ODDS FOR EXTRA CREDIT: See next page for solutions.

Name Sturman key Date _____ Class _____

16-2 Practice Problems

ANS RANGES

1. What is the molarity of the solution produced when 145 g of sodium chloride (NaCl) is dissolved in sufficient water to prepare 2.75 L of solution?

.5-1

2. How many grams of potassium chloride (KCl) are needed to prepare 0.750 L of a 1.50 *M* solution of potassium chloride in water?

3. What is the molarity of the solution produced when 85.6 g of hydrochloric acid (HCl) is dissolved in sufficient water to prepare 0.385 L of solution?

5-8

4. To produce 3.00 L of a 1.90 *M* solution of sodium hydroxide (NaOH), how many grams of sodium hydroxide must be dissolved?

5. If 8.77 g of potassium iodide (KI) are dissolved in sufficient water to make 4.75 L of solution, what is the molarity of the solution?

0-.03

6. In order to prepare 2.00 L of a 3.00 *M* solution of ferric chloride ($FeCl_3$), how many grams of ferric chloride must be used?

7. What is the molarity of the solution produced when 14.1 g of ammonia (NH_3) is dissolved in sufficient water to prepare 0.100 L of solution?

7-10

8. To prepare 10.5 L of a 2.50 *M* solution of potassium hydroxide (KOH), how many grams of potassium hydroxide must be used?

9. What is the molality of a solution containing 75.2 g of silver perchlorate ($AgClO_4$) dissolved in 885 g of benzene?

.2-.5

10. What is the molality of a solid solution containing 0.125 g of chromium and 81.3 g of iron?

11. If 18.6 g of methanol is used to dissolve 2.68 g of $Hg(CN)_2$, what is the molality of the solution?

.4-.6

12. What is the molality of solid solder wire if it is made from 68.7 g of lead dissolved in 117 g of tin?

Name _____ Date _____ Class _____

16-2 Practice Problems (continued)

13. What is the molality of a solution made by dissolving 8.11 g of potassium sulfide (K_2S) in 47.6 g of ethanol?

1-2

14. What is the molality of a solution containing 1330 g of methanol (CH_3OH) and 16.6 g of sodium bromide (NaBr)?

15. What is the molality of a solid solution containing 867 g of aluminum and 14.9 g of copper?

.2-.3

16. Calculate the molality of a solution produced using 15.2 g of calcium chloride ($CaCl_2$) and 345 g of methanol (CH_3OH).

17. In order to prepare a 0.523 *m* aqueous solution of potassium iodide (KI), how many grams of potassium iodide must be added to 2.00 kg of water?

160-180

18. A gas mixture contains 45.6 g of carbon monoxide and 899 g of carbon dioxide. What is the mole fraction of carbon monoxide?

19. A gas mixture contains the following gases with the mole fractions indicated: CH_4 (0.510), C_2H_6 (0.431), C_3H_8 (0.011), and C_4H_{10} (0.013). The mixture also contains the gas acetylene (C_2H_2). What is the mole fraction of acetylene?

.01-.05

20. What is the mole fraction of oxygen in a mixture that contains 66.8 g of oxygen, 44.1 g of nitrogen, and 21.5 g of hydrogen?

21. What is the mole fraction of xenon in a mixture that contains 0.584 g of xenon, 86.40 g of argon, and 3.62 g of neon?

.001-.002

22. A gas mixture contains the following gases with the mole fractions indicated: NH_3 (0.214), Cl_2 (0.452), NH_2Cl (0.118), and N_2 (0.175). The mixture also contains HCl gas. What is the mole fraction of HCl gas?

23. A gas mixture contains the following gases with the mole fractions indicated: H_2O (0.164), H_2 (0.278), O_2 (0.455), and CO_2 (0.101). The mixture also contains carbon monoxide. What is the mole fraction of carbon monoxide?

.001-.003

24. A gas mixture contains 70.25 g of steam, 1.470 g of hydrogen, and 6.58 g of nitrogen. What is the mole fraction of steam?

Sturmon (key)

15-2 Practice Problems

$$\text{molarity} = \frac{\text{moles solute}}{\text{L soln.}} \qquad \text{molality} = \frac{\text{moles solute}}{\text{kg solvent}}$$

① $\mathcal{M}_{NaCl} = 22.99 + 35.45 = 58.44\ g/mol$

$$\frac{145\ g\ NaCl}{1} \cdot \frac{1\ mol\ NaCl}{58.44\ g\ NaCl} = 2.48\ mol\ NaCl$$

$$M = \frac{2.48\ mol}{2.75\ L} = \boxed{.902\ M}$$

③ $\mathcal{M}_{HCl} = 1.01 + 35.45 = 36.46\ g/mol$

$$\frac{85.6\ g}{1} \cdot \frac{1\ mol}{36.46\ g} = 2.35\ mol \qquad M = \frac{2.35\ mol}{.385\ L} = \boxed{6.10\ M}$$

⑤ $\mathcal{M}_{KI} = 39.10 + 126.90 = 166.00\ g/mol$

$$\frac{8.77\ g\ KI}{1} \cdot \frac{1\ mol}{166.00\ g} = .0528\ mol \qquad M = \frac{.0528\ mol}{4.75\ L} = \boxed{.0111\ M}$$

⑦ $\mathcal{M}_{NH_3} = 14.01 + 3(1.01) = 17.04\ g/mol$

$$\frac{14.1\ g\ NH_3}{1} \cdot \frac{1\ mol}{17.04\ g} = .827\ mol \qquad M = \frac{.827\ mol}{.100\ L} = \boxed{8.27\ M}$$

⑨ $\mathcal{M}_{AgClO_4} = 107.87 + 35.45 + 4(16.00) = 207.32\ g/mol$

$$\frac{75.2\ g}{1} \cdot \frac{1\ mol}{207.32\ g} = .363\ mol \qquad m = \frac{.363\ mol}{.885\ kg} = \boxed{.410\ m}$$

(11) $\mathcal{M}_{Hg(CN)_2} = 200.59 + 2(12.01) + 2(14.01) = 252.63\ g/mol$

$\frac{2.68g}{1} \cdot \frac{1mol}{252.63g} = .0106\ mol \qquad m = \frac{.0106\ mol}{.0186\ kg} = .56989... = \boxed{.570m}$

(13) $\mathcal{M}_{K_2S} = 2(39.10) + 32.07 = 110.27\ g/mol$

$\frac{3.11g}{1} \cdot \frac{1mol}{110.27g} = .0735\ mol \qquad m = \frac{.0735\ mol}{.0476\ kg} = \boxed{1.54m}$

(15) $\mathcal{M}_{Cu} = 63.55\ g/mol$

$\frac{14.9g}{1} \cdot \frac{1mol}{63.55g} = .234\ mol \qquad m = \frac{.234\ mol}{.867\ kg} = .2698 \rightarrow \boxed{.270m}$

(17) $\mathcal{M}_{KI} = 166.0\ g/mol$ (found in #5)

$.523 = \frac{x}{2.00} \Rightarrow x = 1.046\ mol \qquad \frac{1.046\ mol}{1} \cdot \frac{166.0g}{1mol} = \boxed{174g}$

(19) $.510 + .431 + .011 + .013 = .965 \qquad 1 - .965 = \boxed{.035}$

(21) $\mathcal{M}_{Xe} = 131.29\ g/mol$

mol Xe: $\frac{.584g}{1} \cdot \frac{1mol}{131.29g} = .00445\ mol\ Xe$

mol Ar: $\frac{86.40g}{1} \cdot \frac{1mol}{39.95g} = 2.16\ mol\ Ar$

mol Ne: $\frac{3.62g}{1} \cdot \frac{1mol}{20.18g} = .179\ mol\ Ne$

$X_{Xe} = \frac{.00445}{(.00445 + 2.16 + .179)} = \boxed{.00190}$

(23) $.164 + .278 + .455 + .101 = .998$

$1 - .998 = \boxed{.002}$