WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 5th Semester Examination, 2021-22

CEMADSE02T-CHEMISTRY (DSE1/2)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Answer any *three* questions taking *one* from each GROUP

GROUP-A

(Units 1 and 2)

1. (a) What are determinate errors? Name the different types of determinate errors. 2

   (b) The amounts of the component A present in the compound AB are given in percent. 2

   Results of A in %: 48.32, 48.36, 48.23, 48.11 and 48.38.

   Calculate the mean and relative mean deviation.

   (c) Define molar absorptivity. Mention its unit. 2

   (d) What are the basic structural units of a spectrometer? 2

   (e) What special technique is used to determine mercury in water sample below the level of µg/L by AAS? Discuss. 2

   (f) Discuss the basic principle of Job's method of continuous variation. 2

   (g) Name two IR sources and mention their composition. 2

   (h) What are spectral interferences in AAS? Mention few ways to minimize them. 2

2. (a) During standardization of $KMnO_4$ solution by standard oxalic acid, the volume (mL) of $KMnO_4$ required for four titrations were 20.5, 20.8, 20.7 and 20.4. From those data calculate average deviation, relative error (%) and error in ppm of that analysis. 3

   (b) Why ionization suppressor is used in estimation of metal ion by atomic emission spectroscopy? 2

   (c) State one advantage and one disadvantage of atomic absorption spectroscopy over atomic emission spectroscopy. 2

   (d) Discuss the characteristics of normal error curve. 2

   (e) For which purpose graphite furnace atomic absorption spectroscopy is used? What do you mean by atomic absorption analysis by cold vapour technique? 3

   (f) Give one example of isotopic substitution for structure elucidation of compound in analytical chemistry. 2

   (g) The absorption of ultraviolet and visible radiation can be conveniently studied together, but infrared absorption studies are made separately. Explain. 2

GROUP-B

(Units 3 and 4)

3. (a) What basic information can be obtained from the measured weight loss in a TGA curve? 2

   (b) Show graphically (qualitatively) the different steps in thermogravimetric separation of $CaCO_3$ and $MgCO_3$. 2

   (c) State two limitations of TGA. 2

   (d) Show how the boundary potential is a measure of the pH of the external solution in a pH meter. 2

   (e) How can you determine the pKa value of acetic acid by using a conductivity meter? 2

   (f) What is cell constant? How it is determined? 2

4. (a) What are the main factors that affect the thermogram of a compound? 3

   (b) What is derivative thermogravimetry? 2

   (c) Why is it necessary for the glass in the membrane of a pH-sensitive electrode to be appreciably hygroscopic? 2

   (d) Identify the different kinds of potentiometric titrations. 2

   (e) What will be the nature of the conductometric titration curve of oxalic acid by NaOH? How will you determine the equivalence points? 3

GROUP-C

(Unit 5)

5. (a) What do you mean by ion exchange capacity of a cation exchange resin? Explain the factors on which one cation is preferentially adsorbed over another by a cation exchange resin. 2+2

   (b) Why thin layer chromatography is superior to paper chromatography? What do you mean by the term "Chromatogram"? 2+2

   (c) Mention two detectors which are often used in gas chromatography. Why retention time is the basis for gas chromatographic analysis? 2+2

6. (a) What is the basic principle of solvent extraction? 3

   (b) How does chelation help in metal ion extraction? Give example of two chelating agents. 3

   (c) Gel permeation chromatography is a type of size-exclusion chromatography. Justify or criticize the statement. 2

   (d) What is cation exchange resin? Give one example. 2

   (e) What are the mobile and stationary phases in gas-liquid chromatography? 2

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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