

Answer on the question #59967, Chemistry / Other

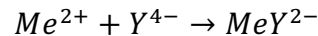
Question :

- 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 :



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

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

Then, amount of Edta in 250mL is :

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

And finally the mass of Edta is :

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

2) Molarity of initial Edta solution :

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

Titer of Edta solution :

$$\begin{aligned} t &= c \cdot M(\text{CaCO}_3) = 1.998 \cdot 10^{-3} \text{ (mol L}^{-1}\text{)} \cdot 100.0869 \text{ (g mol}^{-1}\text{)} = 0.200 \text{ g L}^{-1} \\ &= 0.2 \text{ mg mL}^{-1} \end{aligned}$$

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