

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 N₂ in air is 0.78 atm and the concentration of nitrogen in water is 5.3×10^{-4} M. When the partial pressure of N₂ 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

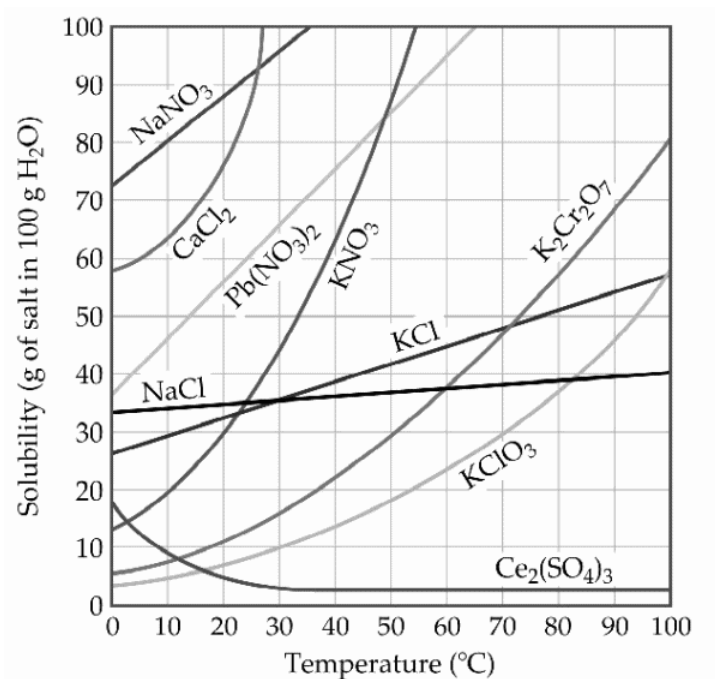
A) A

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 ($\text{Pb}(\text{NO}_3)_2$) 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 in 200 g of $\text{C}_2\text{H}_6\text{O}$ 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 $\text{C}_2\text{H}_6\text{O}$ 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 H₂O 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 H₂O 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 H₂O 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 $-114.6\text{ }^\circ\text{C}$. The molal freezing point depression constant for ethanol is $2.00\text{ }^\circ\text{C/m}$. What is the freezing point ($^\circ\text{C}$) 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 ($^\circ\text{C}$) 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 $1.86\text{ }^\circ\text{C/m}$. 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 $-3.33\text{ }^\circ\text{C}$. Given $K_f = 1.86\text{ }^\circ\text{C/m}$ 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 $25\text{ }^\circ\text{C}$. 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 $25.0\text{ }^\circ\text{C}$. 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 $1.86\text{ }^\circ\text{C/m}$. 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 $1.86\text{ }^\circ\text{C/m}$. 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 $25\text{ }^\circ\text{C}$. What is the molar mass (g/mol) 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 $-0.31\text{ }^{\circ}\text{C}$. What is the percent ionization of this weak acid at this concentration? The molal freezing-point-depression constant of water is $1.86\text{ }^{\circ}\text{C}/m$. 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 $-0.47\text{ }^{\circ}\text{C}$. The molal freezing-point-depression constant of water is $1.86\text{ }^{\circ}\text{C}/m$. 42) _____

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

43) Determine the freezing point ($^{\circ}\text{C}$) 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 $1.86\text{ }^{\circ}\text{C}/m$. 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 $25.0\text{ }^{\circ}\text{C}$. 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 _____ $^{\circ}\text{C}$. 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 $0.52\text{ }^{\circ}\text{C}/m$.

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

Answer Key

Testname: CHAPTER 13. PRACTICE QUESTIONS

- 1) C
- 2) B
- 3) B
- 4) A
- 5) B
- 6) A
- 7) B
- 8) D
- 9) E
- 10) D
- 11) C
- 12) A
- 13) A
- 14) C
- 15) E
- 16) E
- 17) B
- 18) D
- 19) A
- 20) E
- 21) C
- 22) B
- 23) E
- 24) E
- 25) D
- 26) A
- 27) E
- 28) C
- 29) B
- 30) E
- 31) A
- 32) C
- 33) C
- 34) A
- 35) D
- 36) A
- 37) B
- 38) C
- 39) A
- 40) D
- 41) C
- 42) D
- 43) C
- 44) C
- 45) A