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 3) _____
    solubility of oxygen in water at 3.0 atm and 25 °C is _____ g/L.
    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. 4) _____
    The solubility of nitrogen in water at a nitrogen pressure of 0.80 atm is _____ M.
    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 5) _____
    is 1.0 atm. The solubility of Ar at a pressure of 2.5 atm is _____ M.
    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 6) _____
    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.
    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) _____
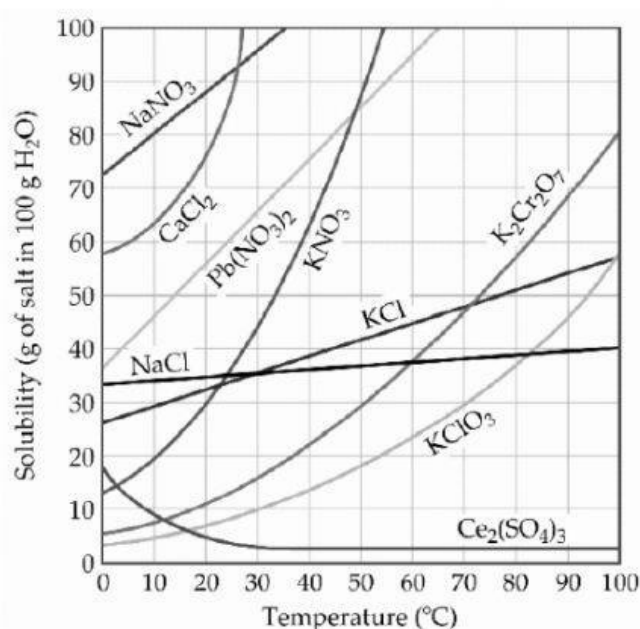
A
B
K
D
E

   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 16) _____ of the solution is 1.202 g/mL.

    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 17) _____
_____ molal.

    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 18) _____ solution is 0.974 g/mL. The mole fraction of NH_3 in the solution is _____.

    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 19) _____ solution is 0.974 g/mL. The molarity of NH_3 in the solution is _____.

    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 20) _____ solution is 1.05 g/mL. The concentration of Cl^- in this solution is _____ M.

    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 21) _____ solution is 1.05 g/mL. The concentration of $CaCl_2$ in this solution is _____ molal.

    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 22) _____ C_2H_6O is _____ molal.

    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 23) _____ is _____ M. The density of the solution is 0.79 g/mL.

    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 24) _____ Ne is _____.

    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