

Answer on Question #71486 - Chemistry - General Chemistry

Question: A stock solution containing Mn^{2+} ions was prepared by dissolving 1.011 g pure manganese metal in nitric acid and diluting to a final volume of 2.000 L. The following solutions were then prepared by dilution:

For solution A, 50.00 mL of stock solution was diluted to 1500.0 mL.

For solution B, 10.00 mL of solution A was diluted to 250.0 mL.

For solution C, 10.00 mL of solution B was diluted to 400.0 mL.

Solution:

Let us find the concentration of Mangan in the initial solution:

$$C_{stock} = \frac{n}{V} = \frac{m}{M \cdot V} = \frac{1.011}{55 \cdot 2} = 0.0092 \text{ M} = 9.2 \cdot 10^{-3} \text{ M} \left(\frac{\text{mol}}{\text{L}} \right);$$

Let us find the concentration of Mangan in solution A, taking into account the dilution:

$$C_A = C_{stock} \cdot \frac{V_{\text{aliquot}}}{V_{\text{flask}}} = 0.0092 \cdot \frac{50}{1500} = 0.00031 \text{ M} = 3.1 \cdot 10^{-4} \text{ M};$$

Let us find the concentration of Mangan in solution B, taking into account the dilution:

$$C_B = C_A \cdot \frac{V_{\text{aliquot}}}{V_{\text{flask}}} = 3.1 \cdot 10^{-4} \cdot \frac{10}{250} = 0.000024 \text{ M} = 1.24 \cdot 10^{-5} \text{ M};$$

Let us find the concentration of Mangan in solution C, taking into account the dilution:

$$C_C = C_B \cdot \frac{V_{\text{aliquot}}}{V_{\text{flask}}} = 1.24 \cdot 10^{-5} \cdot \frac{10}{400} = 0.00000031 \text{ M} = 3.1 \cdot 10^{-7} \text{ M}.$$

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