

Atomic masses: H = 1.008, S = 32.07, O = 16.00, Al = 26.98

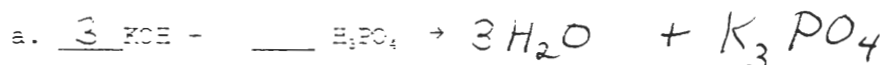
1. (5 Pts) Calculate the molarity of a solution that contains 70.0 g of H<sub>2</sub>SO<sub>4</sub> in 280 mL of solution.

$$\frac{70.0 \text{ g H}_2\text{SO}_4}{280 \times 10^{-3} \text{ L}} \times \frac{1 \text{ mol}}{98.08 \text{ g}} = 2.54 \frac{\text{mol H}_2\text{SO}_4}{\text{L}}$$

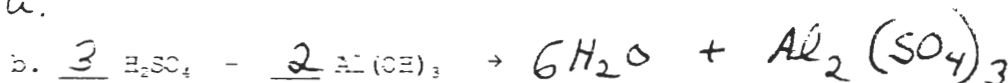
2. (5 Pts) How many moles of sulfate ions are there in a 0.1-liter solution of 0.02-molar Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>?

$$\frac{0.1 \text{ L} \times 0.02 \text{ mol Al}_2(\text{SO}_4)_3}{1 \text{ mol Al}_2(\text{SO}_4)_3} \times \frac{3 \text{ mol SO}_4^{2-}}{1 \text{ mol Al}_2(\text{SO}_4)_3} = 0.006 \text{ mol SO}_4^{2-}$$

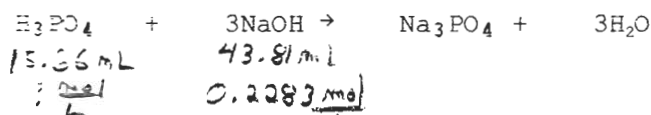
3. (4 Pts) Complete and balance each of the following reaction equations.



a.

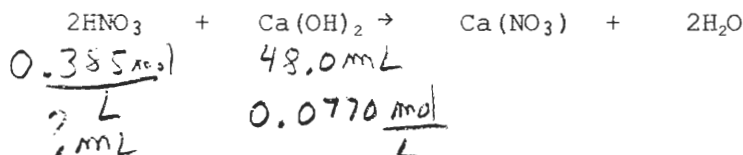


4. (6 Pts) What is the molarity of a phosphoric acid solution if 15.66 mL of this H<sub>3</sub>PO<sub>4</sub> solution requires 43.81 mL of 0.2283 M NaOH for titration to the equivalence point?



$$\frac{15.66 \text{ mL H}_3\text{PO}_4}{15.66 \times 10^{-3} \text{ L H}_3\text{PO}_4} \times \frac{43.81 \text{ mL NaOH}}{1000 \text{ mL NaOH}} \times \frac{0.2283 \text{ mol NaOH}}{1 \text{ mol NaOH}} \times \frac{1 \text{ mol H}_3\text{PO}_4}{3 \text{ mol NaOH}} = 0.2129 \frac{\text{mol H}_3\text{PO}_4}{\text{L H}_3\text{PO}_4}$$

5. (5 Pts) What volume of 0.385 molar nitric acid, HNO<sub>3</sub>, is required to react with 48.0 mL of 0.0770 M calcium hydroxide, Ca(OH)<sub>2</sub>, according to the following equation?



$$\frac{48.0 \text{ mL Ca(OH)}_2}{1000 \text{ mL Ca(OH)}_2} \times \frac{0.0770 \text{ mol Ca(OH)}_2}{1 \text{ mol Ca(OH)}_2} \times \frac{2 \text{ mol HNO}_3}{1 \text{ mol Ca(OH)}_2} \times \frac{1000 \text{ mL HNO}_3}{0.385 \text{ mol HNO}_3} = 19.2 \text{ mL HNO}_3$$