Programme: B.Tech. (CSE, AI, ECE, VLSI, EE, DS)   Year/Semester: 23-24/2nd

Course: **Applied Chemistry I**   Course Code: **CH2301**

Maximum Marks: **40**   Time allowed: **3 hours**
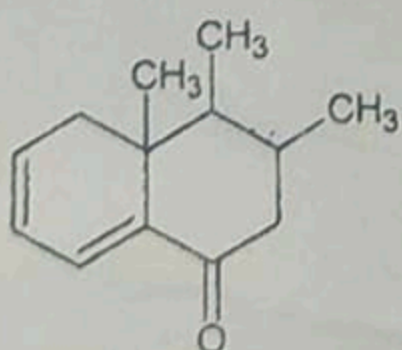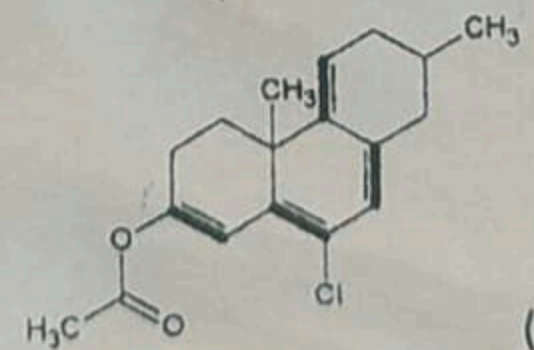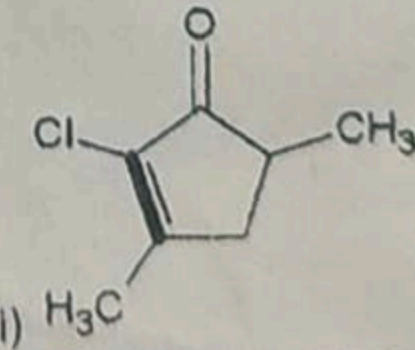
Note: All questions are compulsory.

Q. No.			Marks
1.	(a)	Draw the molecular orbital diagram for NO. Discuss the change in bond energy and magnetic nature during the ionisation of NO to NO^+.	[2]
	(b)	Deduce which of the following complexes shows distortion in regular geometry: $[Mn(H_2O)_6]^{2+}$, $[Ti(H_2O)_6]^{2+}$, $[Ni(H_2O)_6]^{2+}$, $[Cr(H_2O)_6]^{2+}$. Explain on the basis of Jahn Teller Theorem.	[2]
	(c)	State, giving reasons, the limitations of Friedel-Craft alkylation and acylation reaction.	[2]
	(d)	How does computational chemistry serve as an important tool in the field of drug discovery?	[2]
2.	(a)	Write down the mechanism of anionic polymerisation with suitable example.	[2]
	(b)	How do optical and electrical properties of a polymer vary based on its structure?	[2]
	(c)	Differentiate between suspension polymerization and emulsion polymerization methods.	[2]
3.	(a)	Determine the concentration (x) of Ni^{2+} in the cell at 25°C when the emf is measured as 0.601 V. The cell setup is: $Ni(s)/Ni^{2+}$ (x M)//Cu^{2+}(0.75 M)/Cu(s) Given $E°_{oxidation}$ Ni/Ni^{2+} = 0.25 V and $E°_{reduction}$ Cu^{2+}/Cu = 0.34 V	[2]
	(b)	Explain, diagrammatically, the construction and working of Li-ion battery. Compare the merits of Li ion battery over NiCd and Ni-metal hydride battery.	[4]
	(c)	Differentitate between phosphoric acid fuel cell (PAFC) and solid oxide fuel cell (SOFC). Out of these two, which one offers superior performance?	[2]
4.	(a)	Calculate the value of λ_{max} for the following compounds: (i) (ii) (iii)	[3]
	(b)	Calculate the molar absorption coefficient of a 0.5 mM aqueous solution of an unknown compound which showed 25% transmittance at 250 nm. (Assuming cell path length 1 cm).	[2]

	(c)	Describe magnetic anisotropy with suitable example. Explain its influence on the chemical shift values in ^{1}H NMR spectroscopy.	[4]
5.	(a)	Define the term superconductivity. Differentiate between Type-I and Type-II superconductors.	[3]
	(b)	Classify the carbon nanomaterials on the basis of dimensionality. Give suitable examples of each. Describe any two methods for synthesis of 2D materials.	[3]
	(c)	Explain the construction and working of Organic Light Emitting Diode.	[2]