TDP (Honours) 5th Semester Exam., 2021

CHEMISTRY

(Honours)

PAPER : (DSE – I)

Full Marks : 60   *Time* : 3 Hours

The figures in the margin indicate full marks.

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

Answer Question No. 1 and other four questions, taking one from each unit.

GROUP—A

1. Answer *any* **six** of the following questions :

                                                           2×6=12

   (a) How are the accuracy and precision of an analytical measurement mathematically expressed?

   (b) Why is a low temperature flame used for the analysis of alkali and alkaline earth metals?

   (c) What is the necessary condition for a molecule to absorb infrared radiation?

(d) How many fundamental vibrational frequencies can be observed in the infrared absorption spectrum of water?

(e) Which electrodes are used in conductometric and potentiometric titrations?

(f) What are the applications of potentiometry?

(g) What is reversed phase partition chromatography?

(h) What is chiral shift reagents? Give an example.

GROUP—B

UNIT—I

2. (a) Write the principles of F-test and t-test and state the criteria for rejection of data.

(b) Discuss the normal law of distribution of indeterminate errors and explain its significance in chemical analyses.

(c) Two analysts gave the following observations :

Analyst – 1 : 49.01, 49.21 and 49.08

Analyst – 2 : 49.40, 49.42 and 49.44

[Continued]

Calculate precision and accuracy of both the analysts. Which analyst is more precise and which one is more accurate?

5+4+3=12

3. (a) Explain the basic principles of UV-visible spectrophotometer.

(b) What are the fundamental components of a UV-visible spectrophotometer? In what ways a single beam spectrophotometer differs from a double beam spectrophotometer?

(c) How can the metal ions be estimated from its aqueous solution by UV-Vis spectrophotometry?   4+(3+2)+3=12

UNIT—II

4. (a) Why water cannot be used as a solvent in IR spectroscopy?

(b) What are the effect and importance of isotope substitution in IR spectra?

(c) Discuss the basic functions of the following components of IR spectrophotometer :

(i) Detector

(ii) Amplifier

(iii) Recorder   2+4(2+2+2)=12

5. (a) Why is the technique of AAS only limited to metals?

(b) Give an account on choice of source and flame and also designing of burner in case of FAAS and FAES.

(c) Discuss about the technique for the quantitative estimate of trace level of metal ions from water sample. 3+4+5=12

UNIT—III

6. (a) What is thermogravimetric analysis (TGA)? Discuss the basic principle of TGA.

(b) What are the different methods of thermal analysis?

(c) Draw a general thermogram for a sample and discuss the essential features of it.

(d) Find out the percentage composition of a mixture of $CaCO_3$ and $SrCO_3$, where they show weight loses in the temperature ranges 650 °C–850 °C and 950 °C–1150 °C are 110 mg and 220 mg respectively.

4+2+3+3=12

7. (a) What are electroanalytical methods of analysis? Explain with examples.

[Continued]

(b) Discuss the basic principle of potentiometric titration.

(c) How can the dissociation constant of a weak acid be determined using an electroanalytical technique? 4+4+4=12

UNIT—IV

8. *(a)* Write the role of chelating ligand in extraction of metals.

(b) Write the principle of gas chromatography. Mention its applications in pharmaceutical industry.

(c) What is enantiomeric excess? Calculate the percentage composition of two enantiomers of an enantiomeric mixture having 98% ee of *R* enantiomer. 2+(3+3)+(2+2)=12

9. *(a)* Write the basic principle of solvent extraction. Give one industrial application of it.

(b) What is adsorption chromatography? Give two uses of adsorption chromatography.

(c) What are the important components of HPLC?

(d) What are the basic differences between paper chromatography and thin layer chromatography? (2+2)+(2+2)+(2+2)=12

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