STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86 (For candidates admitted during the academic year 2023-24 & thereafter)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024 BRANCH IV- CHEMISTRY FIRST SEMESTER

COURSE	: ELECTIVE
PAPER	: ANALYTICAL INSTRUMENTATION
SUBJECT CODE	: 23CH/PE/AI15
TIME	: 3 HOURS

MAX.MARKS :100

Q. No	SECTION AAnswer all Questions(10x 1=10)	CO	KL
1.	The following region of IR spectra appears between (1400 -600) cm ⁻¹	CO1	K1
	(a) Functional group region (b) Finger print region		
	(c) low frequency region (d) None of the mentioned		
2.	Mössbauer spectroscopy involves nuclear transitions resulting from	CO1	K1
	the absorption ofby the sample.		
	(a) alpha rays (b) beta rays		
	(c) gamma rays (d) x-rays		
3.	XPS works on the principle of	CO1	K1
	(a) cotton effect (b) photovoltaic effect		
	(c) photoelectric effect (d) b and c		
4.	The transducers in the AFM are made of which of the following?	CO1	K1
	(a) Quartz (b) Piezoelectric material		
	(c) Tungsten (d) Aluminum		
5.	Cyclic voltammetry is used for	CO1	K1
	(a) Qualitative analysis (b) Spectral analysis		
	(c) Study the mechanism of redox process (d) Structural analysis		
6.	Working electrode in anodic stripping voltammetry	CO1	K1
	(a) The classical hanging mercury-drop electrode		
	(b) The thin-film mercury electrode		
	(c) Solid electrodes		
	(d) all of the above		
7.	The fundamental principle of amperometric titration is	CO1	K1
	(a) measurement of current change		
	(b) measurement of voltage change		
	(c) measurement of resistance change		
	(d) measurement of conductivity change		

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8	Impedance diagram plotted between	CO1	K1
	(a) Z vs Z' (b) Z' vs Z" (c) Z' vs -Z" (d) log Z vs Z'		
9.	Thermometric titrations are carried out using	CO1	K1
	(a) amperometer (b) voltammeter (c) calorimeter (d) thermistor		
10.	The DSC thermogram is recorded using the parameters	CO1	K1
	(a) Change in mass vs Time (b) Temperature vs Heat flow		
	(c) Mass vs Time (d) Temperature vs Weight		
	SECTION BAnswer all Questions(10x 1=10)	СО	KL
	Fill in the blanks:		
11.	The differential absorption of circularly polarized light is referred	CO2	K2
	as		
12.	AES measures the kinetic energy of an electron to determine	CO2	K2
	it's		
13.	Controlled current coulometry is also known as	CO2	K2
14.	Cottrell equation is the most useful equation in	CO2	K2
15.	In radiochemical analysis, 1 Curie is equal toBq.	CO2	K2
	Answer in one or two sentences:		
16.	What is ICPAES?	CO2	K2
17.	State the modes of operation in STM.	CO2	K2
18.	State Ilkovic equation.	CO2	K2
19.	What is complex dielectric in EIS?	CO2	K2
20.	List out the radiochemical methods.	CO2	K2
	SECTION CAnswer any four(4x6=24)	СО	KL
21.	Give a comparative account of atomic absorption and emission	CO3	K3
	spectroscopy.		
22.	Explain the working principle of AFM with a corresponding block	CO3	K3
	diagram.		
23.	Apply the principle of cyclic voltammetry in detailing the	CO3	K3
	significant behavior of the working electrodes employed in it.		

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24.	Outline the different types of titration curves in amperometry.	CO3	K3
25.	Illustrate the conditions applied for Szilard Chalmers process and mention its applications.	CO3	K3
	SECTION DAnswer any four(4x 8=32)	СО	KL
26.	(a) Examine the significance of cotton effect in compounds.	CO4	K4
	(b) Differentiate Dispersive IR from FTIR. (4+4)		
27.	(a) Illustrate the principle of XPS and list out its application.	CO4	K4
	(b) How do you apply XPS to estimate the kinetic energy of ejected		
	photoelectrons and emitted auger electron? (4+4)		
28.	Outline the procedure of determining the concentration of a substance	CO4	K4
	using coulometric titration.		
29.	Give a detailed account of the instrumentation and application of	CO4	K4
	DTA.		
30.	Discuss the Neutron activation analysis and point out its limitations.	CO4	K4
	SECTION EAnswer the following(2x12=24)	СО	KL
31.	(a) Explain the principle involved in Raman spectroscopy and discuss	CO5	K5
	the fundamental components of Raman spectrophotometer.		
	or		
	(b) Elaborate on the major working parts of TEM with the neat		
	diagram and discuss its working mechanism.		
32.	(a) Evaluate the principle of cathodic stripping voltammetry and how	CO5	K5
	the cathodic stripping analysis is done by varying the		
	working electrodes.		
	or		
	(b) Discuss the principle and components of TGA instrument and		
	state the information that could be achieved for a sample from		
	TGA.		