

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION MAY 2026
(Sixth Semester)**

Branch – **CHEMISTRY**

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	State the advantage of using the method of least squares. (i) It is a simple method (ii) It is a fast method (iii) It provides the best fit line (iv) It is a graphical method	K1	CO1
	2	What is the purpose of TGA? (i) To measure the melting point (ii) To measure the boiling point (iii) To measure the change in weight (iv) To measure the heat of reaction	K2	CO1
2	3	Name the region of the electromagnetic spectrum where IR radiation is found. (i) Infrared region (ii) Visible region (iii) Ultraviolet region (iv) Microwave region	K1	CO2
	4	Explain the principle of Raman spectroscopy. (i) Absorption of radiation by molecules (ii) Emission of radiation by molecules (iii) Scattering of radiation by molecules (iv) Reflection of radiation by molecules	K2	CO2
3	5	Record the laws of colorimetric analysis. (i) Beer's law, Lambert's law (ii) Beer-Lambert's law (iii) Both A and B (iv) None of the above	K1	CO3
	6	Classify the following electronic transitions: $\sigma \rightarrow \sigma^*$, $n \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ (i) Allowed, Forbidden, Allowed, Forbidden (ii) Forbidden, Allowed, Forbidden, Allowed (iii) Allowed, Allowed, Forbidden, Forbidden (iv) Forbidden, Forbidden, Allowed, Allowed	K2	CO3
4	7	Select the correct statement about hyperfine splitting in ESR: (i) It is caused by the interaction of the electron with a nucleus (ii) It is caused by the interaction of the electron with another electron (iii) It is caused by the interaction of the nucleus with another nucleus (iv) It is caused by the interaction of the electron with a magnetic field	K1	CO4
	8	Summarize the factors influencing chemical shift in NMR. (i) Local diamagnetic shielding, diamagnetic anisotropic shielding (ii) Paramagnetic shielding, spin-spin coupling (iii) Both A and B (iv) None of the above	K2	CO4
5	9	Tell the principle of polarography. (i) Measurement of current-voltage relationship (ii) Measurement of potential-time relationship (iii) Measurement of current-time relationship (iv) Measurement of potential-current relationship	K1	CO5
	10	Compare conventional polarography and pulse polarography. (i) Conventional polarography is more sensitive (ii) Pulse polarography is more sensitive (iii) Conventional polarography is faster (iv) Pulse polarography is faster	K2	CO5

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SECTION - B (35 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the difference between precision and accuracy in analytical chemistry.	K2	CO1
		(OR)		
	11.b.	Enumerate the applications of TGA and DTA.		
2	12.a.	Show how IR spectroscopy is used to study the nature of metal-ligand bonding in carbonyl complexes.	K2	CO2
		(OR)		
	12.b.	Compare IR and Raman spectroscopy in terms of instrumentation and applications.		
3	13.a.	Construct a calibration curve for the determination of a metal ion using Beer's law.	K3	CO3
		(OR)		
	13.b.	Identify the types of electronic transitions involved in UV-Visible spectroscopy.		
4	14.a.	Dissert the applications of NMR spectroscopy in kinetic studies.	K3	CO4
		(OR)		
	14.b.	Assume that you are given an unknown compound, and use NMR and ESR spectroscopy to determine its structure.		
5	15.a.	Compare the advantages and limitations of dropping mercury electrode (DME) in polarography.	K4	CO5
		(OR)		
	15.b.	Elaborate on the Ilkovic equation and its significance in polarography.		

SECTION -C (30 Marks)Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Illustrate the use of scatter diagrams and the method of least squares in analytical chemistry.	K2	CO1
2	17	Extend the concept of fingerprint region in IR spectroscopy to the identification of molecules.	K2	CO2
3	18	Build a block diagram of a UV-Visible spectrophotometer and explain its components.	K3	CO3
4	19	Develop a method for the structural determination of a simple organic molecule using NMR spectroscopy.	K4	CO4
5	20	Formulate a method for the analysis of an organic compound using organic polarography.	K6	CO5

Z-Z-Z

END