Answer on Question #54559 – Chemistry – General chemistry

Question:

Benzoic acid, C_6H_5COOH, is a weak acid with Ka = 6.46 x 10-5. 40.00 mL of 0.100 M benzoic acid were mixed with 10.00 mL of 0.200 M sodium hydroxide. Bearing in mind the assumptions mentioned in the last part of the introduction, Calculate (a) the concentration of the sodium benzoate formed

Answer:

First of all let's find the number of moles for benzoic acid and sodium hydroxide:

$v(C_6H_5COOH) = C_1V_1$, where C_1 – the concentration of C_6H_5COOH and V_1 – the volume of C_6H_5COOH.

$v(C_6H_5COOH) = C_1V_1 = 0.1$ M × 0.04 L = $4×10^{-3}$ mol

For NaOH, the same equation is used:

$v(NaOH) = C_2V_2$, where C_2 – the concentration of NaOH and V_2 – the volume of NaOH.

$v(NaOH) = C_2V_2 = 0.2$ M× 0.01 L = $2×10^{-3}$ mol.

According to that 1 mole of NaOH reacts with 1 mole of benzoic acid producing 1 mole Sodium benzoate,

the number of moles for $Na(C_6H_5COO)$ is:

$v(Na(C_6H_5COO)) = 2×10^{-3}$ mol

After the reaction the total volume is the sum of the volumes of the reagent solutions:

V = 10 ml + 40 ml = 50 ml

Thus, the concentration of Sodium Benzoate is:

$C(C_6H_5COO) = v(Na(C_6H_5COO))/V = 2×10^{-3}$ mol/0.05 L = 0.04 M