Answer on the question #59967, Chemistry / Other

Question :

1)Calculate the grams of EDTA (MW=372,24) required to make a 250,0 ml EDTA solution so that in the titration of 12,50 ml of H2O with 40 french degrees of hardness, 25,00 ml of the edta solution are consumed

2)Calculate the molarity and titer in mg CaCO3/ml of the initial edta solution.

Solution :

One french degree of hardness is 0.09991 mmol/L of Ca and Mg ions. Then, 40 fH° is 3.9964 mmol/L.

The reaction equation is :

$$Me^{2+} + Y^{4-} \rightarrow MeY^{2-}$$

Amount of Me is the same as the amount of Edta.

$$n(Me^{2+}) = n(Y^{4-}) = c \cdot V = 3.9964\ (mmol\ L^{-1}) \cdot 12.5 \cdot 10^{-3}(L) = 0.04996 \cdot 10^{-3}\ mol$$

Then, amount of Edta in 250mL is :

$$n(Y^{4-}) = 0.04996 \cdot 10^{-3}\ \cdot 10 = 0.4996 \cdot 10^{-3}\ mol$$

And finally the mass of Edta is :

$$m(Y^{4-}) = n(Y^{4-}) \cdot M(Edta) = 0.4996 \cdot 10^{-3}(mol) \cdot 372.24(g\ mol^{-1}) = 185.95 \cdot 10^{-3}\ g$$

2) Molarity of initial Edta solution :

$$c(Y^{4-}) = \frac{n(Y^{4-})}{V} = \frac{0.4996 \cdot 10^{-3}\ mol}{250\ \cdot 10^{-3}\ L} = 1.998 \cdot 10^{-3}\ mol\ L^{-1}$$

Titer of Edta solution :

$$t = c \cdot M(CaCO_3) = 1.998 \cdot 10^{-3}\ (mol\ L^{-1}) \cdot 100.0869(g\ mol^{-1}) = 0.200\ g\ L^{-1} = 0.2\ mg\ mL^{-1}$$

Answer : 1) mass of Edta 0.18595 g, 2) 1.998 mmol/L, titer 0.200 mg/mL