

Molarity Problems 1

Answer Key

- 1) **How many moles of Na^+ ions are there in 22.0 mL of 0.150 M Na_2CO_3 solution?**

$$M = \text{moles/Liter} \quad \text{mol} = ML = (.150M)(.0220 \text{ L}) = .0033 \text{ mol Na}_2\text{CO}_3$$

$$.0033 \text{ mol Na}_2\text{CO}_3 \times (2 \text{ mol Na}^+ / \text{mol Na}_2\text{CO}_3) = .0066 \text{ mol Na}^+ \text{ ions}$$

- 2) **What is the molar concentration of potassium permanganate in a solution prepared by dissolving 47.4 g of KMnO_4 in water and then making up the solution to 2.50 L?**

$$47.4 \text{ g KMnO}_4 \times (\text{mol} / 157.58 \text{ g}) = .301 \text{ mol KMnO}_4$$

$$.301 \text{ mol} / 2.50 \text{ L} = .120 \text{ M}$$

- 3) **How many grams of KMnO_4 would be required to prepare 200 mL of a 0.178 M solution?**

$$\text{mol} = ML \rightarrow \text{mol} = .2 \times .178 = (.0356 \text{ mol KMnO}_4 \times 157.58 \text{ g/mol}) = 5.61 \text{ g KMnO}_4$$

- 4) **How many mL of a 0.130 M solution of CaCl_2 contains 2.00 g of CaCl_2 ?**

$$2.00 \text{ g CaCl}_2 \times (\text{mol} / 110.97 \text{ g}) = .018 \text{ mol CaCl}_2$$

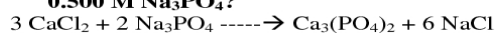
$$L = \text{mol} / M = .018 / .130 = .138 \text{ L} = 138 \text{ mL}$$

- 5) **How many grams of sodium chloride should be put into a 50.0 mL volumetric flask to give 0.15 M solution when the flask is filled to the score mark with water?**

$$M = \text{mol/L} \rightarrow \text{mol} = ML = (.05) (.15) = .0075 \text{ mol NaCl}$$

$$.0075 \text{ mol NaCl} \times 58.43 \text{ g/mol} = .438 \text{ g NaCl}$$

- 6) **What is the maximum weight of 2.00 L of 1.00 M of CaCl_2 with 3.00 L of 0.500 M Na_3PO_4 ?**



$$\text{Mole} = 1.00 \text{ M} \times 2.00 \text{ L} = 2.00 \text{ mol}$$

$$1.0 \text{ mol/L} \times 200 \text{ L} \times (1 \text{ Ca}_3(\text{PO}_4)_2 / 3 \text{ CaCl}_2) = .6667 \text{ mol Ca}_3(\text{PO}_4)_2 \text{ limiting reagent}$$

$$.500 \text{ mol/L} \times 3.00 \text{ L Na}_3\text{PO}_4 \times (1 \text{ Ca}_3(\text{PO}_4)_2 / 2 \text{ Na}_3\text{PO}_4) = .75 \text{ mol Ca}_3(\text{PO}_4)_2$$

$$.6607 \text{ mol Ca}_3(\text{PO}_4)_2 \times 310.07 \text{ g/mol} = 206.71 \text{ g Ca}_3(\text{PO}_4)_2$$