

## ALE 25. Units of Concentration

### Answer Key

#### Important!!

- Check your responses with those below. Do not copy these answers onto your ALE—doing so is plagiarism and will not result in any learning. Rather, determine where you went wrong, what concepts you need to apply/learn, redo those problems that you missed and then recheck your answers. Seek help from the members in your group and from the instructor as needed.
- For answers that involve a calculation you must show your work neatly using dimensional analysis with correct significant figures and units to receive full credit. No work, no credit. Report numerical answers to the correct number of significant figures. **CIRCLE ALL NUMERICAL RESPONSES**

#### Exercises

1. Calculate the molarity of a solution made by diluting 25.0 mL of 6.15 M HCl to a volume of 0.500 L with water. Circle your answer.

**0.308 M HCl**

2. How would you prepare 3.5 L of 0.55 M NaCl from solid NaCl? Circle your answer.

**$1.1 \times 10^2$  g NaCl**

3. Calculate molality of a solution containing 164 g of HCl in 753g of water. Circle your answer.

**5.97 m HCl**

4. Calculate the molality of a solution consisting of 2.77 mL of carbon tetrachloride ( $\text{CCl}_4$ ,  $d = 1.59$  g/mL) in 79.5 mL of methylene chloride ( $\text{CH}_2\text{Cl}_2$ ,  $d = 1.33$  g/mL) Circle your answer.

**0.271 m  $\text{CCl}_4$**

5. A 28.8 mass % aqueous solution of iron (III) chloride has a density of 1.280 g/mL.

a.) Calculate the molality of the solution. Circle your answer.

**2.49 m  $\text{FeCl}_3$**

b.) Calculate the molarity of the solution. Circle your answer.

**2.27 M  $\text{FeCl}_3$**

c.) Calculate the mole fraction of  $\text{FeCl}_3$ . Circle your answer.

**$X_{\text{FeCl}_3} = 0.0430$   $\text{FeCl}_3$**

- 6.a. How many grams of solid NaOH are needed to prepare 250.0g of 1.00% (w/w) NaOH in water? Circle your answer.

**2.50 g NaOH**

b.) How many grams of water are needed? Circle your answer.    **247.5 g Water**

c.) How many mL of water at 20.0 °C are needed? ( $d_{\text{water}}$  at 20.0 °C = 0.9882 g/mL) Circle your answer.

**250.5 mL water**

d.) What is the molality of the solution? Circle your answer.    **0.253 m NaOH**

6e.) What is the approximate freezing point of the solution? ( $K_f$  for water = 1.86 °C/m) Circle your answer.

**-0.939 °C**

7a. Concentrated hydrochloric acid purchased from chemical supply houses is 37% HCl by mass. What mass in grams of conc. HCl is needed to make 1.0 liter of 0.10 M HCl? Circle your answer.

**9.9 g conc HCl**

b.) How would you make the 0.1 M HCl solution? Circle your answer.

8. Calculate the molality 2.00 % NaCl (w/w). (NaCl = 58.4425 g/mol) Circle your answer.

**0.349 m NaCl**

9. Conc. hydrobromic acid can be purchased as 40.0% HBr by mass. The density of the solution is 1.38 g/mL. What is the molar concentration of 40.0% HBr? (HBr = 80.912 g/mol) Circle your answer.

**6.81 M HBr**

10. Dibutyl phthalate,  $C_{16}H_{22}O_4$  (mw = 278 g/mol), is an oil sometimes worked into plastic articles to give them softness. It has a negligible vapor pressure ( $P = 1$  torr @ 148 °C). What is the vapor pressure at 20.0 °C of a solution of 20.0 g dibutyl phthalate in 50.0 g of octane,  $C_8H_{18}$  (mw = 114 g/mol)? The vapor pressure of pure octane at 20.0 °C is 10.5 torr. Circle your answer.

**9.02 torr**