

Answer on Question # 69285, Chemistry / General Chemistry

2. A 20.00 mL sample of MnO_4^{-1} is required to titrate 0.2378 g $\text{Na}_2\text{C}_2\text{O}_4$ in an acidic solution. How many ml of this same MnO_4^{-1} are required to titrate a 25.00 mL sample of 0.1010 M Fe^{+2} in acidic solution.

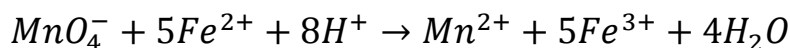
$2\text{MnO}_4^{-1}(\text{aq}) + 16\text{H}^+(\text{aq}) + 5\text{C}_2\text{O}_4^{-2}(\text{aq}) \rightarrow 2\text{Mn}^{+2}(\text{aq}) + 8\text{H}_2\text{O}(\text{l}) + 10\text{CO}_2(\text{g})$
(SHOW WORK)

Solution:

1. Calculate molarity of solution MnO_4^{-1} :

$$c(1/5\text{KMnO}_4) = \frac{1000 * m(\text{Na}_2\text{C}_2\text{O}_4)}{V(1/5\text{KMnO}_4) * E(\text{Na}_2\text{C}_2\text{O}_4)}$$
$$c(1/5\text{KMnO}_4) = \frac{1000 * 0.2378}{20.00 * 2.5 * 134.00} = 0.035493 \text{ (M)}$$

2. Balance equation for the second reaction:



3. Calculate volume of solution MnO_4^{-1} :

$$V(\text{MnO}_4^-) = \frac{c(\text{Fe}^{2+}) \times V(\text{Fe}^{2+}) \times f}{c(\text{MnO}_4^-)}$$
$$V(\text{MnO}_4^-) = \frac{0.1010 \times 25.00 \times 1}{0.035493 \times 5} = 14.23 \text{ (ml)}$$

Answer: 0.035493 M; 14.23 ml.

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