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Question Paper Code: 55904

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Chemical Engineering

15UCH504- INSTRUMENTAL METHODS OF ANALYSIS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Electromagnetic radiation ranges from. CO1- R
 - Cosmic rays to radio waves
 - gamma rays to microwaves
 - X rays to radio waves
 - None of the above
- What is the instrumental method measured by the scattering of radiation? CO1- R
 - Flame photometry
 - Calorimetry
 - Raman spectroscopy
 - Refractometry
- Why do fluorescence spectrometers often use double-beam optics? CO2- R
 - So a reference solution can be used
 - To compensate for beam attenuation by the monochromator
 - To compensate for power fluctuations in the radiation source
 - All of the above
- What is the source of radiation used in Raman Spectroscopy? CO2- R
 - Tungsten-Halogen lamp
 - Mercury arc lamp
 - Scoop lights
 - Neon lamp
- The main factor which influence the chemical shift in NMR CO3- R
 - Inductive effect
 - Anisotropic effect
 - Hydrogen Bonding
 - All of the above

6. In mass spectrometer, the sample that has to be analyzed is bombarded with which of the following? CO3- R
- (a) Protons (b) Neutrons (c) Electrons (d) Alpha particle
7. In chromatography, the stationary phase can be _____ supported on a solid. CO4- R
- (a) Solid or liquid (b) Liquid or gas (c) Solid only (d) Liquid only
8. _____ is used as the matrix in affinity chromatography CO4- R
- (a) Lactose (b) Sucrose (c) Agrose (d) Fructose
9. Potentiometric method of titrations for non-aqueous solvents employs _____ scale. CO5- R
- (a) pH (b) volts (c) micro volts (d) millivolt
10. In voltammetry, _____ makes an important contribution to the movement of material to the electrode. CO5- R
- (a) migration (b) diffusion (c) convection (d) conduction

PART – B (5 x 2= 10 Marks)

11. Recall the relationship between wavelength and energy of EMR. CO1- R
12. Differentiate absorbance from transmittance. CO2- R
13. Mention the types of relaxation in NMR Spectroscopy. CO3- R
14. Give applications of capillary electrophoresis CO4- R
15. What is ion-selective electrode? CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) Electromagnetic radiation shows dual nature. Explain the dual properties of electromagnetic radiation with a neat sketch. CO1- U (16)
- Or
- (b) What are the types of optical instruments? Explain the principle of Fourier transform optical measurements. CO1- U (16)
17. (a) With a neat sketch explain the effects of auxochrome and conjugation on the absorption maxima. CO2- U (16)
- Or
- (b) Explain in detail about the instrumentation of Raman spectroscopy and its Application. CO2- U (16)

18. (a) Explain in detail how Mass spectrometry is used in determining the amount of a component in a complex mixture and isotopic abundance? CO3- U (16)
- Or
- (b) What is meant by chemical shift? Discuss the principle, instrumentation and applications of NMR spectroscopy with a neat diagram. CO3- U (16)
19. (a) Illustrate the dependence of the retention time on the relative solubility of the sample in the stationary and mobile phase of Liquid – Liquid Partition Chromatography. CO4- U (16)
- Or
- (b) Explain the theory of gas chromatography separation and its application'. CO4- U (16)
20. (a) Potentiometric titrations can be applied to redox reactions. Explain it with a suitable example. CO5- U (16)
- Or
- (b) What is STM? Explain the instrumentation of STM with neat diagram. CO5- U (16)

