CHEMISTRY 31

Quiz 5 - Solutions

A solution is prepared in which 0.0050 moles of solid MgSO₄ is dissolved completely in water making a 1.000 L solution. Besides the dissociation reaction, Mg^{2+} also can react to form the complexes MgSO₄(aq) and MgOH⁺ (assume no other complexes form). To simplify this problem, assume that SO₄²⁻ does not react with water and do not consider activity. a) Write out all of the reactions including dissociation. (4 pts)

1) $MgSO_4(aq) \leftrightarrow Mg^{2+} + SO_4^{2^-}$ 2) $Mg^{2+} + OH^- \leftrightarrow MgOH^+$ 3) $H_2O(l) \leftrightarrow H^+ + OH^-$

Note: can also have $MgSO_4(aq) \rightarrow Mg^{2+} + SO_4^{2-}$ (initial dissociation) and $Mg^{2+} + H_2O(l) \leftrightarrow MgOH^+ + H^+$ in replacement of 2) or 3)

b) Give a charge balance equation based on the listed reactions above. (2 pts) $2[Mg^{2+}] + [MgOH^+] + [H^+] = [OH^-] + 2[SO4^{2-}]$

c) Give two mass balance equations based on the listed reactions and the initial concentration of MgSO₄. (4 pts)

 $[MgSO_4]_o = 0.0050 M = [MgSO_4] + [Mg^{2+}] + [MgOH^+] (Mg species)$ $0.0050 M = [MgSO_4] + [SO_4^{2-}] (species)$