B.Sc. 5th Semester (Honours) Examination, 2019 (CBCS)

Subject : Chemistry

Paper : DSE-II

(Analytical Method in Chemistry)

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions from the following: 2×5=10

(a) Explain "high precision of the data does not warrant high accuracy of the result."

(b) Define "transmittance". How it is related to "absorbance"?

(c) Which types of systematic errors are detected by varying the sample size?

(d) Which of the following can be used as carrier gas in gas chromatography?

H_2, He, N_2, O_2.

(e) Why KBr is used in IR spectroscopy?

(f) What is Reverse Phase Liquid Chromatography (RPLC)?

(g) Which flames are used for atomizer in AAS analysis?

(h) What is column resolution in chromatography?

2. Answer *any two* questions from the following: 5×2=10

(a) (i) Define solvent extraction. Explain the role of pH in solvent extraction.

(ii) Calculate the distribution ratio (D) when Fe(III) is extracted from aqueous acidic medium using tributyl phosphate. If $V_o = 10$ ml, $V_w = 25$ ml and $E = 99{\cdot}8$. (1+2)+2=5

(b) (i) Determine the confidence interval (CI) of the mean value of 1432·3 of eight measurements at 95% confidence level (CL). [Given, 95% confidence level at 2σ and $s = 20$ is a good estimate of σ].

(ii) Draw a normal distribution curve with respect population mean (μ) and population standard deviation (σ).

(iii) Which type of error can be distributed by normal distribution curve? 3+1+1=5

(c) (i) You are carrying an experiment of reduction of a ketone to the secondary alcohol by sodium borohydride. How will you use thin layer chromatography (TLC) to monitor whether the reaction is finished or not?

(ii) Distinguish between eluent and effluent. 3+2=5

(d) State and explain Lambert-Beer's law. Draw a curve of transmittance vs. concentration. In which cases deviation of the law from ideal behaviour are observed? 2+1+2=5

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3. Answer *any two* questions from the following: 10×2=20

(a) (i) Define ion-exchange capacity of an ion exchange resin. Mention its unit.

(ii) 22·20 g of cation exchanger in the form of H^+ ion can absorb Ca^{+2} ions fully from 1·0 L of 0·1 N $CaCl_2$ solution. Calculate the exchange capacity of the cation exchanger.

(iii) What are the characteristics of an exchanger?

(iv) What is isocratic elution? 3+3+2+2=10

(b) (i) You are separating a mixture of (R)-2-butanol and (S)- butanol using chiral HPLC. You observed two peaks in the chromatogram with the peak areas (in arbitrary units) of 167890 for the (S)- isomer and 8922 for the (R)- isomer. Calculate the enantiomeric excess of the mixture.

(ii) Define retardation factor (R_f) in Thin Layer Chromatography (TLC).

(iii) You injected a mixture of four hydrocarbons containing neopentane, pentane, isopentane and cyclopentane into Gas Chromatography (GC). Arrange the hydrocarbons according to their increasing retention time. Explain your answer.

(iv) What is the full form of pH? 4+2+3+1=10

(c) (i) What is the radiation source for AAS?

(ii) Between Cation/ Anion/ Organic substances, which (ones) can be analyzed for AAS and why?

(iii) Mention two interferences in AAS analysis. How they interfere in this analysis?

(iv) Which technique can be used for the estimation of mercury by AAS analysis?

(v) What is thermo gravimetric analysis? What information do you get from this analysis? 1+2+3+1+3=10

(d) (i) Describe the set up of potentiometric titration of a weak acid by a strong base using quinhydrone electrode.

(ii) What do you mean by spectrophotometric titration?

(iii) Describe the principle of Job's method of continuous variation to determine the composition of metal-ligand complex.

(iv) Why do we get two peaks in conductometric titration of oxalic acid titrated with NaOH solution? 3+2+3+2=10
