

Bago University
Department of Chemistry
Second Semester Examination, September 2019

Fourth Year BSc
(Chemistry Specialization)
Answer any six Questions

Chem 4110
Analytical Chemistry IV
Time Allowed: (3) hours

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
- (i) When a solid is heated to a high temperature or electricity is passed through a gas, there is _____ of light.
 - (ii) The transition of an electron between two orbitals is called an electronic _____.
 - (iii) Molecules undergo _____ types of quantized transitions.
 - (iv) Neutralization reactions are applicable to _____.
 - (v) If two are available per molecule or ion is described as _____.
 - (vi) EDTA is usually marketed as the _____.
- (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
- (i) The absorbance of a medium increases as attenuation of the beam becomes (greater, smaller, higher).
 - (ii) Ultraviolet and visible absorption spectra are usually obtained on a (solid, liquid, gaseous) sample of analyte.
 - (iii) The (transmittance, absorbance, fluorescence) of a solution is the fraction of the incident electromagnetic radiation.
 - (iv) EDTA can be represented as having (four K_a , three K_a , two K_a) values.
 - (v) The complex between calcium and Eriochrome Black T indicator is much (weaker, stronger, greater) than with magnesium.
 - (vi) The most important (chelometric, complexometric, Leibig) titration is the determination of calcium in blood.
2. (a) Define the following terms.
- (i) Excitation (ii) Relaxation (iii) Absorbance
- (b) The energy different between the 3p and 3s orbitals is 2.118eV. Calculate the wavelength of radiation that would be absorbed in exciting the 3s electron to the 3p state.
3. (a) Write a short note on atomic fluorescence.
- (b) Express the absorbance value 0.765 in term of percent transmittance. Calculate the percent transmittance of solution having twice of the absorbance values of 0.209.
4. (a) Distinguish between emission by fluorescence and phosphorescence.
- (b) Briefly discuss the three types of electronic transition.

P.T.O

5. (a) (i) Give the structure of ethylenediamine ligand and point out the bonding sites with arrows.
(ii) What types of ligand in ethylenediamine? Explain your answer.
- (b) Silver ion forms a stable 1:1 complex with triethylenetetramine, called 'trien' $[\text{NH}_2(\text{CH}_2)_2\text{NH}(\text{CH}_2)_2\text{NH}(\text{CH}_2)_2\text{NH}_2]$. Calculate the silver ion concentration at equilibrium when 25 mL of 0.010 M silver nitrate is added to 50 mL of 0.015 M trien. ($K_f = 5.0 \times 10^7$)
6. (a) Write down the equations and stepwise formation constants for stepwise dissociation of EDTA, H_4Y .
(b) Calculate pCa in 100 mL of solution of 0.100M Ca^{2+} at pH 10 after adding 100mL of 0.100M EDTA. ($\alpha_4 = 0.35$, $K_f = 5.0 \times 10^{10}$)
7. (a) What is meant by EGTA? Explain that it is an ether analogue of EDTA.
(b) If 50 mL of 0.1M Ca^{2+} solution are titrated with 0.1M EDTA, calculate the value of pCa after the addition of 49.9, 50.0 and 50.1 mL of titrant. ($K_f = 5.0 \times 10^{10}$)
