.  
 true  
 false
- 236) The systematic name for the hydrocarbon with the following structural formula is 1-ethyl-2-methylbutane.

%media:chapter23c\_15\_jpg.ext%

- true  
 false

- 237) Stereoisomers that are mirror images of each other, but are not superimposable, are called optical isomers.
- true
  - false
- 238) A pair of nonsuperimposable mirror images is called enantiomers.
- true
  - false
- 239) The reaction of hydrogen chloride gas with propene will yield 1-chloropropane as the main product.
- true
  - false
- 240) A characteristic reaction of alkanes is addition.
- true
  - false
- 241) A characteristic reaction of alkenes is addition.
- true
  - false
- 242) The monomer used to prepare polyvinyl chloride (PVC) is  $\text{CHCl}=\text{CHCl}$ .
- true
  - false
- 243) A thermoplastic polymer can be melted and reshaped or heated and bent.
- true
  - false
- 244) Liquid crystals exhibit properties of both liquids and gases.
- true
  - false
- 245) Liquids are anisotropic because their properties are independent of the axis of testing.
- true
  - false

- 246) Liquid crystals are anisotropic because the properties they display depend on the direction (orientation) of the measurement.
- true
  - false
- 247) Polystyrene with air or gas blown into the solid is the main component in Styrofoam.
- true
  - false
- 248) Polyethylene consisting primarily of unbranched chains is known as high-density polyethylene (HDPE).
- true
  - false
- 249) A polymer where the monomers are connected by an amide linkage are called polyamines.
- true
  - false
- 250) The monomer for a polyester has the general formula of RCOOR'.
- true
  - false
- 251) Ceramics are usually formed by melting and then solidifying inorganic substances such as clays.
- true
  - false
- 252) Ceramics are polymeric inorganic compounds that have low melting points.
- true
  - false
- 253) Nonmetals are more electropositive than metals.
- true
  - false
- 254) Hydrogen is placed at the top of Group 1 of the periodic table, so it must be a metal.
- true
  - false

- 255) Binary hydrides contain hydrogen and either a metal or nonmetal.  
 true  
 false
- 256) Of the three oxides  $\text{SiO}_2$ ,  $\text{MgO}$ , and  $\text{P}_4\text{O}_{10}$ , the most acidic oxide is  $\text{P}_4\text{O}_{10}$ .  
 true  
 false
- 257)  $\text{P}_4\text{O}_6$  and  $\text{P}_4\text{O}_{10}$  are allotropes of phosphorus.  
 true  
 false
- 258) Alkali metal hydrides are very reactive with water, forming  $\text{H}_2$  gas.  
 true  
 false
- 259) The chemistry of fluorine differs in many ways from that of the rest of the halogens.  
 true  
 false
- 260) Ionic hydrides do not have exact (stoichiometric) formulas.  
 true  
 false
- 261) The acidity of oxides of main group elements increases across a period from left to right.  
 true  
 false
- 262) The acidity of oxides of main group elements increases down a group, from top to bottom.  
 true  
 false
- 263) The Haber process is the first step in the manufacture of sulfuric acid.  
 true  
 false
- 264) Phosphoric acid ( $\text{H}_3\text{PO}_4$ ) is a strong acid.  
 true  
 false