G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.
(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: B.Sc., CHEMISTRY

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
III	PART - III	CORE - 3	U23CH303	GENERAL CHEMISTRY - III

Date & Session: 30.04.2025/FN **Time: 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	The Maxwell-Boltzmann distribution describes _____. a) Energy distribution b) Velocity distribution of gas molecules c) Distribution of gas pressure d) Phase changes of gases at high temperatures
CO1	K2	2.	Boyle temperature is the temperature at which_____. a) A gas follows the ideal gas law exactly b) The gas compressibility factor (Z) becomes zero c) The gas undergoes liquefaction d) A gas exhibits maximum deviation from ideal behaviour
CO2	K1	3.	Which property of liquids is responsible for the formation of droplets? a) Viscosity b) Surface tension c) Density d) Capillary action
CO2	K2	4.	Which of the following solids has a hexagonal close-packed (HCP) structure? a) NaCl b) ZnS c) TiO_2 d) Graphite
CO3	K1	5.	Which type of radioactive decay results in the emission of a helium nucleus? a) Alpha (α) decay b) Beta (β) decay c) Gamma (γ) decay d) Positron emission
CO3	K2	6.	Which nuclear reactor is NOT located in India? a) Tarapur Atomic Power Station b) Kaiga Nuclear Power Plant c) Fukushima Daiichi Nuclear Plant d) Kudankulam Nuclear Power Plant
CO4	K1	7.	What is the intermediate involved in nucleophilic aromatic substitution via the benzyne mechanism? a) Carbocation b) Free radical c) Benzyne d) Carbanion
CO4	K2	8.	The major product obtained when benzyl chloride reacts with aqueous NaOH is _____. a) Benzyl alcohol b) Toluene c) Benzaldehyde d) Benzene
CO5	K1	9.	Which reaction is used to introduce the –CH_3 group at the ortho-position of phenol? a) Kolbe's reaction b) Reimer-Tiemann reaction c) Friedel-Crafts alkylation d) Gattermann reaction
CO5	K2	10.	Which of the following is an example of an electrophilic substitution reaction in phenols? a) Hydrolysis b) Bromination c) Cannizzaro reaction d) Hydrogenation

Course Outcome	Bloom's K-level	Q. No.	SECTION – B (5 X 5 = 25 Marks) Answer ALL Questions choosing either (a) or (b)
CO1	K3	11a.	Discuss deviations of real gases from ideal behavior.
			(OR)
CO1	K3	11b.	Define collision frequency, collision diameter, and mean free path.
CO2	K3	12a.	Define surface tension, viscosity, and their applications.
			(OR)
CO2	K3	12b.	Distinguish between crystalline and amorphous solids.
CO3	K4	13a.	Discuss how carbon dating is used to determine the age of fossils and archaeological artifacts.
			(OR)
CO3	K4	13b.	Compare and contrast nuclear fission and nuclear fusion.
CO4	K4	14a.	Define alkyl halides and classify them based on their structure.
			(OR)
CO4	K4	14b.	Discuss the mechanism of nucleophilic aromatic substitution reactions.
CO5	K5	15a.	Formulate the Reimer-Tiemann reaction with mechanism.
			(OR)
CO5	K5	15b.	Write the mechanism of Fries rearrangement and its significance.

Course Outcome	Bloom's K-level	Q. No.	SECTION – C (5 X 8 = 40 Marks) Answer ALL Questions choosing either (a) or (b)
CO1	K3	16a.	Explain the postulates of the kinetic molecular model of gases and derive the kinetic gas equation.
			(OR)
CO1	K3	16b.	Discuss the Maxwell-Boltzmann distribution of molecular speeds. How do average speed, root mean square speed, and most probable speed differ?
CO2	K4	17a.	Compare and contrast the properties and structures of diamond and graphite
			(OR)
CO2	K4	17b.	Analyze different types of stoichiometric and non-stoichiometric defects in solids and their impact on material properties.
CO3	K4	18a.	(i)Describe the nuclear stability of isotopes in terms of the neutron-proton ratio. (ii) Analyze the relationship between mass defect and binding energy.
			(OR)
CO3	K4	18b.	(i)A sample of a radioactive substance contains 100 g of material. How much will remain after 11,460 years if the half-life is 5730 years? Number of half-lives: $11,460/5730=2$ Remaining mass: $N=100\times(1/2)^2$ $\qquad\qquad\qquad =25$ Thus, after **11,460 years**, **25 g** of the substance will remain. (ii)Explain Fajan's-soddy displacement law and Giger- Natta rule
CO4	K5	19a.	Write the preparation of benzyl chloride. Enumerate it's any two chemical properties and uses.
CO4	K5	19b.	**(OR)** What are dihalogen and trihalogen derivatives? Give one example for each and write one method of preparation and one chemical property.
CO5	K5	20a.	Formulate the reaction of benzyl alcohol with sodium, acetic anhydride and thionyl chloride.
CO5	K5	20b.	**(OR)** (i) Illustrate the effect of electron-withdrawing and electron-donating groups on phenol reactivity. (ii) Write the mechanism of Claisen rearrangement.