

## Answer on Question #36760 - Chemistry - Inorganic Chemistry

### Question:

A certain amount of hydrogen peroxide was dissolved in 100 mL of water and then titrated with 1.68 M  $\text{KMnO}_4$ . How much  $\text{H}_2\text{O}_2$  was dissolved if the titration required 18.3 mL of the  $\text{KMnO}_4$  solution?



$$V(\text{H}_2\text{O}) = 100\text{ml};$$

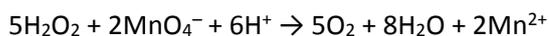
$$C(\text{KMnO}_4) = 1.68 \text{ M};$$

$$V(\text{KMnO}_4) = 18.3\text{ml}.$$

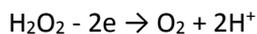
$$m(\text{H}_2\text{O}_2) - ?$$

### Solution:

In the direct titration the equivalent number of moles of the substance (hydrogen peroxide) equals to the equivalent number of moles of the titrant (potassium permanganate). In permanganometric titration such a reaction takes place



The half-reactions corresponding to this reaction are:



$f_{\text{e}}(\text{KMnO}_4) = 1/5$ , and  $f_{\text{e}}(\text{H}_2\text{O}_2) = 1/2$ , since one electron is chemically equivalent to conventional particles  $1/5\text{KMnO}_4$  and  $1/2\text{H}_2\text{O}_2$ .

$$\text{Consequently: } n(1/5\text{KMnO}_4) = 5 \cdot c(\text{KMnO}_4) \cdot V(\text{KMnO}_4)$$

$$n(1/2\text{H}_2\text{O}_2) = m(\text{H}_2\text{O}_2)/M(1/2\text{H}_2\text{O}_2)$$

As far as  $n(1/5\text{KMnO}_4) = n(1/2\text{H}_2\text{O}_2)$ , after the transformation we can find out that:

$$m(\text{H}_2\text{O}_2) = 5 \cdot c(\text{KMnO}_4) \cdot V(\text{KMnO}_4) \cdot M(1/2\text{H}_2\text{O}_2) = 5 \cdot 1.68 \cdot 0.0183 \cdot 18.015 = 2.614 \text{ g}$$

$$\text{Answer: } m = 2.77 \text{ g}$$