Chemistry 152
Tuesday, 5 May 2009

32+38
70 + 30 free

In-Class Activity
Solutions

Answer Key

Mesa San Diego College

1. Calculate the molarity (M) of a solution made by dissolving 73.4 grams of sodium sulfate in enough water to form 275 milliliters of solution.

Na_2SO_4 → 22.99 x2, 32.07, 16.00x4 → 142.05 g/mol ①

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$$\underline{M} = \frac{mol}{L} = \frac{73.4\ g \left(\frac{1\ mol}{142.05\ g}\right)}{(275\ mL)\left(\frac{1\ L}{1000\ mL}\right)} = \boxed{1.88\ \underline{M}}$$

① ① ① ① ①

2. What volume of 0.101 M HNO_3 solution is needed to react with 24.9 mL of 0.00841 M $Ba(OH)_2$ solution? (Hint: Start with a balanced equation.)

$$Ba(OH)_2 + 2\ HNO_3 \rightarrow Ba(NO_3)_2 + H_2O$$

.00841 M, 24.9 mL — .101 M, V? — Bal Eq = 6

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$$24.9\ mL\ Ba(OH)_2 \left(\frac{1\ L}{1000\ mL}\right)\left(\frac{.00841\ mol\ Ba(OH)_2}{1\ L}\right)\left(\frac{2\ mol\ HNO_3}{1\ mol\ Ba(OH)_2}\right)\left(\frac{1\ L}{.101\ mol\ HNO_3}\right)$$

① ① ① ① ①

$$= \boxed{0.0415\ L\ HNO_3}$$

①

3. How many liters of a 2.0 % v/v solution could you prepare using 75 liters of ethanol and an unlimited amount of water?

$$75\ L\ ethanol \left(\frac{100\ L\ solution}{2.0\ L\ ethanol}\right) = \cancel{3750\ L}$$

① ③

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$$\boxed{3800\ L}$$

① Ans ① SF

4. How many grams of sodium chloride are in 100.0 mL of a 2.50 M NaCl solution?

NaCl molar mass 22.99 + 35.45 = 58.44 g/mol ①

$$100.0\ mL\left(\frac{1\ L}{1000\ mL}\right)\left(\frac{2.50\ mol}{1\ L}\right)\left(\frac{58.44\ g}{1\ mol}\right) = \boxed{14.6\ g}$$

① ① ① ① ①

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5. Calculate the mass percent of a solution prepared by adding 75 g of NaOH to 100. g of water.

$$\text{Mass percent} = \frac{\text{solute}}{\text{solution}} = \frac{75\ \text{g NaOH}}{(100.\ \text{g} + 75\ \text{g})\ \text{solution}} \times 100 = \boxed{42.9\%}$$

(1) Ans (1) sf

6. In the previous problem,
   a. What is the solvent? H_2O
   b. What is the solute? $NaOH$

7. [15 pts] When heated, potassium chlorate decomposes to form potassium chloride and oxygen gas. What pressure of oxygen would accumulate in a 150.0-mL container by the decomposition of 15.0 grams of potassium chlorate at 22.0°C. (Hint: Start with a balanced equation.)

$$2\,KClO_3 \rightarrow 2\,KCl + 3\,O_2$$

molar mass: 39.10, 35.45, 3×16.00, 122.55 g/mol (1)

15.0 g, ?

3 sig figs

$$15.0\ \text{g}\ KClO_3 \left(\frac{1\ \text{mol}\ KClO_3}{122.55\ \text{g}}\right)\left(\frac{3\ \text{mol}\ O_2}{2\ \text{mol}\ KClO_3}\right) = 0.1836\ \text{mol}\ O_2$$

keep extra sf, but use only 3 in calculations

$$PV = nRT \qquad T = 22.0 + 273.15 = 295.2\ \text{K}$$

$$P = \frac{nRT}{V} = \frac{(0.1836\ \text{mol})\left(0.08206\ \frac{\text{L atm}}{\text{K mol}}\right)(295.2\ \text{K})}{(150.0\ \text{mL})\left(\frac{1\ \text{L}}{1000\ \text{mL}}\right)} = \boxed{29.7\ \text{atm}}$$

(1) ans (1) sf (1) units

8. [10 pts] An unknown gaseous compound has a mass of 2.678 grams in a 2.00-Liter container at STP. What is its molar mass?

$$\text{molar mass} = \frac{g}{\text{mol}} = \frac{2.678\ \text{g}}{(2.00\ \text{L})\left(\frac{1\ \text{mol}}{22.4\ \text{L}}\right)} = \boxed{30.0\ \text{g/mol}}$$

(1) (1) (1)

(1) ans (1) sf (1) units

$PV = nRT$

$n = \frac{PV}{RT}$ 1 atm

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