Question #49834, Chemistry, Inorganic Chemistry

In a titration of 20.00 mL H3PO4, 12.75 mL of 0.350 M NaOH were used. a)

Find the concentration of the acid in this experiment. b) The base solution was

not standardized. How will that affect the results? How would you standardize

such a solution?
Answer:

a)

$$m = \frac{N_b \times V_b}{V_{aliq}} \times V_a \times E_a = 0.35*12.75/20*20*97.99 = 497.2 \text{ (mg)}$$

$$c = m/(M*V) = 497.2mg/(98*20) = \textbf{0.253M}$$

b) Titration H3RO4 (polybasic acid) has some peculiarities. It is based on the definition of titration with a standard solution of sodium hydroxide. The first dissociation constant of phosphoric acid is large enough (pK1 = 1.96), so it can be titrated in the presence of methyl orange, which corresponds to the equation:

$$H_3PO_4 + NaOH = NaH_2PO_4 + H_2O.$$
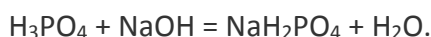
Molar equivalent weight of phosphoric acid in this case is equal to its molecular weight: M = E = 97.9953 g / mol.

The second dissociation constant of phosphoric acid is low (pK2 = 6.7). Therefore, the phosphoric acid on the second stage should be titrated in the presence of phenolphthalein. The equation of the reaction of phosphoric acid as dibasic with alkali:

$$H_3PO_4 + 2\ NaOH = Na_2HPO_4 + 2\ H_2O.$$
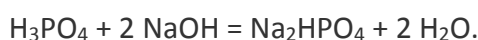
The error in determining H3PO4 less if you enter it in the presence of same indicator that used in the standardization of NaOH.