Name _____ AP Chemistry

HW 11_2: Due 2/13/20 Write the letter of the correct answer on the line in front of the question.

1._____ 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

2. _____ At 20.°C, the vapor pressure of toluene is 22 millimeters of mercury and that of benzene is 75 millimeters of mercury. An ideal solution, equimolar in toluene and benzene, is prepared. At 20.°C, what is the mole fraction of benzene in the vapor in equilibrium with this solution?
(A) 0.23 (B) 0.29 (C) 0.50 (D) 0.77 (E) 0.83

3. _____ What is the mole fraction of ethanol, C_2H_5OH, in an aqueous solution in which the ethanol concentration is 4.6 molal?
(A) 0.0046 (B) 0.076 (C) 0.083 (D) 0.20 (E) 0.72

4. _____ Which of the following aqueous solutions has the highest boiling point?
(A) 0.10 M potassium sulfate, K_2SO_4 (B) 0.10 M hydrochloric acid, HCl (C) 0.10 M ammonium nitrate, NH_4NO_3
(D) 0.10 M magnesium sulfalte, $MgSO_4$ (E) 0.20 M sucrose, $C_{12}H_{22}O_{11}$

5. _____ The weight of H_2SO_4 (molecular weight 98.1) in 50.0 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. _____ Which of the following does NOT behave as an electrolyte when it is dissolved in water?
(A) CH_3OH (B) K_2CO_3 (C) NH_4Br (D) HI (E) Sodium acetate, CH_3COONa

7. _____ A solution of toluene (molecular weight 92.1) in benzene (molecular weight 78.1) is prepared. The mole fraction of toluene in the solution is 0.100. What is the molality of the solution?
(A) 0.100 *m* (B) 0.703 *m* (C) 0.921 *m* (D) 1.28 *m* (E) 1.42 *m*

8. _____ Which of the following solutions has the lowest freezing 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* $MgCl_2$

9. _____ Which of the following pairs of liquids forms the solution that is most ideal (most closely follows Raoult's law)?
(A) $C_8H_{18}(l)$ and $H_2O(l)$ (B) $CH_3CH_2CH_2OH(l)$ and $H_2O(l)$ (C) $H_2SO_4(l)$ and $H_2O(l)$
(D) $CH_3CH_2CH_2OH(l)$ and $C_8H_{18}(l)$ (E) $C_6H_{14}(l)$ and $C_8H_{18}(l)$

10. _____ 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 liquid

11. _____ Which solute produces the highest boiling point in a 0.15 m aqueous solution?
(A) $CaCl_2$ (B) NaBr (C) $CuSO_4$ (D) CH_3OH (E) Li

12. _____ The volume of distilled water that should be added to 10.0 mL of 6.00 M $HCl_{(aq)}$ in order to prepare a 0.500 M $HCl_{(aq)}$ solution is approximately…
(A) 50.0 mL (B) 60.0 mL (C) 100. mL (D) 110. mL (E) 120. mL

13. _____ A solution is made by dissolving a nonvolatile solute in pure solvent. Compared to the pure solvent, the solution…
(A) has a higher normal boiling point. (B) has a higher vapor pressure. (C) has the same vapor pressure.
(D) has a higher freezing point. (E) is more nearly ideal.

14. _____ What is the mole fraction of ethanol, C_2H_5OH, in an aqueous solution that is 46 percent ethanol by mass?
(A) 0.25 (B) 0.46 (C) 0.54 (D) 0.67 (E) 0.75

15. _____ Approximately what mass of $CuSO_4 \cdot 5H_2O$ (250 g mol^{-1}) is required to prepare 250 mL of 0.10 M copper (II) sulfate solution?
(A) 4.0 g (B) 6.2 g (C) 34 g (D) 85 g (E) 140 g

16. _____ 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

17. _____ What is the mole fraction of ethanol, C_2H_5OH, in an aqueous solution where the ethanol concentration is 5.02 molal?
(A) 0.0046 (B) 0.076 (C) 0.083 (D) 0.20 (E) 0.72

18. _____ If equal 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

19. _____ If 200. mL of 0.60 M $MgCl_{2(aq)}$ is added to 400. mL of distilled water, what is the concentration of $Mg^{2+}_{(aq)}$ in the resulting solution? (Assume volume are additive.)
(A) 0.20 M (B) 0.30 M (C) 0.40 M (D) 0.60 M (E) 1.2 M

20. _____ The vapor pressure of pure water at 25°C is 24.0 mm Hg. What is the expected vapor pressure at 25°C of an ideal solution of a nonvolatile non-electrolyte in which the mole fraction of water is 0.900 ?
(A) 1.48 mm Hg (B) 2.40 mm Hg (C) 21.6 mm Hg (D) 24.0 mm Hg (E) 26.7 mm Hg

21. _____ The volume of water that must be added in order to dilute 40 mL of 9.0 *M* HCl to a concentration of 6.0 *M* is:
(A) 10 mL (B) 20 mL (C) 30 mL (D) 40 mL (E) 60 mL

22. _____ Which of the following aqueous solutions has the lowest freezing point?
(A) 0.2 *m* NaCl (B) 0.2 *m* $CaCl_2$ (C) 0.2 *m* H_2SO_4 (D) 0.2 *m* NH_3 (E) 0.2 *m* $Al(NO_3)_3$

23. _____ A chemical supply company sells a concentrated solution of aqueous H_2SO_4 (molar mass 98 g mol^{-1}) that is 50. percent H_2SO_4 by mass. At 25°C, the density of the solution is 1.4 g mL^{-1}. What is the molarity of the H_2SO_4 solution at 25°C?
(A) 1.8 *M* (B) 3.6 *M* (C) 5.1 *M* (D) 7.1 *M* (E) 14 *M*

24. _____ A solution of methanol, CH_3OH , in water is prepared by mixing together 128 g of methanol and 108 g of water. The mole fraction of methanol in the solution is closest to:
(A) 0.80 (B) 0.60 (C) 0.50 (D) 0.40 (E) 0.20

25. _____ When a student prepares an aqueous solution containing the five cations $Ag^+(aq)$, $Hg_2^{2+}(aq)$, $Cu^{2+}(aq)$, $Mn^{2+}(aq)$, and $Ba^{2+}(aq)$, the student observes that no precipitates form in the solution. Which of the following could be the identity of the anion in the solution?
(A) $Cl^-(aq)$ (B) $CO_3^{2-}(aq)$ (C) $CrO_4^{2-}(aq)$ (D) $NO_3^-(aq)$ (E) $SO_4^{2-}(aq)$

26. _____ What is the molarity of $I^-(aq)$ in a solution that contains 34 g of SrI_2 (molar mass 341 g) in 1.0 L of the solution?
(A) 0.034 *M* (B) 0.068 *M* (C) 0.10 *M* (D) 0.20 *M* (E) 0.68 *M*

27. _____ 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

28. _____ 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

29. _____ 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* $C_6H_{12}O_6$

30. _____ 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

31. _____ 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

32. _____ 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* $MgCl_2$