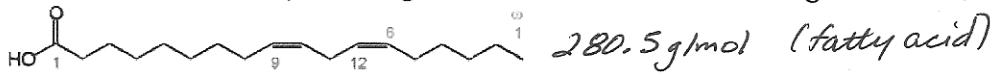


Practice Quiz  
Solutions

Name Key

1. Determine the molality of 71.5 g linoleic acid,  $C_{18}H_{32}O_2$ , in 525 g of hexane,  $C_6H_{12}$ ?



$$m = \frac{\text{moles linoleic acid}}{\text{Kg hexane}} = \frac{71.5g \times 1\text{mol}/280.5g}{.525g} = 0.4855 \Rightarrow \underline{0.486m}$$

2. A student wants to make a 0.150 M aqueous solution of silver nitrate using all of the silver nitrate in the bottle (11.27 g). What volume of solution can be prepared from this quantity of silver nitrate,  $AgNO_3$ ?

$$m \text{ } AgNO_3 = 169.88 \text{ g/mol} \quad 11.27g \times \frac{1\text{mol}}{169.88g} = 0.0663 \text{ mol} \quad 0.150 = \frac{0.0663}{L \text{ soln}} \text{ ans. } \underline{442 \text{ mL}}$$

3. What mass of urea,  $NH_2CONH_2$ , must be dissolved in 2250 mL of water ( $d = 1.00 \text{ g/mL}$ ) to prepare a 1.50 molal solution?

$$1.50m \times 2.250 \text{ Kg } H_2O = 3.375 \text{ mol urea}$$

$$3.375 \text{ mol} \times 60.07 \text{ g/mol} = \underline{203 \text{ g urea}}$$

4. A saline solution is 0.90% (w/w) NaCl. What masses of NaCl and water would be required to prepare 50.0 L of this saline solution. Assume that the density of water is 1.000 g/mL and that the NaCl does not add to the volume of the solution.

Key assumption  
50.0 L soln  $\approx$  50.0 L  $H_2O$

$$\text{mass \%} = 0.90\% = \frac{\text{mass NaCl}}{\text{mass NaCl} + \text{mass } H_2O} \times 100\%$$

$$0.0090 = \frac{x}{x + 50.00 \text{ Kg } H_2O}$$

$$x = 0.454 \text{ Kg} \Rightarrow \underline{450 \text{ g NaCl}}$$

5. The density of ethyl acetate at 20.0°C is 0.902 g/mL. What volume of ethyl acetate at 20.0°C would be required to prepare a 2.0% by mass solution of cellulose nitrate using 25 g of cellulose nitrate? (This is not an aqueous solution.)

$$2.0\% = \frac{\text{mass cellulose nitrate}}{\text{mass cellulose nitrate} + \text{mass ethyl acetate}} \times 100\%$$

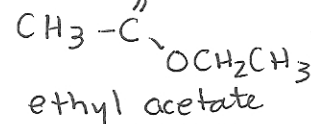
$$0.02 = \frac{25}{25 + x} \quad x = 1225g \Rightarrow \text{ans. } \underline{1.4L}$$

use density

6. What is the mass of sulfuric acid contained in 60.00 mL of 5.85 M solution?

$$5.85 \text{ M} = \frac{\text{moles } H_2SO_4}{0.06000 \text{ L}} \quad \text{moles } H_2SO_4 = 0.351 \text{ moles}$$

$$0.351 \text{ moles} \times 98.09 \text{ g/mol} = \underline{34.4 \text{ g } H_2SO_4}$$



7. What is the mole fraction of water in a 8.2 molal aqueous solution of sodium chloride?  $X_{H_2O} = \frac{55.49}{8.2 + 55.49} = 0.87$

$$8.2 = \frac{\text{moles NaCl}}{\text{Kg } H_2O} \text{ assume } 1 \text{ Kg } H_2O \quad 8.2 \text{ moles NaCl}$$

$$1000 \text{ g } H_2O \times 1\text{mol}/18.02g = 55.49 \text{ moles } H_2O$$

8. How much water would you have to add to 2.40 kg of nickel (II) sulfate hexahydrate in order to prepare a 25.00% by mass aqueous solution?

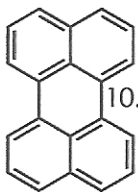
$$25.00\% = \frac{\text{mass } NiSO_4 \cdot 6H_2O}{\text{mass } NiSO_4 \cdot 6H_2O + \text{mass } H_2O} \times 100\%$$

$$.25 = \frac{2.40}{2.40 + x} \quad x = \underline{7.20 \text{ Kg } H_2O}$$

9. An aqueous sulfuric acid solution containing 571.6 g of sulfuric acid per liter of solution has a density of 1.329 g/mL. Find the mass percentage, the mole fraction, the molality and the molarity of this solution?

ANS: mass % = 43.01%      molality = 7.693m

$$X_{H_2SO_4} = 0.1218 \quad \text{molarity} = 5.827 \text{ M}$$



10. Perylene ( $C_{20}H_{12}$ ) is a constituent of coal tar. How many grams of perylene must be dissolved in 66.9 g of chloroform ( $CHCl_3$ ) in order to lower the freezing point by 2.75 degrees?  $K_f$  for chloroform is 4.68°C/molal.

$$2.75 = K_f m = 4.68 \cdot m \quad m = 0.5876m = \frac{\text{moles } C_{20}H_{12}}{\text{Kg } CHCl_3} = 0.0669$$

$$\left( \text{moles } C_{20}H_{12} = 0.03931 \right) \times 252.32 \text{ g/mol} = \underline{9.91 \text{ g Perylene}}$$