Chem 10123, Quiz 1   Answer Key

January 22, 2020

1. (3 points) Of the following substances, $CH_3CH_2CH_3$ should be the most soluble in hexane and CH_3CH_2OH the most soluble in water. In this aqueous solution, the predominant intermolecular force is H-bonding.

     CH_3CH_2Br CH_3CH_2OH CH_3OCH_3 $CH_3CH_2CH_3$
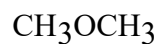
2. (9 points) **SHOW ALL WORK.** Glycerol, $C_3H_5(OH)_3$ (molar mass = 92.0) is a non-dissociating, non-volatile liquid that is very soluble in water. Determine the freezing point (in °C) of a glycerol solution that is 29.0 % glycerol by mass. [For H_2O (molar mass = 18.0), K_f = 1.86 °C/m]

   29.0 mass % indicates 29.0 g glycerol mixed with 71.0 g H_2O.

     m = (29.0 g) (1 mole / 92.0 g) / (0.071 kg H_2O) = 4.44 m

     Δt = k_f m = (1.86 °C / m) (4.44 m) = 8.3 °C

     $\therefore$ The solution freezes at -8.3 °C

3. (2 points) Soap is a good example of a common substance that forms micelles when mixed with water. In general, this type of mixture is called a colloidal dispersion.

4. (6 points) **SHOW ALL WORK.** A solution containing 7.00 mg of hemoglobin in 5.00 mL of solution at 20.0 °C has an osmotic pressure of 0.380 torr. Determine the molar mass of hemoglobin.

     osmotic pressure eq: ΠV = nRT   where n = moles of hemoglobin

     n = ΠV / RT

     n = (0.380 torr) (1 atm / 760 torr) (0.00500 L) / (0.0821 L·atm / mole·K) (293 K)

     n = 1.0392×10^{-7} moles

     molar mass = mass/mole = (0.00700 g) / (1.0392×10^{-7} moles) = 6.74×10^4 g/mole