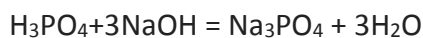


Question #72381, Chemistry / General Chemistry

Determine the amount of 0.1125 M NaOH needed to completely neutralize 20.00 mL of 0.03561 M phosphoric acid. Find the pH at the equivalence point.

Solution



$$n(\text{H}_3\text{PO}_4) : n(\text{NaOH}) = 1 : 3$$

$$n(\text{NaOH}) = 3n(\text{H}_3\text{PO}_4)$$

$$n(\text{NaOH}) = 3 * 0.02 * 0.03561 = 2.136 * 10^{-3} \text{ mol}$$

$$V(\text{NaOH}) = 2.136 * 10^{-3} * 1000 / 0.1125 = 18.992 \approx 19 \text{ ml}$$

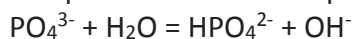
$$V(\text{solution}) = 20 + 19 = 39 \text{ ml}$$

$$n(\text{Na}_3\text{PO}_4) = n(\text{H}_3\text{PO}_4) = 0.02 * 0.03561 = 7.122 * 10^{-4} \text{ mol}$$

$$C(\text{Na}_3\text{PO}_4) = 7.122 * 10^{-4} / 0.039 = 0.01826 \text{ M}$$

For H_3PO_4 $K_{a1} = 7.5 * 10^{-3}$, $K_{a2} = 6.2 * 10^{-8}$, $K_{a3} = 2.2 * 10^{-13}$

The majority of the hydroxide ion will come from this first step. So only the first step will be completed here. To complete the other steps, follow the same manner of this calculation.



$$\frac{x^2}{0.0182 - x} = \frac{10^{-14}}{2.2 * 10^{-13}}$$

$$x = 0.071 \text{ M} = [\text{OH}^-]$$

$$\text{pOH} = -\lg(\text{OH}^-) = 1.15$$

$$\text{pH} = 14 - \text{pOH} = 14 - 1.15 = 12.85$$

Answer

19 ml; pH = 12.85

Answer provided by AssignmentExpert.com