Register Number:……..

KUMARAGURU
college of technology
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B.E/B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Second Semester

COMMON TO AERO / BIO / EEE / EIE / FT / TXT

U18CHI2202**:** Engineering Chemistry

COURSE OUTCOMES

CO1: Apply the basic principles of chemistry at the atomic and molecular level.

CO2: Analyze the impact of engineering solutions from the point of view of chemical principles.

CO3: Apply the chemical properties to categorize the engineering materials and their uses.

CO4: Integrate the chemical principles in the projects undertaken in field of engineering and technology.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	List the primary difference between the Calomel electrode and the Glass electrode? Provide a the key role each electrode plays in electrochemical measurements.	CO4	[K_2]
2.	Define the significance of Electrochemical Series in predicting the feasibility of redox reactions, with an example.	CO3	[K_2]
3.	Define adsorption and briefly explain the two main types of adsorptions. Discuss two key factors that can significantly affect the adsorption process.	CO2	[K_1]
4.	Discuss the significance of the power law in surface catalysis and explain how it relates to the rate of catalyzed reactions.	CO1	[K_2]
5.	Define the term "Degree of Polymerization" and explain its significance in polymer chemistry.	CO2	[K_2]
6.	Differentiate between liquid, solid, and semi-solid lubricants with examples of each type of lubricant and their specific functions in mechanical systems.	CO3	[K_2]
7.	Provide examples of compounds formed by each type of bond and discuss the nature of the interactions between their constituent atoms.	CO2	[K_1]
8.	What is hydrogen bonding, and how does it differ from other types of intermolecular forces? List any two significances in various biological and chemical processes.	CO1	[K_1]
9.	How does entropy relate to the second law of thermodynamics? Discuss the concept of entropy in terms of molecular disorder and explain how the second law governs the direction of natural processes.	CO1	[K_1]
10.	List the difference between temporary hardness and permanent hardness and discuss the adverse effects of hard water in boilers, focusing on the formation of scale and sludge.	CO4	[K_1]

Answer any FIVE Questions:-
PART B (5 x 4 = 20 Marks)
(Answer not more than 80 words)

11.	Derive the Nernst equation and explain its application in calculating electrode potential under non-standard conditions. Discuss the implications of changing temperature and concentration on electrode potential using appropriate examples.		CO4	[K_2]
12.	Compare and contrast Freundlich's adsorption isotherm with Langmuir's adsorption isotherm. Analyze the strengths and limitations of each model in describing adsorption behavior.		CO1	[K_1]
13.	Conducting polymers, such as Polyacetylene and Polythiophene, have gained significant attention due to their unique electronic properties. Compare and contrast these two conducting polymers in terms of their properties in electronic devices. Analyze the factors that influence the conductivity of conducting polymers. List how these materials can contribute to the advancement of modern technology.		CO3	[K_2]
14.	Explain the importance of hybridization in a molecule. Illustrate the process of sp2 hybridization in specific organic molecules and analyze how it affects the molecular shape and properties of the compounds.		CO1	[K_1]
15.	The Gibbs-Helmholtz equation is a fundamental relationship in thermodynamics. Derive the equation and discuss how the equation relates to the concept of the Free Energy and how it aids in predicting the equilibrium state of a system.		CO2	[K_2]
16.	Provide a brief comparison of external treatment (demineralization process) and internal treatment (colloidal, carbonate, phosphate, and calgon conditioning) in terms of their effectiveness and suitability for different water treatment scenarios.		CO4	[K_2]

Answer any FIVE Questions:-
PART C (5 x 12 = 60 Marks)
(Answer not more than 300 words)

17.	a)	Compare and contrast Metallurgically Influenced Corrosion (MIC) with Environmentally Induced Cracking (EIC) in terms of their mechanisms, influencing factors, and specific scenarios where they are likely to occur. Provide real-world examples of each type of corrosion and the consequences they may entail.	6	CO4	[K_3]
	b)	Compare the effectiveness and limitations of two corrosion control methods: Inhibitors and Cathodic Protection. Illustrate how each method works and analyze their suitability in different corrosion scenarios.	6	CO2	[K_2]
18.	a)	Discuss the different types of catalysis used in various chemical processes and explain how each type of catalysis works and provide examples of their applications in industrial processes.	6	CO2	[K_2]
	b)	Analyze the relationship between adsorption and catalytic activity, highlighting how surface area and surface properties of catalysts influence their catalytic performance with the help of Eley-Rideal mechanism and Langmuir-Hinshelwood mechanism. Provide examples of reactions where each mechanism is likely to play a dominant role.	6	CO3	[K_2]

19.	a)	Describe the constituents of polymer composites (PC) and provide real-world examples of PC and analyze their specific advantages over traditional materials.	6	CO1	[K_2]
	b)	Analyze and discuss the functions and key properties of lubricants. Provide a comprehensive analysis of synthetic lubricants and their advantages over conventional mineral-based lubricants.	6	CO3	[K_2]
20.	a)	Analyze the three types of Van der Waal's forces and discuss the factors that influence the strength of these forces and how they contribute to properties.	6	CO1	[K_1]
	b)	Explain the characteristics that give rise to hydrogen bonding and analyze how it influences the properties of molecules and materials. Discuss the impact of hydrogen bonding on the properties of liquids, like water, and how it contributes to phenomena like surface tension and high heat capacity.	6	CO2	[K_1]
21.	a)	Maxwell's relations are essential tools for relating different thermodynamic properties to each other. Provide a detailed explanation of two Maxwell's relations and demonstrate how they can be derived from fundamental thermodynamic equations.	6	CO3	[K_2]
	b)	Derive claussius clapeyron equation and explain its significance.	6	CO3	[K_2]
22.	a)	Explain the importance of treating domestic water to remove impurities and harmful substances. Analyze the different methods of domestic water treatment, including filtration, disinfection, and chemical treatment.	6	CO4	[K_2]
	b)	Compare and contrast two desalination methods: reverse osmosis and electrodialysis. Evaluate the suitability of each method for large-scale and small-scale desalination applications, considering factors like water quality, cost-effectiveness, and technological advancements.	6	CO4	[K_2]

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