

Answer on question #62408, Chemistry / General chemistry

A student used 0.750g of potassium hydrogen phthalate dissolved in 50.0 mL of water as a primary standard (MW 204.23 g/mol). 36.01 mL of sodium hydroxide aqueous solution were required to titrate the sample. What is the molarity of the sodium hydroxide solution?

Solution:

At first we need to check potassium hydrogen phthalate water solution molarity:

$$c = \frac{m}{M \cdot V} = \frac{0.750 \text{ g}}{204.23 \frac{\text{g}}{\text{mol}} \cdot 0.050 \text{ l}} = 0.073 \text{ mol/L}$$

After, when we know the molarity of a primary standard, we can use the equivalent law:

$$n_1 V_1 = n_2 V_2$$

As a definition we know a standard solution volume and molarity. With equivalent law, molarity of the sodium hydroxide equal to:

$$c_1 V_1 = c_2 V_2$$

$$0.073 \frac{\text{mol}}{\text{L}} \cdot 50.75 \text{ ml} = x \frac{\text{mol}}{\text{L}} \cdot 36.01 \text{ ml}$$

$$x = \frac{0.073 \frac{\text{mol}}{\text{L}} \cdot 50.75 \text{ ml}}{36.01 \text{ ml}} = 0.103 \text{ mol/L}$$

Answer: the molarity of the sodium hydroxide is 0.103 mol/L.