Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous Institute U/s UGC Act 1956)

B.Tech. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1CH305 **DATE: 26-12-2025**

SUBJECT NAME: APPLIED CHEMISTRY

TIME: 11:00 AM to 01:30 PM **TOTAL MARKS: 70**

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

			Marks	BL	CO
Q.1	**(a)**	Define: (i) Dipole Moment (ii) Normality (iii) Viscosity	**03**	**R**	**1**
	(b)	Explain the factors related to osmosis and osmotic pressure that influence the optimization of the process.	**04**	**U**	**1**
Q.2	**(a)**	Explain the term Electrolyte, Conductance and Equivalent conductance.	**03**	**U**	**2**
	(b)	Explain the determination of the cell constant of a conductivity cell with a diagram.	**04**	**U**	**2**
	(c)	Describe the difference between molar conductance and specific conductance.	**07**	**U**	**2**
		OR			
Q.2	**(a)**	Discuss Arrhenius theory of ionisation.	**03**	**U**	**2**
	(b)	Explain the conductance of a solution changes during the titration of a strong acid with a strong base.	**04**	**U**	**2**
	(c)	Explain the mechanism of electrolysis and state Faraday's laws of electrolysis.	**07**	**U**	**2**
Q.3	**(a)**	Explain Order of reaction.	**03**	**U**	**3**
	(b)	The following data was obtained on hydrolysis of methyl acetate at 25°C in 0.35 N hydrochloric acid. Analyze the data and show that it is a first order reaction.	**04**	**N**	**3**

t (secs)	0	4500	7140	∞
ml alkali used	24.36	29.31	31.72	47.15

	(c)	Construct the phase diagram of the Water system and explain its salient features.	**07**	**A**	**3**

OR

Q.3	**(a)**	Explain the term phase, component and degree of freedom.	**03**	**U**	**3**
	(b)	A solution of H_2O_2 when titrated against $KMnO_4$ solution at different time intervals gave the following results: t (minutes) | 0 | 10 | 20 Vol $KMnO_4$ used for 10 ml H_2SO_4 | 23.8 ml | 14.7 ml | 9.1 ml Analyze the data and & Show that the decomposition of H_2O_2 is a first order reaction.	**04**	**N**	**3**
	(c)	Construct the phase diagram of the Sulphur system and explain its salient features.	**07**	**A**	**3**

SECTION B

			Marks	BL	CO
Q.4	**(a)**	Define enthalpy of reaction and differentiate between exothermic and endothermic processes with suitable examples.	**03**	**U**	**4**
	(b)	Calculate the enthalpy of formation of CO_2 from the following data using Hess's Law: $C + ½\ O_2 \rightarrow CO \quad \Delta H = -110$ kJ/mol $CO + ½\ O_2 \rightarrow CO_2 \quad \Delta H = -283$ kJ/mol	**04**	**A**	**4**
Q.5	**(a)**	Explain the working principle of a Nephelometer and list two of its chemical applications.	**03**	**U**	**5**
	(b)	With a neat diagram, describe the instrumentation of a Flame Photometer and discuss its analytical significance.	**04**	**A**	**5**
	(c)	A sample contains Na^+ and K^+ ions. Describe how Atomic Absorption Spectroscopy (AAS) can be used to estimate their concentrations, including the principle and calibration method.	**07**	**N**	**5**

OR

Q.5	**(a)**	Explain the principle of Mass Spectroscopy and how molecular ion peaks are used to determine molecular weight.	**03**	**U**	**5**
	(b)	What are the differences between Nephelometry and Turbidimetry? Give one analytical application for each	**04**	**A**	**5**
	(c)	Draw a labeled schematic of an AAS instrument and explain the functions of its components.	**07**	**N**	**5**

Q.6	**(a)**	Describe the principle and basic working of Scanning Electron Microscopy (SEM) for surface characterization.	**03**	**U**	**6**
	(b)	Compare XRD and Thermal Gravimetric Analysis (TGA) in terms of the information they provide about materials.	**04**	**A**	**6**
	(c)	A gas mixture contains methane, ethane, and propane. Explain how Gas Chromatography (GC) separates and quantifies these components. Include the roles of carrier gas and detector.	**07**	**N**	**6**

OR

Q.6	**(a)**	Discuss the principle and working of Transmission Electron Microscopy (TEM).	**03**	**U**	**6**
	(b)	Explain Field Emission SEM (FESEM) and how it differs from conventional SEM in resolution and image quality	**04**	**A**	**6**
	(c)	What are the types of Chromatography based on the mobile phase? Explain the instrumentation of Gas Chromatography with a schematic diagram.	**07**	**N**	**6**

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