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

1) The process of solute particles being surrounded by solvent particles is known as _____. 1) _____

A) dehydration

B) agglutination

C) solvation

D) agglomeration

E) salutation

2) Pairs of liquids that will mix in all proportions are called _____ liquids. 2) _____

A) saturated

B) miscible

C) supersaturated

D) unsaturated

E) polar liquids

3) The solubility of oxygen gas in water at 25 °C and 1.0 atm pressure of oxygen is 0.041 g/L. The solubility of oxygen in water at 3.0 atm and 25 °C is _____ g/L. 3) _____

A) 0.014 B) 0.12 C) 0.041 D) 3.0 E) 0.31

4) The solubility of nitrogen gas in water at 25 °C and a nitrogen pressure of 1.0 atm is 6.9×10^{-4} M. The solubility of nitrogen in water at a nitrogen pressure of 0.80 atm is _____ M. 4) _____

A) 5.5×10^{-4} B) 0.80 C) 1.2×10^{3} D) 3.7×10^{-3} E) 8.6×10^{-4}

5) The solubility of Ar in water at 25 °C is 1.6×10^{-3} M when the pressure of the Ar above the solution is 1.0 atm. The solubility of Ar at a pressure of 2.5 atm is _____ M. 5) _____

A) 6.4×10^{-4} B) 4.0×10^{-3} C) 7.5×10^{-2} D) 1.6×10^{3} E) 1.6×10^{-3}

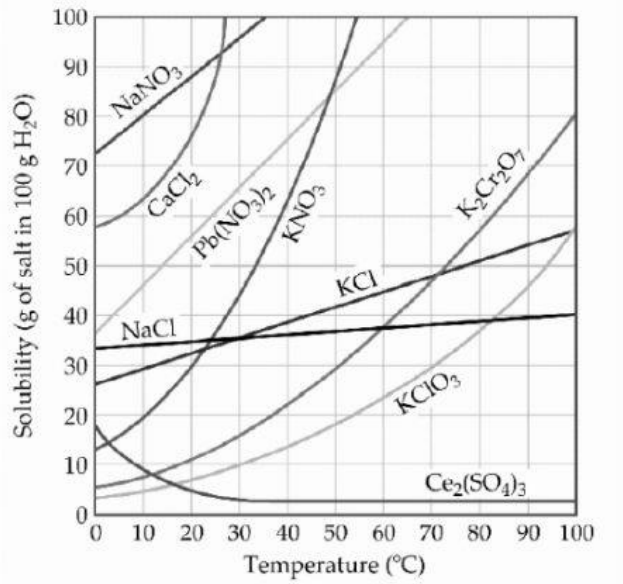
6) On a clear day at sea level, with a temperature of 25 °C, the partial pressure of N_2 in air is 0.78 atm and the concentration of nitrogen in water is 5.3×10^{-4} M. When the partial pressure of N_2 is _____ atm, the concentration in water is 1.1×10^{-3} M. 6) _____

A) 1.6 atm B) 1.0 atm C) 0.78 atm D) 2.1 atm E) 0.63 atm

7) Which one of the following vitamins is water soluble? 7) _____

A
B
K
D
E

A) A B) B C) K D) D E) E



8) A sample of potassium nitrate (49.0 g) is dissolved in 101 g of water at 100 °C, with precautions taken to avoid evaporation of any water. The solution is cooled to 30.0 °C and no precipitate is observed. This solution is _____. 8) _____

A) placated

B) hydrated

C) saturated

D) supersaturated

E) unsaturated

9) A sample of potassium chlorate (15.0 g) is dissolved in 201 g of water at 70 °C, with precautions taken to avoid evaporation of any water. The solution is cooled to 30.0 °C and no precipitate is observed. This solution is _____. 9) _____

A) saturated

B) supersaturated

C) miscible

D) hydrated

E) unsaturated

10) A sample of potassium nitrate (49.0 g) is dissolved in 101 g of water at 100 °C, with precautions taken to avoid evaporation of any water. The solution is cooled to 30.0 °C and a small amount of precipitate is observed. This solution is _____. 10) _____

A) unsaturated

B) supersaturated

C) hydrated

D) saturated

E) placated

11) The solubility of $MnSO_4$ monohydrate in water at 20 °C is 70.0 g per 100.0 mL of water. A solution at 20 °C that is 4.22 *M* in $MnSO_4$ monohydrate is best described as a(n) _____ solution. The formula weight of $MnSO_4$ monohydrate is 168.97 g/mol. 11) _____

A) saturated

B) unsaturated

C) supersaturated

D) solvated

E) hydrated

12) A solution is prepared by dissolving 23.7 g of $CaCl_2$ in 375 g of water. The density of the resulting solution is 1.05 g/mL. The concentration of $CaCl_2$ is _____% by mass. 12) _____

A) 5.94 B) 6.24 C) 0.0594 D) 6.32 E) 0.0632

13) The concentration of urea in a solution prepared by dissolving 16 g of urea in 39 g of H_2O is _____% by mass. The molar mass of urea is 60.0 g/mol. 13) _____

A) 29 B) 41 C) 0.41 D) 0.48 E) 0.29

14) The concentration of nitrate ion in a solution that contains 0.900 M aluminum nitrate is _____ M. 14) _____

A) 0.450 B) 0.300 C) 2.70 D) 1.80 E) 0.900

15) The concentration of KBr in a solution prepared by dissolving 2.21 g of KBr in 897 g of water is _____ molal. 15) _____

A) 2.46

B) 0.0186

C) 2.07×10^{-5}

D) 0.0167

E) 0.0207

16) The concentration of lead nitrate ($Pb(NO_3)_2$) in a 0.726 M solution is _____ molal. The density of the solution is 1.202 g/mL. 16) _____

A) 0.650 B) 1.928 C) 0.819 D) 0.476 E) 0.755

17) The concentration of a benzene solution prepared by mixing 12.0 g C_6H_6 with 38.0 g CCl_4 is _____ molal. 17) _____

A) 0.316 B) 4.04 C) 0.508 D) 0.240 E) 0.622

18) A solution is prepared by dissolving 15.0 g of NH_3 in 250 g of water. The density of the resulting solution is 0.974 g/mL. The mole fraction of NH_3 in the solution is _____. 18) _____

A) 0.940 B) 0.0640 C) 16.8 D) 0.0597 E) 0.922

19) A solution is prepared by dissolving 15.0 g of NH_3 in 250 g of water. The density of the resulting solution is 0.974 g/mL. The molarity of NH_3 in the solution is _____. 19) _____

A) 3.24 B) 0.00353 C) 3.53 D) 0.882 E) 60.0

20) A solution is prepared by dissolving 23.7 g of $CaCl_2$ in 375 g of water. The density of the resulting solution is 1.05 g/mL. The concentration of Cl^- in this solution is _____ M. 20) _____

A) 1.20

B) 0.562

C) 6.64×10^{-2}

D) 0.214

E) 1.12

21) A solution is prepared by dissolving 23.7 g of $CaCl_2$ in 375 g of water. The density of the resulting solution is 1.05 g/mL. The concentration of $CaCl_2$ in this solution is _____ molal. 21) _____

A) 5.70 B) 1.76 C) 0.569 D) 0.214 E) 63.2

22) The concentration of HCl in a solution that is prepared by dissolving 5.5 g of HCl in200 g of C_2H_6O is _____ molal. 22) _____

A) 7.5×10^{-4} B) 0.75 C) 1.3 D) 27.5 E) 3.3×10^{-2}

23) The concentration (M) of HCl in a solution prepared by dissolving 5.5 g of HCl in 200 g of C_2H_6O is _____ M. The density of the solution is 0.79 g/mL. 23) _____

A) 21 B) 0.93 C) 6.0×10^{-4} D) 1.72 E) 0.58

24) The mole fraction of He in a gaseous solution prepared from 4.0 g of He, 6.5 g of Ar, and 10.0 g of Ne is _____. 24) _____

A) 0.20 B) 0.86 C) 1.5 D) 0.11 E) 0.61

25) The mole fraction of urea (MW = 60.0 g/mol) in a solution prepared by dissolving 16 g of urea in 39 g of H_2O is _____. 25) _____

A) 0.37 B) 0.58 C) 0.13 D) 0.11 E) 9.1

26) The concentration of urea (MW = 60.0 g/mol) in a solution prepared by dissolving 16 g of urea in 39 g of H_2O is _____ molal. 26) _____

A) 6.9 B) 96 C) 0.11 D) 6.3 E) 0.68

27) The molarity of urea in a solution prepared by dissolving 16 g of urea (MW = 60.0 g/mol) in 39 g of H_2O is _____ M. The density of the solution is 1.3 g/mL. 27) _____

A) 0.11 B) 6.8 C) 3.7 D) 0.16 E) 6.3

28) What is the molarity of sodium chloride in solution that is 13.0% by mass sodium chloride and that has a density of 1.10 g/mL? 28) _____

A) 143

B) 2.23

C) 2.45

D) 1.43×10^{-2}

E) 2.56

29) The concentration of sodium chloride in an aqueous solution that is 2.23 M and that has a density of 1.01 g/mL is _____% by mass. 29) _____

A) 45.3 B) 12.9 C) 10.1 D) 2.21 E) 7.83

30) The vapor pressure of pure ethanol at 60 °C is 0.459 atm. Raoult's Law predicts that a solution prepared by dissolving 10.0 mmol naphthalene (nonvolatile) in 90.0 mmol ethanol will have a vapor pressure of _____ atm. 30) _____

A) 0.0918 B) 0.498 C) 0.790 D) 0.367 E) 0.413

31) The vapor pressure of pure water at 25 °C is 23.8 torr. What is the vapor pressure (torr) of water above a solution prepared by dissolving 18.0 g of glucose (a nonelectrolyte, MW = 180.0 g/mol) in 95.0 g of water? 31) _____

A) 23.4 B) 24.3 C) 0.451 D) 0.443 E) 23.8

32) The vapor pressure of pure water at 25 °C is 23.8 torr. Determine the vapor pressure (torr) of water at 25 °C above a solution prepared by dissolving 35 g of urea (a nonvolatile, non-electrolyte, MW = 60.0 g/mol) in 75 g of water. 32) _____

A) 0.88 B) 3.3 C) 21 D) 27 E) 2.9

33) The freezing point of ethanol (C_2H_5OH) is -114.6 °C. The molal freezing point depression constant for ethanol is 2.00 °C/m. What is the freezing point (°C) of a solution prepared by dissolving 50.0 g of glycerin ($C_3H_8O_3$, a nonelectrolyte) in 200 g of ethanol? 33) _____

A) -114.6 B) -115 C) -120.0 D) -132.3 E) -5.42

34) What is the freezing point (°C) of a solution prepared by dissolving 11.3 g of $Ca(NO_3)_2$ (formula weight = 164 g/mol) in 115 g of water? The molal freezing point depression constant for water is 1.86 °C/m. 34) _____

A) -3.34 B) -1.11 C) 3.34 D) 1.11 E) 0.00

35) A solution containing 10.0 g of an unknown liquid and 90.0 g water has a freezing point of -3.33 °C. Given K_f = 1.86 °C/m for water, the molar mass of the unknown liquid is _____ g/mol. 35) _____

A) 619 B) 333 C) 69.0 D) 62.1 E) 161

36) A solution is prepared by dissolving 0.60 g of nicotine (a nonelectrolyte) in water to make 12 mL of solution. The osmotic pressure of the solution is 7.55 atm at 25 °C. The molecular weight of nicotine is _____ g/mol. 36) _____

A) 160 B) 28 C) 43 D) 50 E) 0.60

37) A solution is prepared by dissolving 6.00 g of an unknown nonelectrolyte in enough water to make 1.00 L of solution. The osmotic pressure of this solution is 0.750 atm at 25.0 °C. What is the molecular weight (g/mol) of the unknown solute? 37) _____

A) 30.6

B) 195

C) 16.4

D) 110

E) 5.12×10^{-3}

38) Calculate the freezing point (0°C) of a 0.05500 m aqueous solution of glucose. The molal freezing-point-depression constant of water is 1.86 °C/m. 38) _____

A) -0.2046 B) 0.0286 C) -0.1023 D) 0.1023 E) -0.05627

39) Calculate the freezing point (0°C) of a 0.05500 m aqueous solution of $NaNO_3$. The molal freezing-point-depression constant of water is 1.86 °C/m. 39) _____

A) -0.2046 B) 0.0286 C) 0.1023 D) -0.1023 E) -0.05627

40) An aqueous solution of a soluble compound (a nonelectrolyte) is prepared by dissolving 33.2 g of the compound in sufficient water to form 250 mL of solution. The solution has an osmotic pressure of 1.2 atm at 25 °C. What is the molar mass (g/mL) of the compound? 40) _____

A) 2.3×10^2 B) 1.0×10^3 C) 6.8×10^2 D) 2.7×10^3 E) 28

41) A 0.15 m aqueous solution of a weak acid has a freezing point of –0.31 °C. What is the percent ionization of this weak acid at this concentration? The molal freezing-point-depression constant of water is 1.86 °C/m. 41) _____

A) 35 B) 31 C) 11 D) 89 E) 17

42) Determine the fraction of ionization of HX if a solution prepared by dissolving 0.020 mol of HX in 115 g of water freezes at –0.47 °C. The molal freezing-point-depression constant of water is 1.86 °C/m. 42) _____

A) 1.45 B) 0.044 C) 0.30 D) 0.45 E) 0.348

43) Determine the freezing point (°C) of a 0.015 molal aqueous solution of $MgSO_4$. Assume i = 2.0 for $MgSO_4$. The molal freezing-point-depression constant of water is 1.86 °C/m. 43) _____

A) 0.000 B) –0.028 C) –0.056 D) –0.084 E) –0.17

44) A solution is prepared by dissolving 2.60 g of a strong electrolyte (formula weight = 101 g/mol) in enough water to make 1.00 L of solution. The osmotic pressure of the solution is 1.25 atm at 25.0 °C. What is the van't Hoff factor (i) for the unknown solute? 44) _____

A) 0 B) 0.99 C) 1.98 D) 2.98 E) 0.630

45) George is making spaghetti for dinner. He places 4.01 kg of water in a pan and brings it to a boil. Before adding the pasta, he adds 58 g of table salt to the water and again brings it to a boil. The temperature of the salty, boiling water is _____°C. 45) _____

It is a nice day at sea level so that pressure is 1.00 atm. Assume negligible evaporation of water. K_b for water is 0.52°C/*m*.

A) 100.26 B) 100.00 C) 100.13 D) 99.74 E) 99.87