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

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023
BRANCH IV- CHEMISTRY
FIRST SEMESTER

COURSE : ELECTIVE
PAPER : ANALYTICAL INSTRUMENTATION
SUBJECT CODE : 23CH/PE/AI15
TIME : 3 HOURS **MAX.MARKS :100**

Q. No.	SECTION A (10 x 1 = 10 marks) Answer ALL Questions	CO	KL
1	Define Circular dichroism	1	1
2	Can ^{57}CO act as MB nuclei? Give reason	1	1
3	Why Hydrogen and Helium cannot be detected by XPS?	1	1
4	Write the light source used in UV-Vis spectroscopic technique.	1	1
5	Write the Ilkovic equation	1	1
6	What is the function of counter electrode	1	1
7	Write the various types of mass transport	1	1
8	What are chrono methods?	1	1
9	Define thermogravimetry.	1	1
10	What are hot atoms?	1	1

Q. No.	SECTION – B (10 x 1 = 10 marks) Answer ALL Questions	CO	KL
11	Define circular birefringence	1	2
12	Sn (II) shows positive isomer shift whereas Sn (Iv) shows negative isomer shift in MB spectroscopy. Give reason	1	2
13	Write the application of XPS technique	1	2
14	What is the source used in UV-VIS spectroscopy?	1	2
15	Draw a Cyclic voltammogram	1	2
16	Expand ICPAES.	1	2
17	Define Fingerprint region	1	2
18	Are H_2, N_2 and Cl_2 IR active? Give reason	1	2
19	Draw the TGA curve of $CuSO_4.5\ H_2O$	1	2
20	Define Mossbauer effect	1	2

Q. No.	SECTION C (4 x 6 = 24 marks) ANSWER ANY FOUR QUESTIONS	CO	KL
21	What are cotton effect curves? Explain	3	3
22	Explain Stokes line, antistokes line and Rayleigh scattering with diagram	3	3
23	Differentiate SEM and AFM technique	3	3
24	Explain Szilard- chalmers Process	3	3
25	Explain the factors affecting a thermogram	3	3

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Q. No.	SECTION – D (4 x 8 = 32 marks) ANSWER ANY FOUR QUESTIONS	CO	KL
26	Differentiate between Combination bands and Overtones . Discuss the selection rule for IR spectroscopy	4	4
27	(a)In Mossbauer experiment, a source emitting at 14.4 KeV($3.48x10^{18}$Hz) had to be moved towards theabsorber at2.2mm/s for resonance. Calculate the shift in frequency between the absorber and source.(b)Explain the principle and instrumentation of Mossbauer spectroscopy.	4	4
28	Discuss the instrumentation of double beam UV-Vis spectrometer and explain Franck Condon principle	4	4
29	Explain Amperometric titration. How does it differ from normal titration?	4	4
30	Discuss the instrumentation and advantages of HPLC.	4	4

Q. No.	SECTION – E (2 x 12 = 24 marks) ANSWER THE FOLLOWING	CO	KL
31 a	Explain isomer shift, quadrupole splitting and hyperfine splitting in Mossbauer spectroscopy. (or)	5	5
31 b	(i) Differentiate TEM and STM. The percentage transmittance of equimolar solution of a compound at 250nm and at 25°C is 13.2% for $5x10^{-4}$mol/lit solution. Cell length is 1cm. Calculate A and molar extinction co-efficient (ii) Derive the integrated equation of Beer lamberts law.		
32 a	Explain the principle, working and application of DTA. (or)	5	5
32 b	Define (i)3 electrode system(ii) Nernst equation and (iii)explain Coulometric titration.		

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