Roll No._____

B.Sc -M. Sc. INTEGRATED PROGRAM CHEMISTRY
SEMESTER V EXAMINATION -2019
PAPER TITLE: PAPER NO: BCH- DSE01TH
PAPER TITLE: ANALYTICAL METHODS IN CHEMISTRY

Write your Roll no at the top immediately after receipt of this question paper

Time: 3hrs ***Max. marks: 75***

Attempt all the questions. All parts of a question must be attempted in continuation. Start answer of a fresh question on a new page.

Q1. Answer briefly ANY TEN of the following **1.5 x 10 =15**

i. What do you mean by retention time?
ii. Describe the working of photomultiplier tube.
iii. Name the stationary and mobile phase in paper chromatography
iv. What is heat capacity?
v. What can TGA tell you about a material?
vi. What is Nernst equation?
vii. What is equivalence point?
viii. A solution's transmittance is 35.0%. What is the transmittance if you dilute 25.0 mL of the solution to 50.0 mL?
ix. Calculate the molarity of a potassium dichromate solution prepared by placing 9.67 grams of $K_2Cr_2O_7$ in a 100-mL volumetric flask, dissolving, and diluting to the calibration mark.
x. Name some IR Transparent materials used for IR analysis of different kind of samples.

Q2. Attempt ANY THREE of the following **5 x 3 = 15**

A. Define precision and accuracy. Explain with the help of a diagram
B. Differentiate between relative and absolute certainty.
C. What is the difference between random and systemic errors?
D. Calculate mean and standard deviation of the following set of analytical results
12.34, 12.63, 12.45, 12.32, 12.87, 12.90
E. Discuss *F*-test for equality of two variances

Q3. Attempt ANY THREE of the following **5 x 3 = 15**

A. Triple bonds have lower stretching frequencies than corresponding double bonds, which in turn have lower frequencies than single bonds. Justify

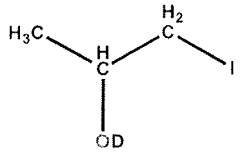
B. Why do extensively conjugated compounds absorb light in the visible region and thus have color.

C. How does the differences in wavenumber in the IR signals of various carbonyl-containing compounds relate to differences in compound structures.

D. What is the difference in operation principle of **AAS** and **AES**?

E. Indicate the number of signals that would appear in the proton NMR spectrum of the following.

(i) $CH_3CH_2CH_2\text{-}NO_2$ (ii) CH_3CCl_3 (iii) $BrCH_2CH_2CH_2Br$

(iv) 

(v) 

Q4. Attempt <u>ANY THREE</u> of the following **5 x 3 = 15**

A. Give the applications of potentiometry in potentiometric titrations.

B. How can Ca and Mg be estimated quantitatively from their mixture?

C. What is direct potentiometry?

D. A 1.4639-g sample of limestone was analyzed for Fe, Ca, and Mg. The iron was determined as Fe_2O_3 yielding 0.0357 g. Calcium was isolated as $CaSO_4$, yielding a precipitate of 1.4058 g, and Mg was isolated as 0.0672 g of $Mg_2As_2O_7$. Report the amount of Fe, Ca, and Mg in the limestone sample as %w/w Fe_2O_3, %w/w CaO, and %w/w MgO.

E. A 516.7-mg sample containing a mixture of K_2SO_4 and $(NH_4)_2SO_4$ was dissolved in water and treated with $BaCl_2$, precipitating the SO_4^{2-} as $BaSO_4$. The resulting precipitate was isolated by filtration, rinsed free of impurities, and dried to a constant weight, yielding 863.5 mg of $BaSO_4$. What is the %w/w K_2SO_4 in the sample?

Q5. Attempt <u>ANY THREE</u> of the following **5 x 3 = 15**

A. Compare gas and liquid chromatography

B. Name the types of detectors used in chromatography? Explain any one in detail.

C. What are the advantages of HPLC?

D. Derive the relation between distribution coefficient and distribution ratio.

E. Discuss determination of enantiomeric composition using NMR.

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P.T.O.