

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSC/PRE-PHD
BRANCH: CHEMISTRY

SEMESTER : VIII/NA
SESSION : SP/19

SUBJECT: SAC2005 ADVANCED ANALYTICAL CHEMISTRY

TIME: 3.00 Hrs

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Compare and contrast the terms - Accuracy, precision and error. Describe the term *standard deviation* with relevant mathematical expression. How the mathematical expression for standard deviation depends on sample size? [6]
- Q.1(b) The dissolved oxygen (DO) of water collected from a river was found as 5.1ppm, 4.9ppm, 4.8ppm, 5.0ppm and 5.2ppm; in five readings. Find (a) mean value of DO (b) *Standard deviation* of the readings (c) *confidence limit* at 99% confidence level. [6]
(Given: when degree of freedom is 4, $t = 4.604$ at 99% confidence level
when degree of freedom is 5, $t = 4.032$ at 99% confidence level
when degree of freedom is 6, $t = 3.707$ at 99% confidence level)
- Q.2(a) Discuss the principle and instrumentation of Atomic Absorption spectrophotometer? [6]
- Q.2(b) What is Beer Lambert's law? Discuss the causes of deviation and limitations? [6]
- Q.3(a) What is XRF? Discuss its principle and significance? [6]
- Q.3(b) Discuss the applications of XRF? How is it different from XRD? [6]
- Q.4(a) Compare and contrast conductometric titrations of strong acid vs strong base with that of weak acid vs strong base. [6]
- Q.4(b) Discuss the method of estimation of Fe (II) by potentiometric titration against standardized potassium -di-chromate solution. Discuss the advantages of potentiometric titrations over conductometric titrations. [6]
- Q.5(a) What is 2D TLC? Describe with well labeled schematic. How it is superior to ordinary TLC? [6]
- Q.5(b) Compare and contrast the working of Thermal conductivity detector (TCD) and Flame Ionization Detector (FID). What are their advantages and disadvantages? Comment on the nature of carrier gas to be used in each case. [6]
- Q.6(a) Describe with well labeled schematics, the working of capillary electrophoresis. What do you mean by the term Electro-osmotic Flow (EOF)? How EOF is important in separation of chemical species? Explain with examples. [6]
- Q.6(b) What is size exclusion chromatography? Explain with appropriate schematics and example. [6]
- Q.7(a) What is TGA and DTA? Discuss the interpretation of TGA analysis giving example of a standard curve? [6]
- Q.7(b) What is Differential Scanning colorimetry? Highlight the difference between colorimetry and calorimetry? [6]

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