一. What are the concentration of Ag^+, $Ag(NH_3)^+$ and $Ag(NH_3)_2^+$ in a solution prepared by adding 0.10 mol of $AgNO_3$ to 1.0 L of 3.0 M NH_3 (15%)

$K_f = 1.7 \times 10^7$, $K_1 = 2.1 \times 10^3$, $K_2 = 8.1 \times 10^3$

二. A 0.750 M solution of H_2SO_4 in water has a density of 1.046 g/mL at 20°C , what is the concentration of this solution in (a) mole fraction (b) weight percent , and (c) molality ? (The molar mass of H_2SO_4 is 98.1 g/mole) (15%)

三. Vinyl chloride ($H_2C=CHCl$) , the starting material used in the industrial preparation of PVC , is prepared by a two-step process that begins with the reaction of Cl_2 with ethylene to yield 1,2-dichloroethane : $Cl_2 + H_2C=CH_2 \rightarrow ClCH_2CH_2Cl$ (l)

$\triangle H^\circ = -217.5$ Kj / mole , $\triangle S^\circ = -233.9$ j / k.mole

(a) Tell whether the reaction is favored by entropy , by enthalpy , by both , or by neither , and then calculate $\triangle G^\circ$ at 298K . (15%)

(b) Tell whether the reaction has an equilibrium temperature between spontaneous and nonspontaneous , if yes , calculate the equilibrium temperature. (15%)

四. Classify each of the following as a Lewis acid or a Lewis base : (20%)

(a) CN^- (b) H_2O (c) Fe^{3+} (d) CO_2 (e) $B(CH_3)_3$

五. What is the oxidation of oxygen in each of the following compound ? Is each compound an oxide , a peroxide , or a superoxide? (20%)

(a) SiO_2 (b) GeO_2 (c) BaO_2 (d) KO_2 (e) RhO_2