

AP Chemistry Summer Assignment Cumulative Assessment Set #2

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 51) A strong electrolyte is one that _____ completely in solution. 51) _____
A) disappears B) reacts C) associates D) ionizes
- 52) Which of the following are strong electrolytes? 52) _____
HCl HC₂H₃O₂ NH₃ KCl
A) HCl, KCl
B) HCl, HC₂H₃O₂, NH₃, KCl
C) HCl, HC₂H₃O₂, KCl
D) HCl, NH₃, KCl
E) HC₂H₃O₂, KCl
- 53) The spectator ions in the reaction between aqueous hydrofluoric acid and aqueous barium hydroxide are _____. 53) _____
A) OH⁻, F⁻, and Ba²⁺
B) H⁺, OH⁻, F⁻, and Ba²⁺
C) F⁻ and Ba²⁺
D) Ba²⁺ only
E) OH⁻ and F⁻
- 54) Which hydroxides are strong bases? 54) _____
Sr(OH)₂ KOH NaOH Ba(OH)₂
A) KOH, NaOH, Ba(OH)₂
B) Sr(OH)₂, KOH, NaOH, Ba(OH)₂
C) KOH, NaOH
D) KOH, Ba(OH)₂
E) None of these is a strong base.
- 55) The concentration (M) of an aqueous methanol produced when 0.200 L of a 2.00 M solution was diluted to 0.800 L is _____. 55) _____
A) 0.400 B) 0.800 C) 0.200 D) 0.500 E) 8.00
- 56) How many grams of NaCl are there in 55.0 mL of a 1.90 M aqueous solution of NaCl? 56) _____
A) 6.11 B) 0.105 C) 6.11 × 10³ D) 3.21 E) 12.2
- 57) Which combination will produce a precipitate? 57) _____
A) AgNO₃ (aq) and Ca(C₂H₃O₂)₂ (aq)
B) KOH (aq) and Mg(NO₃)₂ (aq)
C) NaOH (aq) and HCl (aq)
D) NaC₂H₃O₂ (aq) and HCl (aq)
E) NaOH (aq) and HCl (aq)

- 58) Oxidation is the _____ and reduction is the _____. 58) _____
 A) gain of oxygen, loss of mass
 B) gain of oxygen, loss of electrons
 C) gain of electrons, loss of electrons
 D) loss of oxygen, gain of electrons
 E) loss of electrons, gain of electrons
- 59) In which species does sulfur have the highest oxidation number? 59) _____
 A) S₈ (elemental form of sulfur)
 B) H₂SO₃
 C) H₂S
 D) SO₂
 E) K₂SO₄
- 60) What volume (mL) of 0.135 M NaOH is required to neutralize 13.7 mL of 0.129 M HCl? 60) _____
 A) 0.24 B) 6.55 C) 0.076 D) 14.3 E) 13.1
- 61) The specific heat capacity of liquid water is 4.18 J/g·K. How many joules of heat are needed to raise the temperature of 5.00 g of water from 25.1°C to 65.3°C? 61) _____
 A) 54.4
 B) 2.08 × 10⁻²
 C) 1.89 × 10³
 D) 48.1
 E) 840
- 62) ΔH for an endothermic process is _____ while ΔH for an exothermic process is _____. 62) _____
 A) zero, positive
 B) zero, negative
 C) positive, negative
 D) negative, positive
 E) positive, zero
- 63) The value of ΔH° for the reaction below is +128.1 kJ: 63) _____

$$\text{CH}_3\text{OH}(\text{l}) \rightarrow \text{CO}(\text{g}) + 2\text{H}_2(\text{g})$$
 How many kJ of heat are consumed when 5.10 g of CO (g) is formed as shown in the equation?
 A) 23.3 B) 8.31 C) 162 D) 0.182 E) 62.0
- 64) Given the following reactions 64) _____

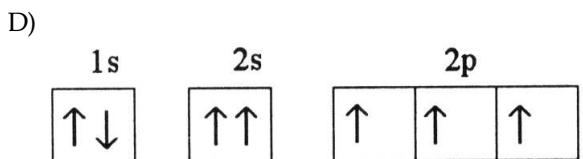
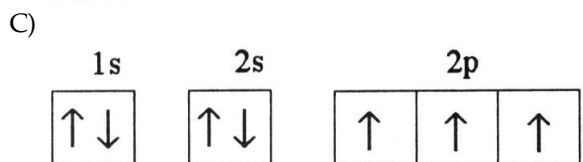
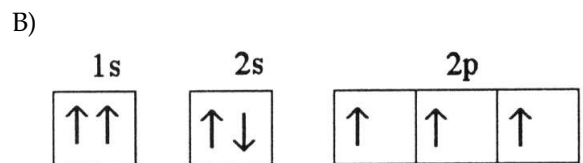
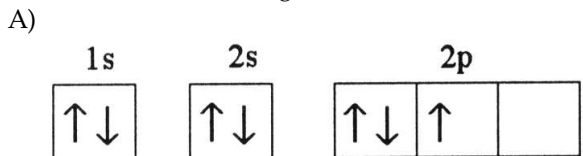
$$\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}(\text{g}) \quad \Delta\text{H} = +180.7 \text{ kJ}$$

$$2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}_2(\text{g}) \quad \Delta\text{H} = -113.1 \text{ kJ}$$
 the enthalpy for the decomposition of NO₂ into molecular nitrogen and oxygen is _____ kJ.

$$2\text{NO}_2(\text{g}) \rightarrow \text{N}_2(\text{g}) + 2\text{O}_2(\text{g})$$
 A) -293.8 B) 67.6 C) 293.8 D) 45.5 E) -67.6

65) The energy of a photon of light is _____ proportional to its frequency and _____ proportional to its wavelength. 65) _____
 A) directly, inversely
 B) directly, directly
 C) inversely, inversely
 D) indirectly, not
 E) inversely, directly

66) Which one of the following is the correct electron configuration for a ground-state nitrogen atom? 66) _____



E) None of the above is correct.

67) How many p-orbitals are occupied in a Ne atom? 67) _____
 A) 3 B) 1 C) 5 D) 6 E) 2

68) $[\text{Ar}]4s^23d^{10}4p^3$ is the electron configuration of a(n) _____ atom. 68) _____
 A) Sb B) Sn C) P D) V E) As

69) The lowest energy shell that contains f orbitals is the shell with $n =$ _____. 69) _____
 A) 4 B) 3 C) 5 D) 1 E) 2

70) At maximum, an f-subshell can hold ____ electrons, a d-subshell can hold ____ electrons, and a p-subshell can hold ____ electrons. 70) _____
 A) 14, 8, 2 B) 14, 10, 6 C) 2, 12, 21 D) 2, 6, 10 E) 2, 8, 18

71) Which of the following would have to gain two electrons in order to achieve a noble gas electron configuration? 71) _____
 O Sr Na Se Br
 A) Sr B) Sr, O, Se C) Br D) Na E) O, Se

- 72) In general, as you go across a period in the periodic table from left to right: 72) _____
 (1) the atomic radius _____;
 (2) the electron affinity becomes _____ negative; and
 (3) the first ionization energy _____.
 A) decreases, decreasingly, increases
 B) decreases, increasingly, increases
 C) increases, increasingly, decreases
 D) decreases, increasingly, decreases
 E) increases, increasingly, increases
- 73) Na reacts with element X to form an ionic compound with the formula Na_3X . Ca will react with X 73) _____
 to form _____.
 A) Ca_3X_2 B) Ca_3X C) CaX D) CaX_2 E) Ca_2X_3
- 74) How many equivalent resonance forms can be drawn for CO_3^{2-} (carbon is the central atom)? 74) _____
 A) 3 B) 2 C) 4 D) 0 E) 1
- 75) The electron-domain geometry of _____ is tetrahedral. 75) _____
 A) CBr_4
 B) PH_3
 C) XeF_4
 D) CCl_2Br_2
 E) all of the above except XeF_4
- 76) The formal charge on carbon in the molecule below is _____. 76) _____

$$\begin{array}{c} \text{:}\ddot{\text{O}}\text{:} \\ \parallel \\ \text{O}=\text{C}=\text{O} \\ \parallel \\ \text{:}\ddot{\text{O}}\text{:} \end{array}$$

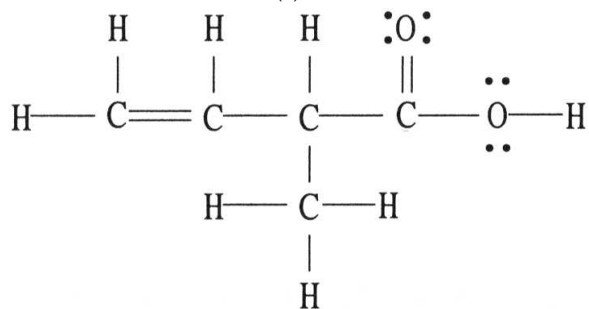
 A) +3 B) +1 C) 0 D) +2 E) -1
- 77) Of the following molecules, only _____ is polar. 77) _____
 A) CBr_4 B) BF_3 C) Cl_2 D) BeCl_2 E) SiH_2Cl_2
- 78) The bond angles marked a, b, and c in the molecule below are about __, __, and __, respectively. 78) _____

$$\begin{array}{ccccccc} & & \text{:}\ddot{\text{O}}\text{:} & \text{H} & \text{:}\ddot{\text{O}}\text{:} & & \\ & & \parallel & | & \parallel & & \\ \text{H} & - & \text{N} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{O} & - & \text{H} \\ & & \text{H} & & & & \text{H} & & & & \text{:}\ddot{\text{O}}\text{:} & & \\ & & \text{a} & & \text{b} & & \text{c} & & & & & & \end{array}$$

 A) $90^\circ, 90^\circ, 90^\circ$
 B) $<109.5^\circ, 120^\circ, 109.5^\circ$
 C) $109.5^\circ, 90^\circ, 120^\circ$
 D) $<120^\circ, 120^\circ, <109.5^\circ$
 E) $120^\circ, <120^\circ, 90^\circ$

79) There is/are _____ π bond(s) in the molecule below.

79) _____



- A) 0 B) 1 C) 2 D) 4 E) 16

80) A sample of a gas originally at 25°C and 1.00 atm pressure in a 2.5 L container is allowed to expand until the pressure is 0.85 atm and the temperature is 15°C. The final volume of the gas is _____ L.

80) _____

- A) 3.0 B) 2.6 C) 2.1 D) 2.8 E) 0.38

81) The amount of gas that occupies 60.82 L at 31 °C and 367 mmHg is _____ mol.

81) _____

- A) 11.6 B) 894 C) 1.18 D) 0.120 E) 0.850

82) Which of the following is not part of the kinetic-molecular theory?

82) _____

- A) Collisions between gas molecules do not result in the loss of energy.
B) Atoms are neither created nor destroyed by ordinary chemical reactions.
C) Attractive and repulsive forces between gas molecules are negligible.
D) Gases consist of molecules in continuous, random motion.
E) The volume occupied by all of the gas molecules in a container is negligible compared to the volume of the container.

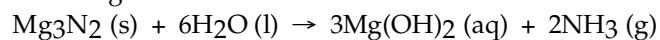
83) Standard temperature and pressure (STP), in the context of gases, refers to _____.

83) _____

- A) 273.15 K and 1 pascal
B) 298.15 K and 1 atm
C) 273.15 K and 1 torr
D) 273.15 K and 1 atm
E) 298.15 K and 1 torr

84) What volume (L) of NH₃ gas at STP is produced by the complete reaction of 7.5 g of H₂O according to the following reaction?

84) _____



- A) 3.1 B) 0.32 C) 28 D) 9.3 E) 19

85) Of the following gases, _____ will have the greatest rate of effusion at a given temperature.

85) _____

- A) HBr B) NH₃ C) HCl D) Ar E) CH₄

86) Of the following substances, only _____ has London dispersion forces as its only intermolecular force.

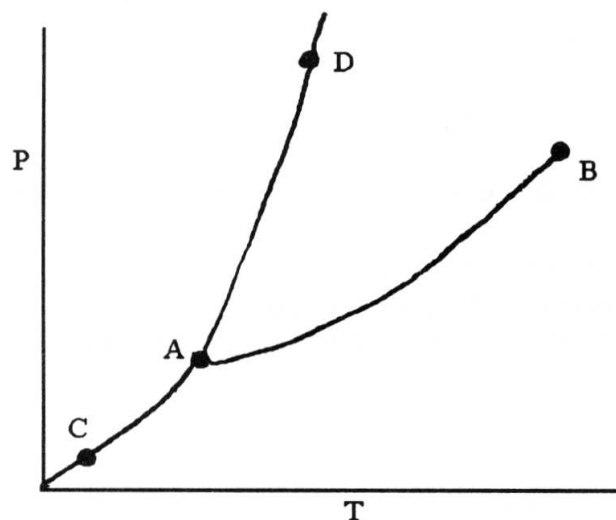
86) _____

- A) CH₃OH B) NH₃ C) HCl D) H₂S E) CH₄

87) Of the following substances, _____ has the highest boiling point.

87) _____

- A) CH₄ B) NH₃ C) CO₂ D) Kr E) H₂O



- 88) On the phase diagram shown above, segment _____ corresponds to the conditions of temperature and pressure under which the solid and the gas of the substance are in equilibrium. 88) _____
 A) AD B) CD C) AB D) AC E) BC
- 89) The phrase "like dissolves like" refers to the fact that _____. 89) _____
 A) polar solvents dissolve polar solutes and nonpolar solvents dissolve nonpolar solutes
 B) condensed phases can only dissolve other condensed phases
 C) gases can only dissolve other gases
 D) solvents can only dissolve solutes of similar molar mass
 E) polar solvents dissolve nonpolar solutes and vice versa
- 90) Which one of the following substances would be the most soluble in CCl_4 ? 90) _____
 A) NH_3
 B) $\text{C}_{10}\text{H}_{22}$
 C) NaCl
 D) $\text{CH}_3\text{CH}_2\text{OH}$
 E) H_2O
- 91) Which of the following substances is more likely to dissolve in CH_3OH ? 91) _____
 A) CCl_4
 B) H_2
 C) N_2
 D) $\text{CH}_3\text{CH}_2\text{OH}$
 E) Kr
- 92) At equilibrium, _____. 92) _____
 A) the rates of the forward and reverse reactions are equal
 B) the rate constants of the forward and reverse reactions are equal
 C) all chemical reactions have ceased
 D) the value of the equilibrium constant is 1
 E) the limiting reagent has been consumed

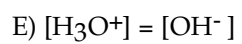
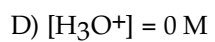
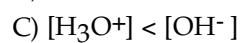
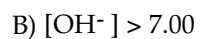
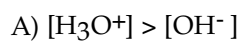
- 93) The equilibrium constant for the gas phase reaction 93) _____

$$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$$
is $K_{\text{eq}} = 4.34 \times 10^{-3}$ at 300°C . At equilibrium, _____.
- A) roughly equal amounts of products and reactants are present
B) products predominate
C) only products are present
D) only reactants are present
E) reactants predominate
- 94) Consider the following chemical reaction: 94) _____

$$\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$$
At equilibrium in a particular experiment, the concentrations of H_2 , I_2 , and HI were 0.15 M, 0.033 M, and 0.55 M, respectively. The value of K_{eq} for this reaction is _____.
- A) 9.0×10^{-3} B) 111 C) 23 D) 61 E) 6.1
- 95) Which of the following expressions is the correct equilibrium-constant expression for the reaction 95) _____
below? $\text{HF}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}_3\text{O}^+(\text{aq}) + \text{F}^-(\text{aq})$
- A) $[\text{H}_3\text{O}^+][\text{F}^-] / [\text{HF}]$
B) $[\text{HF}][\text{H}_2\text{O}] / [\text{H}_3\text{O}^+][\text{F}^-]$
C) $1 / [\text{HF}]$
D) $[\text{H}_3\text{O}^+][\text{F}^-] / [\text{HF}][\text{H}_2\text{O}]$
E) $[\text{F}^-] / [\text{HF}]$
- 96) Consider the following reaction at equilibrium: 96) _____

$$2\text{NH}_3(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \quad \Delta H^\circ = +92.4 \text{ kJ}$$
Le Chatelier's principle predicts that adding $\text{N}_2(\text{g})$ to the system at equilibrium will result in ____.
- A) removal of all of the $\text{H}_2(\text{g})$
B) a lower partial pressure of N_2
C) a decrease in the concentration of $\text{H}_2(\text{g})$
D) an increase in the value of the equilibrium constant
E) a decrease in the concentration of $\text{NH}_3(\text{g})$
- 97) According to the Arrhenius concept, an acid is a substance that _____. 97) _____
- A) tastes bitter
B) causes an increase in the concentration of H^+ in aqueous solutions
C) is capable of donating one or more H^+
D) reacts with the solvent to form the cation formed by autoionization of that solvent
E) can accept a pair of electrons to form a coordinate covalent bond
- 98) A Brønsted-Lowry acid is defined as a substance that _____. 98) _____
- A) increases $[\text{OH}^-]$ when placed in H_2O
B) increases K_{a} when placed in H_2O
C) acts as a proton donor
D) acts as a proton acceptor
E) decreases $[\text{H}^+]$ when placed in H_2O

99) In basic solution, _____.



99) _____

100) What is the pH of an aqueous solution at 25.0 °C in which $[\text{H}^+]$ is 0.0025 M?

A) 3.40

B) 2.60

C) 2.25

D) -2.60

E) -3.40

100) _____