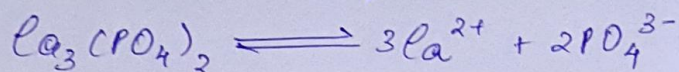


Name: Priyanshu MahatoRoll No.: pm21015002.Expt. NO. 06: Estimation method for calcium in water / ~~1~~ milk by standard EDTA solution.

Q1. Monobasic Calcium Phosphate [$\text{Ca}_3(\text{PO}_4)_2$] is soluble in water but its di & tribasic forms are insoluble. So, $\text{Ca}_3(\text{PO}_4)_2$ is almost insoluble or very less ~~stable~~ soluble in water because the solubility product for dissociation of $\text{Ca}_3(\text{PO}_4)_2$ is $2.07 \times 10^{-33} \ll 1$.

Let the molar solubility of $\text{Ca}_3(\text{PO}_4)_2$ be S



$$\Rightarrow [\text{Ca}^{2+}] = 3C, [\text{PO}_4^{3-}] = 2C$$

$$\Rightarrow K_{sp} = [\text{Ca}^{2+}]^3 [\text{PO}_4^{3-}]^2 = (3C)^3 (2C)^2$$

$$\Rightarrow 2.07 \times 10^{-33} = 27 \times 4 \times C^5$$

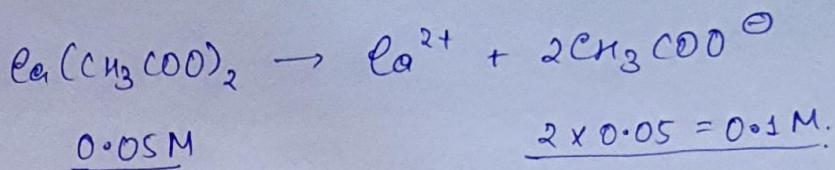
$$\Rightarrow C^5 = \frac{2.07 \times 10^{-33}}{108} = 0.019 \times 10^{-33}$$

$$\Rightarrow C = (1.9 \times 10^{-35})^{1/5} = \underline{\underline{3.1 \times 10^{-7} \text{ M}}}$$

\therefore Molar Solubility of $\text{Ca}_3(\text{PO}_4)_2$ is $3.1 \times 10^{-7} \text{ M}$ which is very low. So, it's insoluble or very less soluble in water.

Q2. Calculate pH of 0.05 M of $\text{Ca}(\text{CH}_3\text{COO})_2$ where pK_a is 4.74.

$$\Rightarrow pK_a = 4.74$$



$\text{Ca}(\text{CH}_3\text{COO})_2$
(Weak Acid + Strong Base)

$$\begin{aligned} \text{pH} &= 7 + \frac{1}{2} pK_a + \frac{\log C}{2} \\ &= 7 + \frac{1}{2} (4.74) + \frac{1}{2} \log(0.1) \\ &= 8.87. \end{aligned}$$

$$\therefore \text{pH} = \underline{\underline{8.87}} \text{ ans.}$$

Q3. Coordination no. of EDTA is 6.

EDTA is a hexadentate ligand that donate six e^- pairs to central metal atom and form a chelate. Chelate is a ring like structure that is formed when multidentate ligand donate more than one electron pairs to central metal atom. Chelation forming complexes are more stable. When EDTA donates its 6 electron pairs to central metal atom, it forms octahedral geometry with chelate which is more stable as compare to EBT complex, which is a tridentate ligand.