Find Maximum Ion Concentration Given a
Fixed Ion Concentration – Question 3

Find the maximum concentration of Pb^{2+} in p.p.m. that can co-exist in equilibrium with a chloride ion concentration of 0.05 M.

$$Pb(Cl)_2 \rightleftharpoons Pb^{2+} + 2\,Cl^{1-} \qquad\qquad Ksp \;=\; 1.6 \times 10^{-5}$$

$$K_{sp} = [Pb^{2+}][Cl^{1-}]^2$$

$$[Pb^{2+}] = \frac{K_{sp}}{[Cl^{1-}]^2}$$

$$[Pb^{2+}] = \frac{1.6 \times 10^{-5}}{(0.05)^2}$$

$$[Pb^{2+}] = 6.4 \times 10^{-3} \text{ M}$$

$$\frac{6.4 \times 10^{-3} \text{ mol } Pb^{2+} \text{ L}}{1 \text{ L}} \quad\text{x}\quad \frac{207.20 \text{ g } Pb^{2+}}{1 \text{ mol } Pb^{2+}} \quad\text{x}\quad \frac{1000 \text{ mg}}{1 \text{ g}} \;=\; \frac{1326 \text{ mg } Pb^{2+}}{1 \text{ L}}$$

$$\therefore [Pb^{2+}] = 1326 \text{ p.p.m.}$$