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MAIN EXAMINATION

AUGUST - DECEMBER 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

REGULAR PROGRAMME

CHEM 300: INSTRUMENTAL METHODS

Date: DECEMBER 2015	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Q1. a) Consider 50.00ml of a solution that is 0.0429M in Hcl that is mixed with 20.00 Ml of a solution that is 0.106M in Hcl. What is the concentration in the final solution? **(5 marks)**

b) Define the following terms
- i Quantitation
- ii Detection
- iii Identification
- iv Matrix effect
- v Distinguishing characteristic **(10 marks)**

c) What is the difference between a measurement and an observation? **(5 marks)**

d) Why are values of response for the analyte near the detection limit inconclusive for the analytical goal of detection? **(4 marks)**

e) Define /explain each of the following terms
- i Monochromatic light
- ii Single beam instrument
- iii Transmittance. **(6 marks)**

Q2. a) What special quality must a differentiating characteristics have to be used for separation? **(4 marks)**

b) What is the frequency and color of light that has a wavelength λ of 630 nm in a vacuum? What is the energy of one photen of this light? **(6 marks)**

c) What is a spectrum, and what is the form of the spectrum of white light? **(4 marks)**

d) Why is the use of a blank solution rather than no sample cell or an empty sample cell so important? **(6 marks)**

Q3. a) A solution has an absorbance of 0.237. What is its percentage transmittance? **(5 marks)**

b) What are the advantages of the double beam spectrometer over the single beam spectrometer? **(6 marks)**

c) Explain why the validity of an analytical result ultimately depends on knowing the composition of some primary standards **(9 marks)**

Q4. a) A solid mixture weighing 1.372g containing only sodium carbonate and sodium bicarbonate required 29.11 Ml of 0.7344m HCl for complete titration.

$Na_2CO_3 + 2HCl \longrightarrow 2NaCl_{(aq)} + CO_2 + H_2O$

FM 106

$NaHCO_3 + HCl \longrightarrow NaCl_{(aq)} + CO_2 + H_20$

FM 84

Calculate the mass of each component in the sample mixture. **(8 marks)**

b) Calculate the absorptivity of a compound with molecular mass = 144 if concentration is 1.0×10^{-5} gml solution exhibits an absorbance of 0.400 when the optical path is unity. **(5 marks)**

c) i What is the difference between determinate errors and indeterminate errors? **(3 marks)**

ii Name the THREE kinds of determinate errors? **(4 marks)**

Q5. a) What is electromagnetic radiation? **(4 marks)**

b) Give the definitions of each of the following terms;

i Frequency of wave

ii Wavelength

iii The mathematical relationship between frequency and wavelength. **(6 marks)**

c) List the colors of visible light in decreasing order of energy? **(4 marks)**

d) Give a brief description of how a typical spectrophotometer functions. **(6 marks)**

END