

Answer on Question #59712 - Chemistry - General Chemistry

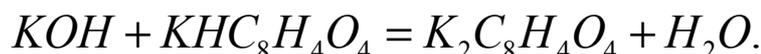
Task:

Potassium hydrogen phthalate, $KHC_8H_4O_4$, is a solid acidic substance that reacts in a 1:1 mole ratio with bases that have one hydroxide ion. Suppose that 0.7025 g of $KHC_8H_4O_4$ is titrated to the equivalence point by 20.18 mL of a KOH solution. What is the molarity of the KOH solution?

Solution:

Equivalence point: The point at which the two solutions used in a titration are present in chemically equivalent amounts.

We write the reaction that occurs during the titration:



According to the reaction equation:

$$n(KOH) = n(KHC_8H_4O_4).$$

We find the amount of $KHC_8H_4O_4$:

$$n(KHC_8H_4O_4) = \frac{m(KHC_8H_4O_4)}{M(KHC_8H_4O_4)} = \frac{0.7025\text{g}}{204\text{g/mol}} = 0.00344\text{moles}.$$

Then,

$$n(KOH) = n(KHC_8H_4O_4) = 0.00344\text{moles}.$$

The molarity of a solution is calculated by taking the moles of solute and dividing by the liters of solution.

$$\text{Molarity} = \frac{\text{moles of solute}}{\text{liters of solution}}.$$

Convert mL to L:

$$1000\text{mL} = 1\text{L};$$

$$V(KOH) = 20.18\text{mL} = 0.02018\text{L}.$$

We find the molarity of the KOH using of moles and the volume.

$$C_m(KOH) = \frac{n(KOH)}{V(KOH)} = \frac{0.00344}{0.02018} = 0.170(\text{mol/L}).$$

$$\text{Answer: } C_m(KOH) = 0.170\text{mol/L}.$$