

Please read thoroughly and answer all questions. Points available are in parentheses.

- (1.)** (i) What is the molar solubility of Ag_2CO_3 ($K_{\text{sp}} = 8.1 \times 10^{-12}$) in pure water? (5)
(ii) What is the molar solubility of Ag_2CO_3 in 0.10 M Na_2CO_3 ? (5)
- (2.)** You have a solution of 100.0 mL 0.020 M Ag^+ (aq), (with innocent counter-ion) and another solution of 100.0 mL 0.100 M carbonic acid solution?
- (i) What is the pH of 0.100 M carbonic acid solution? (5)
(ii) What is the pH of the mixture of solutions? (5)
(iii) What pH is required to precipitate Ag_2CO_3 (s)? (10)
(iv) You set the pH = 4.00. What is the $[\text{CO}_3^{2-}]$? Will Ag_2CO_3 (s) form now? (5)
- (3.)** You have Fe (s) and Ni (s) electrodes, and you are going to use these to prepare a galvanic cell with Fe^{2+} (aq) and Ni^{2+} (aq) electrolytes.
- (i) Please write the anode and cathode reactions (6)
(ii) Please write the overall cell reaction, with the overall cell potential (10)
(iii) Please write the short-hand notation for the galvanic cell (5)
(iv) If the $[\text{Fe}^{2+}$ (aq)] = 0.100 M and $[\text{Ni}^{2+}$ (aq)] = 1.100 M, what is the cell potential? (5)
(v) If the cell is at equilibrium, what E_{cell} ? (5)
- (4.)** Please write the names of the following: (9)
- $[\text{Pt}(\text{H}_2\text{O})_4](\text{NO}_3)_2$; $\text{K}_3[\text{Fe}(\text{CN})_6]$; $[\text{Co}(\text{en})\text{ClBr}(\text{H}_2\text{O})_2]\text{Cl}$
- (5.)** Please draw the complete sets of possible isomers for each of the following complexes: (15)
- $[\text{Pt}(\text{H}_2\text{O})_2\text{Cl}_2]$; $[\text{Co}(\text{ox})_3]^{3-}$; $[\text{Co}(\text{en})_2\text{Cl}_2]^+$
- (6.)** Please assign *d*-orbital splitting diagrams for the following tetrahedral complexes. (10)
- $[\text{NiCl}_4]^{2-}$; $[\text{FeCl}_4]^-$