# 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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