Answer on Question #39040-Chemistry-Organic Chemistry

Questions

(a) What is the molarity of a 0.050 N solution of $Ba(OH)_2$ (calculated on the basis of complete neutralizaton of the alkali)?

(b) What is the normality of a 0.050 M H_3PO_4 (based on neutralization of the acid to the HPO_4^{2-} ion)?

Solution

(a) Chemical equation of complete neutralizaton of $Ba(OH)_2$:

$$Ba(OH)_2 + 2\ HCl \rightarrow BaCl_2 + 2\ H_2O \textit{ or}$$
$$Ba(OH)_2 + 2\ H^+ \rightarrow Ba^{2+} + 2\ H_2O$$

Since 2 mol of H^+ are needed to neutralize one mole of $Ba(OH)_2$, the equivalence factor for $Ba(OH)_2$ in this reaction f_{eq} = 1/2. Molarity of the solution:

$$C_M = C_N \cdot f_{eq} = 0.050 \cdot 0.500 = 0.025\ M$$

(b) Chemical equation of H_3PO_4 neutralization to the HPO_4^{2-} ion:

$$H_3PO_4 + 2\ NaOH \rightarrow Na_2HPO_4 + 2\ H_2O \textit{ or}$$
$$H_3PO_4 + 2\ OH^- \rightarrow HPO_4^{2-} + 2\ H_2O$$

Since 2 mol of OH^- are needed to neutralize one mole of H_3PO_4 to the HPO_4^{2-} ion, the equivalence factor for H_3PO_4 in this reaction f_{eq} = 1/2. Normality of the solution:

$$C_N = \frac{C_M}{f_{eq}} = \frac{0.050}{0.500} = 0.100\ N$$

Answers: (a) C_M = 0.025 M, (b) C_N = 0.1000 N