KUMARAGURU college of technology
character is life

Register Number:……..

B.E/B.TECH DEGREE EXAMINATIONS: NOV/ DEC 2024

(Regulation 2024)

First Semester

Bio Technology

24CYI103 : Foundations of Chemistry for Biotechnology

COURSE OUTCOMES

CO1: Apply knowledge of solution chemistry to prepare and standardize chemical solutions for biochemical processes.

CO2: Analyse the factors affecting reaction rates to evaluate enzyme behaviour under different conditions.

CO3: Apply the reactivity of major organic molecules to identify functional groups and bonds in living cells.

CO4: Apply various organic reactions and mechanisms to select appropriate pathways for biochemical synthesis.

CO5: Analyse the role of stereochemistry in drug efficacy to assess the biological significance of isomers.

CO6: Evaluate and apply fundamental principles of solution chemistry, chemical kinetics, organic reactions, and stereochemistry in biochemical processes and pharmaceutical production.

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

PART A (4 * 20 = 80 Marks)
Answer all the Questions

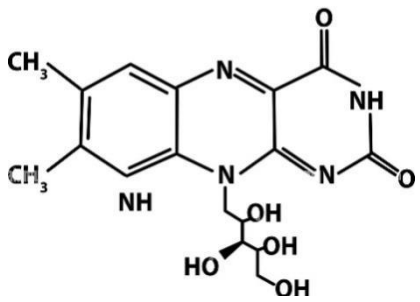
1.	a)	Calculate the molality of a solution containing 36g of glucose ($C_6H_{12}O_6$) dissolved in 64g of water.	2	CO6	[K_3]
	b)	How is the boiling point elevation for a solution calculated.	2	CO1	[K_1]
	c)	Scenario: You are provided with a weak acid HA and its salt NaA. The goal is to prepare 250 mL of a buffer solution with a pH of 4.0. The pKa of HA is 4.2.	4	CO6	[K_1]

Discuss the impact of buffer capacity on the stability of biochemical systems.

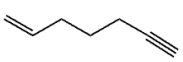
	d)	Explain the principle behind the Henderson-Hasselbalch equation used for this buffer preparation.	6	CO1	[K_3]
	e)	Calculate the ratio of $[A^-]/[HA]$ required for the buffer.	6	CO1	[K_2]
2.	a)	Define molecularity of a reaction and provide examples.	2	CO2	[K_1]
	b)	Explain transition state theory and its relevance in catalysis.	2	CO2	[K_2]
	c)	Discuss the different factors influencing reaction rates with examples .	4	CO2	[K2]
	d)	Derive an expression for the rate constant of a first-order reaction and illustrate with an example.	6	CO6	[K_3]
	e)	Derive and evaluate how enzyme concentration influences the rate of a biochemical reaction using the Michaelis-Menten equation.	6	CO6	[K_3]
3.	a)	Identify and name the functional groups present in the given molecule.	2	CO3	[K_1]

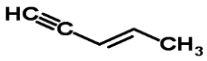
Vitamin B2

Riboflavin



	b)	Identify and name the functional groups present in the given molecule.	2	CO3	[K_2]





	c)	Illustrate and explain the hyper conjugation effect in an organic molecule and explain its role in influencing the stability of the molecule.	4	CO3	[K_3]
	d)	Predict the product of the phosphorylation reaction involving glucose during glycolysis regulation catalysed by enzyme.	6	CO4	[K_2]

e)	Predict the products of hydrolysis for ester under acidic and basic conditions with examples .	6	CO4	[K_3]

4.	a)	With an example explain the significance of structural isomerism in fatty acid.	2	CO5	[K_1]
	b)	Differentiate between geometric isomers with an example of cis- and trans-isomerism.	2	CO5	[K_2]
	c)	Using a case study of L-DOPA, discuss the biological significance of stereoisomers in pharmaceutical applications for the treatment of Parkinson's.	12	CO5	[K_3]
	d)	Analyze the importance of drug efficacy and toxicity in pharmaceutical industry.	4	CO5	[K_3]

PART B (1 x 20 = 20 Marks)
Answer any ONE Question

5.	a)	Differentiate between DNA and RNA based on their sugar components.	2	CO3	[K_2]
	b)	Explain the importance of reaction intermediates like carbenes in organic synthesis.	2	CO3	[K_2]
	c)	Illustrate the different isomers of Glucose and explain how their unique structure influence their roles in various biochemical reactions in the body.	8	CO6	[K_3]
	d)	Explain how the enzymatic pathway involved in the preparation of AMP offers an environmentally friendly solution.	8	CO4	[K_3]

6.	a)	Explain the concept of allosteric regulation in biological systems.	2	CO3	[K_1]
	b)	Illustrate with the structure of leucine and isoleucine the biological relevance of structural isomerism.	2	CO3	[K_2]
	c)	Discuss the role of enzyme in cell function.	8	CO6	[K_3]
	d)	Evaluate using the case study of thalidomide tragedy, the biological significance of stereochemistry in drug action.	8	CO4	[K_3]

CO distribution summary:

	CO1	CO2	CO3	CO4	CO5	CO6
Marks (%)	14	14	12	20	20	20

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