Answer on Question #54742 – Chemistry – General Chemistry

Task:
30.0 mL of 0.512 M sulfuric acid was added to 25.0 mL of 0.666 M sodium hydroxide.
a. Write the balanced chemical equation.
b. Determine the molarity of either acid or base remaining after the reaction.
c. Find the molarity if a 50.00 mL aliquot of this solution is diluted to 250 mL.

Answer:

    a. $H_2SO_4 + 2NaOH = Na_2SO_4 + 2H_2O$

    b. According to the equestion, $n(NaOH) = 2 \cdot n(H_2SO_4)$

$n = C_M \cdot V$

$n(H_2SO_4) = 0.030 \cdot 0.512 = 0.015 \ mol$

$n(NaOH) = 0.025 \cdot 0.666 = 0.017 \ mol$

At the same time, the required amount of NaOH is: $n(NaOH)^* = 0.1536 \cdot 2 = 0.3072 \ mol$

So that in this situation NaOH is used fully, and the amount of H_2SO_4 left is:

$n(H_2SO_4)_{left} = 0.015 - \dfrac{0.017}{2} = 0.007 \ mol$

New molarity of that sulfuric acid will be:

$C_M(H_2SO_4)_{left} = \dfrac{0.007}{0.03 + 0.025} = 0.127 \ M$

    c. A 50.00 mL aliquot of this solution contains sulfuric acid:

$n(H_2SO_4)_{aliquot} = \dfrac{0.007}{55} \cdot 50 = 0.0064 \ mol$

If it is diluted to 250 ml, new molarity will be:

$C_M(H_2SO_4)_{aliquot} = \dfrac{0.0064}{0.25} = 0.025 \ M$