Name: KEY

A 1) A true solution is *best* described as a

A) homogeneous mixture
B) homogeneous compound
C) heterogeneous mixture
D) heterogeneous compound

B 2) Which sample represents a homogeneous mixture?

A) $C_2H_5OH(s)$ B) $C_2H_5OH(aq)$ C) $C_2H_5OH(g)$ D) $C_2H_5OH(\ell)$

D 3) A compound differs from a mixture in that a compound *always* has a

A) heterogeneous composition
B) minimum of three components
C) maximum of two components
D) homogeneous composition

B 4) Ductility and malleability are examples of

A) properties of nonmetals
B) physical properties
C) properties of all matter
D) chemical properties

D 5) Compounds are usually broken down into their component elements by

A) filtration
B) evaporation
C) physical changes
D) chemical changes

C 6) Burning is an example of a change that is

A) physical B) intensive C) chemical D) endothermic

A 7) An example of a substance that can be decomposed by a chemical change is

A) water B) helium C) silver D) iron

B 8) The combustion of propane is *best* described as an

A) endothermic chemical change
B) exothermic chemical change
C) exothermic physical change
D) endothermic physical change

C 9) A solid is dissolved in a beaker of water. Which observation suggests that the process is endothermic?

A) The solution changes color.
B) The solution gives off a gas.
C) The temperature of the solution decreases.
D) The temperature of the solution increases.

A 10) Given the reaction:

$$H_2 + Cl_2 \longrightarrow 2HCl$$

Which of the following statements *best* describes the energy change as bonds are formed and broken in this reaction?

A) The forming of the H—Cl bond releases energy.
B) The breaking of the H—H bond releases energy.
C) The forming of the H—Cl bond absorbs energy.
D) The breaking of the Cl—Cl bond releases energy.

D 11) The temperature of 15 grams of water increased 3.0 Celsius degrees. How much heat was absorbed by the water? [*Specific Heat of Water = 4.18 J/g •k*]

A) 5.0 joules B) 12 joules C) 63 joules D) 188 joules

B 12) How many kilojoules of heat are absorbed when 70.00 grams of water is completely vaporized at its boiling point? [*Specific Heat of Water = 4.18 J/g •k*]

A) 2,259 kJ B) 158.1 kJ C) 2.259 kJ D) 158,130 kJ

B 13) What type of energy is stored within a chemical substance?

A) free energy
B) potential energy
C) activation energy
D) kinetic energy

C 14) What unit is used to express the amount of energy absorbed or released during a chemical reaction?

A) gram B) torr C) joule D) degree

D 15) The amount of heat required to raise the temperature of one gram of a substance by one degree Celsius is called

A) heat of fusion
B) heat of vaporization
C) vapor pressure
D) specific heat capacity

C 16) How many joules are equivalent to 35 kilojoules?

A) 3,500 joules B) 0.035 joule C) 35,000 joules D) 0.35 joule

D 17) Two pure water samples held in separate containers at 1 atmosphere pressure must have molecules possessing the same average kinetic energy if the samples have the same

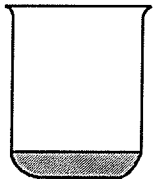
A) density B) volume C) mass D) temperature

C 18) Which substance is made of particles with the *highest* average kinetic energy?

A) $CO_2(g)$ at 25°C
B) $H_2O(\ell)$ at 30°C
C) Fe(s) at 35°C
D) $Br_2(\ell)$ at 20°C

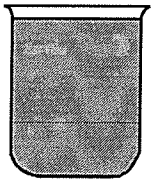
B 19) In which beaker would the particles have the *highest* average kinetic energy?

A)



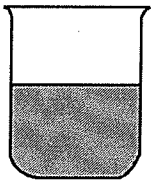
50 milliliters
0.1 M HCl at 10°C

C)



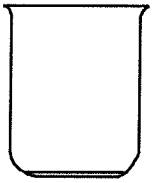
400 milliliters
0.1 M HCl at 15°C

B)



200 milliliters
0.1 M HCl at 30°C

D)



10 milliliters
0.1 M HCl at 20°C

D 20) Compared to the average kinetic energy of 1 mole of water at 0°C, the average kinetic energy of 1 mole of water at 298 K is

A) the same, and the number of molecules is the same
B) the same, but the number of molecules is greater
C) greater, and the number of molecules is greater
D) greater, but the number of molecules is the same

A 21) The temperature of a substance changes from -173°C to 0°C. How many Kelvin degrees does this change represent?

A) 173 B) 273 C) 446 D) 100.

A 22) Under the same conditions of temperature and pressure, a liquid differs from a gas because the particles of the liquid

A) have stronger forces of attraction between them
B) take the shape of the container they occupy
C) are in constant straight-line motion
D) have no regular arrangement

D 23) Which sample contains particles arranged in a regular geometric pattern?

A) $CO_2(\ell)$ B) $CO_2(aq)$ C) $CO_2(g)$ D) $CO_2(s)$

C 24) At STP, which element has a definite shape and volume?

A) Xe B) Hg C) Ag D) Ne

A 25) At what point do a liquid and a solid exist at equilibrium?

A) melting point
B) boiling point
C) vaporization point
D) sublimation point

B 26) The number of joules per gram required to melt ice at its melting point is called

A) heat of vaporization
B) heat of fusion
C) sublimation
D) vapor pressure

D 27) What is the total number of joules of heat needed to change 150.0 grams of ice to water at 0°C? (heat of fusion = 333.6 J/g)

A) 2.224 B) 1,394 C) 333.6 D) 50,040

C 28) The phase change represented by the equation $I_2(s) \longrightarrow I_2(g)$ is called

A) condensation
B) boiling
C) sublimation
D) melting

B 29) Solid substances are *most* likely to sublime if they have

A) low vapor pressures and weak intermolecular attractions
B) high vapor pressures and weak intermolecular attractions
C) high vapor pressures and strong intermolecular attractions
D) low vapor pressures and strong intermolecular attractions

B 30) The *strongest* intermolecular forces of attraction exist in a liquid whose heat of vaporization is

A) 200 J/g B) 400 J/g C) 300 J/g D) 100 J/g

A 31) As the temperature of a liquid increases, its vapor pressure

A) increases B) decreases C) remains the same

B 32) What is the boiling point of propanone at standard atmospheric pressure?

A) 78°C B) 56°C C) 30°C D) 100°C

D 33) According to the *Vapor Pressure of Four Liquids* chemistry reference table, if the pressure on the surface of water in the liquid state is 47.0 kPa, the water will boil at

A) 35°C B) 60°C C) 95°C D) 80°C

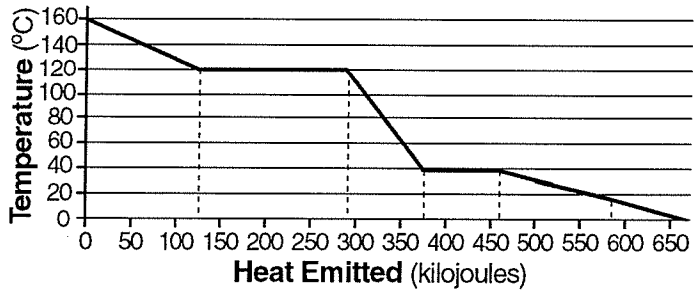
C 34) Which phase change is endothermic?

A) gas to liquid
B) gas to solid
C) liquid to gas
D) liquid to solid

D 35) Which change results in a release of energy?

A) the melting of $H_2O(s)$
B) the evaporation of $H_2O(\ell)$
C) the boiling of $H_2O(\ell)$
D) the condensation of $H_2O(g)$

D 36) The graph below represents the uniform cooling of a substance starting as a gas at 160°C.



At which temperature does a phase change occur for this substance?

A) 80°C B) 0°C C) 140°C D) 40°C

A 37) An ideal gas is made up of gas particles that

A) are in random motion
B) can be liquefied
C) have volume
D) attract each other

A 38) An assumption of the kinetic theory of gases is that the particles of a gas have

A) little attraction for each other and an insignificant volume
B) little attraction for each other and a significant volume
C) strong attraction for each other and a significant volume
D) strong attraction for each other and an insignificant volume

C 39) A flask containing molecules of gas *A* and a separate flask containing the molecules of gas *B* are both at the same temperature. Gases *A* and *B* must have equal

A) pressures
B) masses
C) average kinetic energies
D) volumes

C 40) One reason that a real gas deviates from an ideal gas is that the molecules of the real gas have

A) a negligible volume
B) a straight-line motion
C) forces of attraction for each other
D) no net loss of energy on collision

C 41) Real gas behavior deviates from ideal gas behavior because real gas particles have

A) no volume but some attraction for each other
B) no volume and no attraction for each other
C) volume and some attraction for each other
D) volume but no attraction for each other

B 42) As the space between molecules in a gas sample decreases, the tendency for the behavior of this gas to deviate from the ideal gas laws

A) remains the same
B) increases
C) decreases

A 43) Under what conditions does a real gas behave *most* like an ideal gas?

A) at high temperatures and low pressures
B) at high temperatures and high pressures
C) at low temperatures and high pressures
D) at low temperatures and low pressures

A 44) Which gas under high pressure and low temperature has a behavior *closest* to that of an ideal gas?

A) $H_2(g)$
B) $O_2(g)$
C) $CO_2(g)$
D) $NH_3(g)$

B 45) At constant temperature, the pressure on 8.0 liters of a gas is increased from 1 atmosphere to 4 atmospheres. What will be the new volume of the gas?

A) 4.0 L
B) 2.0 L
C) 32 L
D) 1.0 L

D 46) A gas occupies a volume of 30 milliliters at 273 K. If the temperature is increased to 364 K while the pressure remains constant, what will be the volume of the gas?

A) 30 mL
B) 20 mL
C) 60 mL
D) 40 mL

C 47) A sample of gas is at STP. As the pressure decreases and the temperature increases, the volume of the gas

A) decreases
B) remains the same
C) increases

C 48) A 0.500-mole sample of a gas has a volume of 11.2 liters at 273 K. What is the pressure of the gas?

A) 273 atm
B) 0.500 atm
C) 1.00 atm
D) 11.2 atm

D 49) A gas has a volume of 1,400 milliliters at a temperature of 20.0 K and a pressure of 101.3 kPa. What will be the volume when the temperature is changed to 40.0 K and the pressure is changed to 50.65 kPa?

A) 350 mL
B) 750 mL
C) 1,400 mL
D) 5,600 mL

D 50) A sealed flask contains 1 mole of hydrogen and 3 moles of helium gas at 20° C. If the total pressure is 40 kPa, what is the partial pressure of the hydrogen gas?

A) 20 kPa
B) 30 kPa
C) 40 kPa
D) 10 kPa

C 51) Equal volumes of all gases at the same temperature and pressure contain an equal number of

A) atoms
B) electrons
C) molecules
D) protons

C 52) An example of a binary compound is

A) sodium
B) mercury
C) ammonia
D) ethanol

A 53) What is the correct name for the compound with the formula $CrPO_4$?

A) chromium (III) phosphate
B) chromium (II) phosphide
C) chromium (III) phosphide
D) chromium (II) phosphate

B 54) What is the correct chemical formula for sodium sulfate?

A) $NaSO_4$ B) Na_2SO_4 C) Na_2SO_3 D) $NaSO_3$

D 55) What is the chemical formula for copper (II) chlorate?

A) Cu_2Cl B) Cu_2ClO_3 C) $CuCl_2$ D) $Cu(ClO_3)_2$

A 56) What is the chemical formula for mercury (I) chloride?

A) Hg_2Cl_2 B) Hg_2Cl C) Hg_2Cl_4 D) $HgCl_2$

C 57) What is the formula for the compound that forms when magnesium bonds with phosphorus?

A) MgP_2 B) Mg_2P C) Mg_3P_2 D) Mg_2P_3

D 58) An example of an empirical formula is

A) C_2H_2 B) H_2O_2 C) C_2Cl_2 D) $CaCl_2$

A 59) The formula H_2 represents one

A) molecule B) atom C) liter D) gram

B 60) The formula N_2O_4 is an example of

A) an ionic formula
B) a molecular formula
C) an empirical formula
D) a structural formula

D 61) Which represents *both* an empirical and molecular formula?

A) C_3H_6 B) N_2O_4 C) $C_6H_{12}O_6$ D) P_2O_5

D 62) What is the total number of atoms of oxygen in the formula $Al(ClO_3)_3 \cdot 6H_2O$?

A) 9 B) 6 C) 10 D) 15

A 63) How many carbon atoms are represented by $3Mg(HCO_3)_2$?

A) 6 B) 2 C) 3 D) 18

A 64) What is the total mass of iron in 1.0 mole of Fe_2O_3?

A) 112 g B) 72 g C) 160 g D) 56 g

B 65) A sealed container of nitrogen gas contains 6×10^{23} molecules at STP. As the temperature increases, the mass of the nitrogen will

A) increase B) remain the same C) decrease

B 66) The total number of sodium atoms in 46.0 grams of sodium is

A) 24.0×10^{23} B) 12.0×10^{23} C) 3.01×10^{23} D) 6.02×10^{23}

A 67) How many molecules are in 0.25 mole of O_2?

A) 1.5×10^{23} B) 6.0×10^{23} C) 12×10^{23} D) 3.0×10^{23}

D 68) How many moles of hydrogen atoms are there in one mole of $C_6H_{12}O_6$ molecules?

A) $12(6.0 \times 10^{23})$
B) $24(6.0 \times 10^{23})$
C) 24
D) 12

A 69) How many moles of hydrogen atoms are present in one mole of $C_2H_4(OH)_2$?

A) 6 B) 2 C) 8 D) 4

B 70) What is the percent by mass of oxygen in $Ca(OH)_2$?

A) 22 B) 43 C) 74 D) 16

A 71) Given the reaction:

$$2CO + O_2 \longrightarrow 2CO_2$$

What is the minimum number of moles of O_2 required to produce one mole of CO_2?

A) 0.50 B) 2.0 C) 1.0 D) 0.25

D 72) Given the reaction:

$$2KClO_3(s) \longrightarrow 2KCl(s) + 3O_2(g)$$

What is the total number of moles of $KClO_3(s)$ needed to produce 6 moles of $O_2(g)$?

A) 1 B) 2 C) 3 D) 4

B 73) Which pair of atoms would form the *most* stable compound?

A) Li and Br B) Li and F C) Li and Cl D) Li and I

D 74) Electronegativity is a measure of an atom's ability to

A) repel the electrons in the bond between the atom and another atom
B) attract the protons of another atom
C) repel the protons of another atom
D) attract the electrons in the bond between the atom and another atom

B 75) In which compound do the atoms have the *greatest* difference in electronegativity?

A) $AlCl_3$ B) KF C) NaBr D) LiI

A 76) Which electronegativity is possible for an alkali metal?

A) 1.0 B) 2.0 C) 3.0 D) 4.0

B 77) Atoms of nonmetals generally react with atoms of metals by

A) sharing electrons to form ionic compounds
B) gaining electrons to form ionic compounds
C) sharing electrons to form covalent compounds
D) gaining electrons to form covalent compounds

A 78) Which atoms are *most* likely to form covalent bonds?

A) nonmetal atoms that share electrons
B) nonmetal atoms that share protons
C) metal atoms that share protons
D) metal atoms that share electrons

C 79) The bond between hydrogen and oxygen in a water molecule is classified as

A) ionic and nonpolar
B) covalent and nonpolar
C) covalent and polar
D) ionic and polar

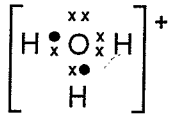
A 80) Which combination of atoms can form a polar covalent bond?

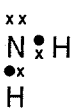
A) H and Br B) Na and Br C) N and N D) H and H

C 81) Which species contains a coordinate covalent bond?

A) H : H

B) $\left[\bullet Hg : Hg \times \right]^{2+}$

C) 

D) 

C 82) What type of bond is present in copper wire?

A) ionic B) electrovalent C) metallic D) covalent

D 83) Which factor distinguishes a metallic bond from an ionic bond or a covalent bond?

A) the mobility of protons
B) the equal sharing of electrons
C) the unequal sharing of electrons
D) the mobility of electrons