Answer on the question #67038, Chemistry / Physical Chemistry

Question:

100mL of oxalic acid requires35mL of 0.04 M KMnO4 to titrate it to the end point. Calculate the molarity of the oxalic acid.?

Solution:

The reaction equation is:

$$2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

Thus, 2 moles of $KMnO_4$ reacts with 5 moles of $H_2C_2O_4$. So, the relation of their number of the moles is the following:

$$\frac{n(KMnO_4)}{2} = \frac{n(H_2C_2O_4)}{5}$$

Let's calculate the number of the moles of potassium permanganate:

$$n(KMnO_4) = c(KMnO_4) \cdot V(KMnO_4) = 0.04(M) \cdot 35 \cdot 10^{-3}(L) = 1.4 \cdot 10^{-3}(mol)$$

So, the number of the moles of oxalic acid is:

$$n(H_2C_2O_4) = n(KMnO_4) \cdot \frac{5}{2} = 1.4 \cdot 10^{-3}(mol) \cdot \frac{5}{2} = 3.5 \cdot 10^{-3}(mol)$$

Then, dividing the number of the moles by the volume of oxalic acid solution, we get the concentration:

$$c(H_2C_2O_4) = \frac{n(H_2C_2O_4)}{V(H_2C_2O_4)} = \frac{3.5 \cdot 10^{-3}(mol)}{100 \cdot 10^{-3}(L)} = 0.035(M)$$

Answer: 0.035M