Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES
End Semester Examination, May 2025

Course: Chemistry **Semester: II**
Program: B.Tech. ASE + ME + AE + EE + ECE **Time : 03 hrs.**
Course Code: CHEM1013 **Max. Marks: 100**

Instructions: Read all the instructions below carefully and follow them strictly.

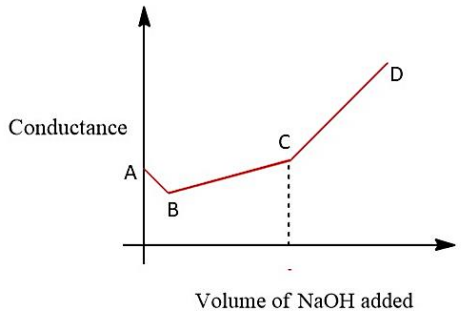
1) **Mention Roll No. at the top of the question paper.**
2) **Internal choice is given in Q. no. 8 and 10.**
3) **ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Explain catalytic cracking of hydrocarbons with examples.	**4**	**CO1**
Q 2	At 500^0C, the reaction between N_2 and H_2 to form ammonia has K_c = 12.0 x 10^{-2}. What is the value of K_p for the reaction? (Given gas constant = 0.0821 L atm $K^{-1}mol^{-1}$)	**4**	**CO2**
Q 3	Derive the rate expression for a unimolecular reaction at low pressure according to Lindemann theory.	**4**	**CO2**
Q 4	For a certain first order reaction, $t_{0.5}$ is 200 s. Calculate the time required for 75% completion of a reaction.	**4**	**CO2**
Q 5	Explain synthesis of nanomaterials using microemulsion method.	**4**	**CO5**

SECTION B
(4Qx10M= 40 Marks)

Q 6	The molar conductance of CH_3COONa, HCl and NaCl at infinite dilution are 91x10^{-4}, 426.16x10^{-4} and 126.45x10^{-4} Sm^2mol^{-1}, respectively at 25˚C. Calculate the molar conductance at infinite dilution for CH_3COOH. If molar conductance of 0.01M aqueous solution of CH_3COOH is 16.32x10^{-4} Sm^2mol^{-1}, calculate the degree of dissociation of CH_3COOH.	**10**	**CO3**
Q 7	A 100ml sample of water required 13.5ml of 0.02 M EDTA solution for titration using EBT as indicator. Another 100ml of water from the same source was boiled and precipitates were removed by filtration. The	**10**	**CO4**

	filtrate required 6ml of 0.02 M EDTA for titration. Calculate total hardness, permanent hardness and temporary hardness of water sample.		
Q 8	a) Provide a brief overview of the bulk polymerization method, including its key advantages and disadvantages. **OR** Write the molecular structure of the polymer and its monomer unit, used for the manufacture of tyres and contact lenses. b) Define thermoplastics and thermosets. **OR** Calculate the number average molecular mass of a polymer having 30 molecules with molecular mass 4000 each, 30 molecules with molecular mass 6000 each and 40 molecules with molecular mass 8000 each.	**5** **5**	**CO5**
Q 9	a) 0.2346 g of an organic substance gave on combustion 0.2754 g of CO_2 and 0.4488 g of water. Calculate the % of carbon and hydrogen in it. b) Define octane number and mention four methods used to increase it.	**5** **5**	**CO1**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	a) Explain the following graph  **OR** The standard reduction potentials of Cu^{+2}/Cu and Ag^{+}/Ag electrodes are +0.337 and +0.799V, respectively. Construct a galvanic cell using these electrodes so that its standard EMF is positive. For what concentration of Ag^{+} will the EMF of the cell at 25˚C be zero if the concentration of Cu^{+2} is 0.01M? b) Discuss the effect of the environment on the rate of corrosion and the methods to prevent it. **OR** Explain the various types of film (metal oxide layer) formed during the oxidation corrosion.	**10** **10**	**CO3**

Q 11	a) A sample of water contains following impurities: $MgSO_4$ = 60 mg/l, $CaSO_4$ = 68 mg/l, $Mg(HCO_3)_2$ = 146 mg/l, $CaCl_2$ = 111 mg/l. Calculate the quantity of lime (70% pure) and soda (95% pure) needed for softening 4000 l of water. (Given atomic wt. H=1, C=12, O=16, Cl=35.5, Mg=24, S=32, Ca=40). b) With the help of suitable reactions, explain the process of purification of water by ion-exchange method. Write advantages and disadvantages of the method.	**10** **10**	**CO4**