2022

(Held in 2023)

CHEMISTRY

Paper : CHMHE5026

(Instrumental Methods of Chemical Analysis)

Full Marks : 60
Pass Marks : 24

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer from the following : 1×5=5

(a) Which of the following wavelength ranges is associated with UV spectroscopy?

(i) 0·8 μm–500 μm

(ii) 400 nm–100 nm

(iii) 380 nm–750 nm

(iv) 0·01 nm–10 nm

(b) The number of signals given by TMS in proton NMR spectrum is

(i) 0

(ii) 1

(iii) 2

(iv) 3

(c) Which of the following emissions have low ionizing power?

(i) α-particle

(ii) β-particle

(iii) γ-particle

(iv) X-ray particle

(d) Which of the following molecules is IR active?

(i) H_2

(ii) N_2

(iii) H_2O

(iv) O_2

(e) Which of the following forms of electrochemistry seeks to obtain the condition for full polarization?

(i) Potentiometry

(ii) Coulometry

(iii) Electrogravimetry

(iv) Voltammetry

(Continued)

2. Answer the following questions : 2×5=10

(a) What do you mean by the terms 'chemical shift' and 'spin-spin splitting'?

(b) Distinguish between chromophores and auxochromes.

(c) What are the necessary conditions for a molecule to be IR active? Which of the following molecules is not IR active and why?

O_2 and H_2O

(d) Name various electrodes used in potentiometry.

(e) What is supercritical fluid? Give examples.

3. Answer the following questions (any *five*) : 5×5=25

(a) Discuss various types of electro-magnetic spectrum.

(b) Describe the electrospray ionization process of mass spectroscopy.

(c) Discuss about the method of X-ray analysis.

(Turn Over)

(d) What are the differences between atomic absorption spectroscopy and flame emission spectroscopy?

(e) Write a short note on gas chromatography separation technique.

(f) Discuss various types of electronic transition in UV spectroscopy.

(g) Briefly discuss the principle of NMR spectroscopy. Write the application of NMR spectroscopy.

4. Answer the following questions (any *two*) : 10×2=20

(a) Describe the basic difference among atomic emission, atomic absorption and atomic fluorescence spectroscopy.

(b) What are different types of liquid chromatography? Explain how a sample is separated and detected in liquid chromatography.

(c) What is chemical shift? Discuss various factors influencing chemical shift. Why do we choose TMS (tetramethylsilane) as a standard substance for recording chemical shift?

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