Name _____ **AP Chemistry**

HW 11_3: Due 2/17/15 Write the letter of the correct answer on the line in front of the question.

1. B D What mass of KBr (molar mass 119 g mol^{-1}) is required to make 250. mL of a 0.400 *M* KBr solution?
(A) 0.595 g (B) 1.19 g (C) 2.50 g (D) 11.9 g (E) 47.6 g

2. B C A sample of a solution of RbCl (molar mass 121 g mol−1) contains 11.0 percent RbCl by mass. From the following information, what is needed to determine the molarity of RbCl in the solution?
I. Mass of the sample
II. Volume of the sample
III. ~~Temperature of the sample~~
(A) I only (B) II only (C) I and II only
~~(D) II and III only~~ ~~(E) I, II, and III~~

3. B Which of the following aqueous solutions has the highest boiling point at 1.0 atm?
(A) 0.20 *M* $CaCl_2$ (B) 0.25 *M* Na_2SO_4 (C) 0.30 *M* NaCl
(D) 0.30 *M* KBr (E) 0.40 *M* $C_6H_{12}O_6$

4. E Molarity units are most appropriate in calculating which of the following?
(A) freezing point depression (B) vapor pressure (C) boiling point elevation
(D) surface tension (E) osmotic pressure

5. D The weight of H_2SO_4 (molecular weight 98.1) in 500.0 milliliters of a 6.00-molar solution is
(A) 3.10 grams (B) 12.0 grams (C) 29.4 grams (D) 294 grams (E) 300. grams

6. A Which of the following solutions has the lowest boiling point?
(A) 0.20 *m* $C_6H_{12}O_6$, glucose (B) 0.20 *m* NH_4Br (C) 0.20 *m* $ZnSO_4$
(D) 0.20 *m* $KMnO_4$ (E) 0.20 *m* $MgCl_2$

7. C If the temperature of an aqueous solution of NaCl is increased from 20 °C to 90 °C, which of the following statements is true?
(A) The density of the ~~solution remains unchanged~~.
(B) The molarity of the solution remains unchanged.
(C) The molality of the solution remains unchanged.
(D) The mole fraction of solute decreases.
(E) The mole fraction of solute increases.

8. C I. freezing point depression II. osmotic pressure III. vapor pressure
Mole fractions are typically used to calculate which properties for solutions containing nonvolatile solutes?
(A) I only (B) II only (C) III only (D) I and II only (E) II and III only

9. B Fish kills are often observed in lakes and ponds in the summer but rarely in the winter. A contributing factor is the use of oxygen by decaying algae. Another factor is:
(A) the higher solubility of toxic metals in the summer
(B) the decreased solubility of oxygen at higher temperature
(C) the high temperature itself kills the fish
(D) the toxicity of decaying algae
(E) soluble nutrients are generally less soluble at higher temperatures

10. E Ethyl alcohol, C_2H_5OH, and water become noticeably warmer when mixed. This is due to:
(A) the decrease in volume when they are mixed
(B) smaller attractive forces in the mixture than in the pure liquids
(C) the hydrogen bonding of the two liquids
(D) the change in vapor pressure observed
(E) stronger attractive forces in the mixture than in the pure liquids

11. E The molality of the glucose in a 1.0-molar glucose solution can be obtained by using which of the following?
(A) Volume of the solution (B) Temperature of the solution (C) Solubility of glucose in water
(D) Degree of dissociation of glucose (E) Density of the solution

12. C What is the mole fraction of ethanol, C_2H_5OH, in an aqueous solution in which the ethanol concentration is 5.02 molal?
(A) 0.0046 (B) 0.076 (C) 0.083 (D) 0.20 (E) 0.72 5.2 / 5.2 55.5

13. E If equal numbers of moles of each of the following are dissolved in 1 kg of distilled water, the one with the lowest boiling point will be:
(A) NaF (B) $AlCl_3$ (C) $Mg(C_2H_3O_2)_2$ (D) CH_3CH_2COOH (E) C_6H_6

14. A solution of hydrochloric acid has a density of 1.15 grams per mL and is 30.% by weight HCl.
(a) What is the molarity of this solution of HCl?
(b) What volume of this solution should be taken in order to prepare 5.0 liters of 0.20-molar hydrochloric acid by dilution with water?
(c) In order to obtain a precise concentration, the 0.20-molar hydrochloric acid is standardized against pure HgO (molecular weight = 216.59) by titrating the OH^- produced according to the following quantitative reaction:

$$HgO(s) + 4I^- + H_2O \rightarrow HgI_4^{2-} + 2OH^-$$

In a typical experiment, 0.7147 gram of HgO required 31.67 milliliters of the hydrochloric acid solution for titration. Based on these data, what is the molarity of the HCl solution expressed to four significant figures?

vol. 87.0 mL

mass 30 70 100

mol 0.822

a. $\frac{0.822}{0.087} = 9.45\,M$

b. $(9.45)(x) = (5)(0.20)$

$x = 0.106\,L$

c. $0.7147 \div 216.59 = 0.00330$ mole HgO $\left|\frac{2\text{ mol } OH^-}{1\text{ mol } HgO}\right. = 0.00660$ mole OH^-

$H^+ + OH^- \rightarrow H_2O$

$\frac{0.00660}{0.03167} = 0.208\,M$