



1. Answer the following questions (20% 4 points each).
 - (a) What is common ion effect? What is buffer solution.
 - (b) Write down the structure of Teflon and n-octyl acetate.
 - (c) What are the three laws of thermodynamics?
 - (d) Write down the major structure of Nucleic acid and Enzyme.
 - (e) What is green-house effect? What are green house gas?
2. What are the bonding theories used to describe the bonding of transition metal complexes? (10%)
3. An organic compound contains C, H, N and O. Combustion of 0.1023 g of the compound in excess oxygen yielded 0.2766 g of CO_2 and 0.0991 g of H_2O . A sample of 0.4831 g of the compound was analyzed for nitrogen. At STP, 27.6 mL of dry N_2 was obtained. In a third experiment the density of the compound as a gas was found to be 4.02 g/L at 127°C and 265 torr. What are the empirical formula and the molecular formula of the compound. (10%)
4. Acrylic acid ($\text{CH}_2=\text{CHCO}_2\text{H}$) is a precursor for many important plastics. K for acrylic acid is 5.6×10^{-5} .
 - (a) Calculate the pH of a 0.10 M solution of acrylic acid.
 - (b) Calculate the $[\text{H}^+]$ necessary to ensure that the percent dissociation of a 0.10 M solution of acrylic acid is less than 0.010%.
 - (c) Calculate the pH of 0.050 M solution of sodium acrylate ($\text{NaC}_3\text{H}_3\text{O}_2$). (10%).
5. Predict the sign of ΔS° for each of the following changes. (10%)
 - (a) $\text{AgCl}(s) \rightarrow \text{Ag}^+(aq) + \text{Cl}^-(aq)$
 - (b) $2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(l)$
 - (c) $\text{Na}(s) + 1/2\text{Cl}_2(g) \rightarrow \text{NaCl}(s)$
 - (d) $\text{HCl}(g) \rightarrow \text{H}^+(aq) + \text{Cl}^-(aq)$
 - (e) $\text{N}_2(g) + \text{O}_2(g) \rightarrow 2\text{NO}(g)$
6. A solution containing a 3+ metal ion is electrolyzed by a current of 5.00 A for 10.0 min. What is the identity of the metal if 1.19 g of metal is plated out? (5%).
7. The ionization energy of gold is 890.1 KJ/mol. Is light with a wavelength of 225 nm capable of ionizing a gold atom in the gas phase? why? (5%).