BT (5)

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9001

B.E. /B.Tech. DEGREE END-SEMESTER EXAMINATIONS – April / May 2023
Eighth Semester
Biotechnology

U19BTE16 – FOOD NUTRITION & HEALTH SCIENCES

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Mention the various forms of malnutrition.	2	K1	CO1
2.	Why are recommended dietary allowances set up?	2	K2	CO1
3.	What is dietary fiber?	2	K1	CO1
4.	List the nutrients which supply energy.	2	K2	CO1
5.	Why is more protein food needed during pregnancy?	2	K2	CO4
6.	Indicate the advantages of breastfeeding.	2	K1	CO5
7.	Differentiate food allergy and food intolerance.	2	K3	CO1
8.	Name fruit spoilage microorganisms.	2	K1	CO4
9.	Define a balanced diet.	2	K2	CO2
10.	Draw a nutritional chart for an underweight person.	2	K3	CO2

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	With a neat diagram, explain the steps involved in the absorption process in GIT.	13	K2	CO1
		(OR)			
	b)	i. Explain nutrition research in India.	6	K1	CO1
		ii. List down the five classes of food groups. With an example, explain.	7		CO2
12.	a)	i. Enlist the objectives in planning meals. How can you ensure nutritional adequacy in meals?	8	K2	CO2
		ii. Discuss the factors influencing basal metabolic rate.	5		CO3
		(OR)			
	b)	Classify vitamins based on their solubility. Elucidate the source, functions, and deficiency of each vitamin.	13	K1	CO2 CO5
13.	a)	i. Compare and contrast the nutritional needs of a child in the first year of life with those of an adult.	8	K1	CO3
		ii. How can parents help children to develop good eating habits?	5		CO5
		(OR)			
	b)	Elucidate the fitness parameters and explain how it is assessed.	13	K2	CO3
14.	a)	Summarize the various food-borne diseases at different stages of food processing.	13	K2	CO2 CO3
		(OR)			
	b)	i. Classify food adulterants. Explain each with an example and mention the methods to identify the same.	10	K1	CO1
		ii. What is artificial sweetener? Give an example.	3		CO2
15.	a)	i. Summarize the functions of Indian dietetic association.	6	K2	CO3
		ii. Describe the dietary consideration for healthy gut.	7		CO4
		(OR)			
	b)	What is therapeutic diet? Classify and explain each with proper example.	13	K2	CO3

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	i. Explain the digestion of fat in gastrointestinal tract.	8	K4	CO3
		ii. List the benefits of fats as a nutritional source.	7		
		(OR)			
	b)	How do you plan a diet for a patient suffering from tuberculosis?	15	K3	CO4

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Question Paper Code: 9003

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS –April / May 2023
Eighth Semester
Biotechnology
U19BTE21 – CANCER BIOLOGY
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define mutation with an example?	2	K1	CO1
2.	Define tumor suppressor gene with an example?	2	K1	CO1
3.	Define how X- ray radiation exposure lead to carcinogenesis?	2	K2	CO2
4.	Define ROS. How it is generated?	2	K2	CO2
5.	Write about Retroviruses with an example?	2	K1	CO2
6.	Write about proto-oncogene with an example?	2	K1	CO1
7.	What is meant by disruption of basement membrane?	2	K2	CO1
8.	What is EMT?	2	K1	CO2
9.	How radiation therapy is performed?	2	K3	CO2
10.	List any four chemotherapeutics drugs used in cancer therapy?	2	K1	CO2

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Discuss Cell Cycle with a neat, labelled diagram and write about the positive and negative regulators of cell cycle?	7+6	K3	CO3
		(OR)			
	b)	Write a note on the role of diet as a causative factor for cancer with mechanistic examples?	6+7	K3	CO4
12.	a)	Discuss about various Physical carcinogens and explain their mechanism with examples?	5+8	K2	CO3
		(OR)			
	b)	Discuss about various Chemical carcinogens and explain their mechanism with examples?	5+8	K2	CO3
13.	a)	Write a note on Oncogenes and discuss about any one growth factor that acts as an Oncogene with mechanism?	7+6	K2	CO4
		(OR)			
	b)	Write a note on Viral induced Cancers with two examples?	6+7	K3	CO4
14.	a)	Discuss about various steps involved in metastatic cascade with a neat and labelled diagram?	7+6	K3	CO3
		(OR)			
	b)	Discuss about the role of Proteinases in tumor cell invasion with a neat and labelled diagram?	7+6	K3	CO4
15.	a)	Write a note on various therapeutic modalities for Cancer?	13	K2	CO2
		(OR)			
	b)	Discuss about different diagnostic modalities that are utilized to detect cancers?	13	K3	CO3

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Define Signal switches with an example where in a mutation act as a signal switch between tumor suppressor and oncogene?	7+8	K5	CO4
		(OR)			
	b)	Write a detail note on Immunotherapy and Personalized therapy for cancer?	8+7	K4	CO4

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Question Paper Code: 9004

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – April / May 2023

Eighth Semester

Biotechnology

U19BTE25 – TOTAL QUALITY MANAGEMENT

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Explain the Crosby contributions to Quality	2	K1	CO1
2.	What is Deming's "system of profound knowledge"?	2	K2	CO1
3.	Distinguish between 'internal customer' and 'external customer'.	2	K2	CO2
4.	Describe the three levels of quality in the Kano model of customer satisfaction?	2	K2	CO2
5.	Discuss about Types of histograms and their interpretations.	2	K2	CO1
6.	Highlight the features of 6 sigma.	2	K2	CO1
7.	Explain the cause-and-effect diagram (or) fishbone diagram.	2	K1	CO1
8.	Explain the FAILURE MODE AND EFFECT ANALYSIS (FMEA).	2	K1	CO1
9.	What is BENCH MARKING? Explain its Types.	2	K1	CO1
10.	What is ISO? How it differs from ISI standards?	2	K1	CO1

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain the general duties of a quality council?	13	K2	CO2
		(OR)			
	b)	State and explain the barriers to TQM implementation in an organization	13	K2	CO2

12.	a)	Define process capability? What is the difference between C_p and C_{pk} ?	13	K2	CO2
		(OR)			
	b)	Explain the steps involved in continuous improvement process	13	K2	CO2
13.	a)	Discuss in detail about The seven traditional tools of quality	13	K2	CO3
		(OR)			
	b)	Briefly explain about the concept of six sigma	13	K2	CO3
14.	a)	Explain QFD for design of a course in business school	13	K2	CO2
		(OR)			
	b)	How do you make an FMEA chart and calculate RPN? Explain with an example?	13	K2	CO2
15.	a)	Explain ISO 9000 Implementation and certification process?	13	K2	CO2
		(OR)			
	b)	Explain the ISO 9001:2015 implementation and audit process?	13	K2	CO2

PART – C

(1 x 15 = 15Marks)

Q.No.	Questions	Marks	KL	CO
16.	A major national bank uses a five –day Kaizen approach to attack process speed and efficiency problems. A cross-functional team is selected for the event and participants are pulled off their jobs for several days at a time. The project is well-defined in the beginning because there is a no time to redefine the purpose or scope. A sample agenda that the bank uses for the five days of kaizen implementation is given below. Day 1 is spent looking at the process with new eyes. Participants do a "unit walk", a tour of operations affected by the problem or simulation being studied where they simulate being a work item flowing through the process. The group visits each portion of the process because there is cross-functional representation, they can hear insights from someone who works ion that area. The group creates a value stream map) a picture of the " as-is" simulation) that captures the basic process steps such as cycle times, number of steps, rework loops, queuing delays, work in progress(WIP) and transportation time. Day 3 is designed around clarifying problems and brainstorming solutions. The team re-organizes the value stream. It creates a "should" map that depicts how the process would need to function to solve the identified problems. The outcome includes developing action plans for implementing solutions or trail simulations for the next day.			

Day 4 is used to test the solutions. A simulation exercise is carried out if possible. The group quantifies the improvement if the proposed changes are implemented using estimates of reduction in travel time, queuing time, work in process, number of steps, number of forms, etc.

On day 5, the participants prepare and present their findings to the sponsor in a formal report-out session.

The bank makes this model work by having its internal consultants partner with the manager/sponsor to select problems that are extremely high priority, not only for that work area but also for the business as whole. This makes it much modest than a traditional kaizen. The teams are expected only to get through the simulation and piloting of solution ideas. The internal consultant will assist the team with full-scale implementation.

The results achieved as a result of Kaizen implementation are:

1. Cycle-time improvements have ranged from 30 percent faster to nearly 95 percent faster. One administrative process went from 20 minutes to 12 minutes, and a complaint resolution process dropped from 30 days to eight days.
2. Fiscal indicators have all been positive. One high-level project has allowed the bank to start charging for a service that previously was offered free to customers. New revenues are expected to total between USD 6 million to USD 9 million per year. Other projects have led to cost reduction or loss avoidance in terms of hundreds of thousands of dollars.

Conclusion

Kaizen events are a powerful improvement tool because people are isolated from their day-to-day responsibilities and allowed to concentrate all their creativity and time on problem solving and improvement. Companies that use Kaizen have found that they generate energy among those who work in the area being improved and produce immediate gains in productivity and quality.

16.	a)	Critically examine the characteristics of the bank's Kaizen event and Discuss the Kaizen model followed by the bank.	15	K4	CO5
		(OR)			
	b)	Interpret the results achieved by the bank by this Kaizen event and why do you consider the Kaizen event to be powerful?	15	K5	CO5

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Question Paper Code: 9005

B.E. / B.Tech DEGREE END-SEMESTER EXAMINATIONS – May 2023
Sixth Semester
Biotechnology
U19BT620 – ENZYME ENGINEERING AND TECHNOLOGY
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define enzyme activity in terms of international unit and katal.	2	K1	CO1
2.	How does the metal ion increase catalytic activity in metalloenzymes?	2	K2	CO1
3.	Write the significance of turn over number.	2	K2	CO2
4.	What is a ping-pong mechanism?	2	K1	CO2
5.	How Iodoacetamide helps in determining the inhibition mechanism?	2	K2	CO3
6.	What are allosteric enzymes? Give an example.	2	K1	CO3
7.	Animal, plant, and microbes – Which one is best for enzyme isolation and why?	2	K3	CO4
8.	How Trypsin activity was measured?	2	K1	CO4
9.	What is the role of collagen in skin aging?	2	K3	CO5
10.	State the application of xylanase in the detergent industry.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)		Classify enzymes and explain how it is named as per the enzyme commission's recommendations.	13	K2	CO1
			(OR)			
	b)	i.	In detail, discuss the hypothesis which explains enzyme specificity.	8	K1	CO1
		ii.	How amino acids in the active sites are measured by the affinity labelling method?	5	K3	
12.	a)		Write about Monod - Wyman - Changeux model.	13	K1	CO2
			(OR)			
	b)		Develop kinetics for single substrate reactions using a steady-state approach.	13	K2	CO2
13.	a)		Derive the kinetics of competitive and uncompetitive enzyme inhibition with relevant examples.	13	K2	CO3
			(OR)			
	b)	i.	Define half-life and deactivation energy. How these parameters are determined?	8	K3	CO3
		ii.	Differentiate suicide inhibition from product inhibition.	5		
14.	a)	i.	Outline the strategies for extraction of pectinase from a fruit.	8	K2	CO4
		ii.	List out the criteria for the development of pectinase assay.	5		
			(OR)			
	b)		Summarize the characterization technique to identify the protein structure of an enzyme.	13	K1	CO4
15.	a)	i.	Draw the flow chart of the leather industry process. Explain how protease can help in those processes.	9	K2	CO5
		ii.	What are thrombolytic agents? How does streptokinase act as a thrombolytic agent?	4		
			(OR)			
	b)		Enumerate any two-enzyme applications in the food industry.	13	K1	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	The following results were obtained for an enzyme-catalyzed reaction.	15	K4	CO2

Substrate concentration [S] x 10^5(M)	Velocity v x 10^9(M/ min)
0.833	13.8
1.00	16.0
1.25	19.0
1.67	23.6
2.00	26.7
2.50	30.8
3.33	36.3
4.00	40.0
5.00	44.4
6.00	48.0
8.00	53.4
10.00	57.1
20.00	66.7

Calculate K_m and V_{max} using

i. LB Plot
ii. Hanes Plot
iii. Eadie-Hofstee plot

(OR)

b) With a proper flow diagram, explain the purification steps involved in the extraction of intracellular protease from a bacterial source. 15 K3 CO5

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Question Paper Code: 9008

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023

Sixth Semester

Biotechnology

U19BT622 – CHEMICAL REACTION ENGINEERING

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define molecularity of a reaction with an example.	2	K1	CO1
2.	What is meant by variable volume reaction system?	2	K1	CO1
3.	State the applications of a semi-batch reactor.	2	K1	CO2
4.	Distinguish between space time and space velocity.	2	K3	CO2
5.	Write down the design equation for Plug flow reactor.	2	K2	CO3
6.	Define Damkohler number.	2	K1	CO3
7.	Define the term 'selectivity' for a parallel reaction.	2	K1	CO4
8.	Define instantaneous fractional yield.	2	K1	CO4
9.	List the characteristics of a tracer.	2	K1	CO5
10.	What is meant by F curve and C curve?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Discuss various theories explaining the temperature dependency of rate constant.	13	K2	CO1

(OR)

	b)	i.	Differentiate elementary and non-elementary reactions.	3	K3	CO1
		ii.	A zero order homogeneous gas phase reaction with stoichiometry A → rR proceeds in a constant volume bomb, with 20 mole% inerts. Pressure rises from 1 to 1.3 atm in 2 min. If the same reaction is carried in a constant pressure batch reaction, determine the fractional volume change in 4 minutes, if the feed is at 3 atm pressure and contains 40 mole% inerts?	10	K3	
12.	a)	i.	Derive the performance equation of an ideal batch reactor.	8	K3	CO2
		ii.	In an isothermal batch reactor, the conversion of a liquid reactant A is 70% in 13 minutes. Determine the space time and space velocity necessary to effect this conversion in a mixed flow reactor. Consider first order kinetics.	5	K2	
			(OR)			
	b)	i.	1 lit/s of gaseous reactant A is fed into a mixed flow reactor (V= 1lit). The reaction stoichiometry is A → 3R, the conversion is 50% and the leaving flow rate is 2l/s. Determine the space time.	3	K3	CO2
		ii.	It is planned to operate a batch reactor for a liquid phase reaction A → R. The rate of reaction v/s concentration data is given in the table below. Estimate the time needed for each batch for the concentration to drop from C_{A0} = 1.3 mol/lit to C_{Af} = 0.3 mol/lit.	10		

C_A mole/lit	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.3	2.0
$-r_A$ (mol/lit .min)	0.1	0.3	0.5	0.6	0.5	0.25	0.10	0.06	0.05	0.045	0.042

13.	a)	Assuming a stoichiometry A → R for a 1st order gas phase reaction, the size (volume) of a plug flow reactor for 99% conversion of pure A is calculated to be 32 liters. In fact, however, the stoichiometry of the reaction is A → 3R. For this corrected stoichiometry, determine the required volume of the reactor.	13	K3	CO3
		(OR)			
	b)	Derive an equation that relates conversion and space time for N number of equal-size CSTRs connected in series.	13	K3	CO3
14.	a)	For a liquid-phase reaction: $A + B \rightarrow R + T$, $\frac{dC_R}{dt} = \frac{dC_T}{dt} = k_1 C_A^{1.5} . C_B^{0.3}$ is accompanied by undesired side reaction $A + B \rightarrow S + U$, $\frac{dC_S}{dt} = \frac{dC_U}{dt} = k_2 C_A^{0.5} . C_B^{1.8}$ What contacting schemes (reactor type) would you suggest to these reactions to minimize the concentration of undesired products?	13	K5	CO4
		(OR)			

b)	For an irreversible first order series reaction A $\xrightarrow{k_1}$ R $\xrightarrow{k_2}$ S, derive an expression for the maximum concentration of intermediate product R (desired) and the time at which it occurs in a plug flow reactor.	13	K3	CO4
15. a)	i. Derive the expression for E(t) for the ideal CSTR. Consider pulse tracer analysis.	3	K3	CO5
	ii. The data given below represent the continuous response to a pulse input into a closed vessel, which is to be used as a chemical reactor. Calculate the mean residence time of fluid in the vessel and tabulate and construct C & E curve.	10	K5	

t, min	0	5	10	15	20	25	30	35
Cpulse, g/L	0	3	5	5	4	2	1	0

(OR)

b)	i. Explain the concept of RTD in reactor design.	5	K2	CO5
	ii. Derive the equation to find (1) mean residence time (2) conversion by the use of tracer information.	8	K3	

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16. a)	i.	Discuss the graphical method of identifying the best arrangement of two unequal sized stirred tank reactors connected in series for the given conversion and reaction order.	10	K3	CO3
	ii.	Write short notes on membrane reactors.	5	K2	CO3

(OR)

b)	Discuss in detail the Quantitative discussion about Product Distribution for a parallel reaction of the type:	15	K3	CO4

$$A \xrightarrow{k_1} R \text{ (desired)}$$

$$A \xrightarrow{k_2} S \text{ (undesired)}$$

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Question Paper Code: 9006

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Sixth Semester
Biotechnology
U19BT621 – PROTEIN ENGINEERING
(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What is the role of covalent bonds in protein structure?	2	K2	CO1
2.	List the types of amino acids.	2	K1	CO1
3.	What are secondary structure of proteins?	2	K1	CO2
4.	Name two methods for prediction of structure binding sites of protein.	2	K2	CO2
5.	What are domains in tertiary structure?	2	K2	CO3
6.	What is the most common quaternary structure of proteins?	2	K1	CO3
7.	Name any two DNA binding proteins and its functions.	2	K2	CO4
8.	What is the role of membrane proteins?	2	K2	CO4
9.	Define proteomics.	2	K1	CO5
10.	Give the importance of protein arrays in proteomic studies.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Write in detail about the physical, chemical and molecular properties of amino acids.	13	K2	CO1
		(OR)			
	b)	Discuss about various bonds that are involved in the protein formation.	13	K2	CO1
12.	a)	Explain about the protein sequencing and its structure interpretation of protein.	13	K3	CO2
		(OR)			
	b)	Discuss in detail about super secondary structure and the methods used for its prediction.	13	K3	CO2
13.	a)	Write about the methods to identify the 3D structure of proteins.	13	K3	CO3
		(OR)			
	b)	Discuss in detail about the Ramachandran plot and its significance.	13	K2	CO3
14.	a)	Explain with diagram, the leucine zipper and its importance.	13	K2	CO4
		(OR)			
	b)	Explain the role of photosynthetic reaction centers in plants.	13	K3	CO4
15.	a)	Explain the phosphoproteome analysis and techniques involved.	13	K3	CO5
		(OR)			
	b)	How are yeast hybrid systems are used to study the protein-protein interactions.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Protein engineering using directed evolution is a common strategy for improving the catalytic properties of enzymes. With examples, describe how directed evolution may be applied and comment on its advantages and limitations.	15	K3	CO3
		(OR)			
	b)	How is helix turn helix motif play a vital role in DNA binding explain with a suitable example?	15	K3	CO3

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Question Paper Code: 9015

B.E. / B.Tech DEGREE END-SEMESTER EXAMINATIONS – May 2023

Sixth Semester

Biotechnology

U19BT619 – PLANT AND ANIMAL BIOTECHNOLOGY

(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Write a note on the sterilization of the culture medium used in plant tissue culture.	2	K1	CO1
2.	Brief on protoplast culture.	2	K1	CO1
3.	Differentiate between direct and indirect gene transfer methods with one suitable example for each.	2	K2	CO2
4.	Distinguish between co-integrative and binary vectors.	2	K2	CO2
5.	Highlight the difference between defined and serum free media used in animal cell culture.	2	K2	CO3
6.	Write a note on the cryopreservation of animal cells.	2	K2	CO3
7.	List any TWO viral methods of gene transfer in animals.	2	K1	CO4
8.	What is the difference between adenovirus vector and adeno-associated virus vector?	2	K2	CO4
9.	Write a short note on Cry gene in *Bacillus thuringiensis*.	2	K2	CO5
10.	Define roundup ready crops. Give two examples.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Compare and Contrast organogenesis and somatic embryogenesis and its direct and indirect approaches.	13	K2	CO1
		(OR)			
	b)	i. Exemplify the methods of Micro propagation and its brief its applications.	8	K2	CO1
		ii. Portray the stages of micro propagation with a schematic representation.	5		
12.	a)	Illustrate the Agrobacterium mediated gene transfer method and mention its applications.	13	K2	CO2
		(OR)			
	b)	i. Demonstrate the electroporation method as a direct method of gene transfer.	8	K2	CO2
		ii. Mention its advantages and disadvantages.	5		
13.	a)	Elaborate the role of stem cells in animal cell culture and brief its applications.	13	K2	CO3
		(OR)			
	b)	Narrate the steps involved in the development of a primary cell line.	13	K2	CO3
14.	a)	Outline the biology and construction of lentivirus and herpes virus vectors with applications.	13	K3	CO4
		(OR)			
	b)	With a suitable example each, describe the stable and transient methods of gene transfer along with its pros and cons.	13	K2	CO4
15.	a)	Paraphraze the methodology of producing insect resistance crops and describe the significance of insect resistance crops.	13	K2	CO5
		(OR)			
	b)	What are probiotics? Describe ideal characteristics, mode of action and uses of probiotics with examples.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	With an example case study, explain the large scale production of a secondary metabolite using plant cell culture in a suitable bioreactor.	15	K4	CO1
		(OR)			
	b)	Suggest the suitable ways to increase the lactation yield of cow by manipulating the rumen microbial digestive system.	15	K4	CO5

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 2004

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023

Fourth Semester

Biotechnology

U19MA408 – PROBABILITY AND STATISTICS

(Regulation 2019)

(Common to Biomedical Engineering)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Given that the probability density function of a random variable X is $f(x) = kx, 0 < x < 1; f(x) = 0,$ elsewhere. Find the value of k.	2	K2	CO1
2.	Prove that Moment Generating Function for $f(x) = \frac{1}{2^x}, x > 0$	2	K2	CO1
3.	10 coins are thrown simultaneously. Find the probability of getting atleast 7 heads.	2	K3	CO2
4.	Find the mean of exponential distribution.	2	K1	CO2
5.	Find the marginal distribution of x for $f(x,y) = x + y, 0 < (x,y) < 1$.	2	K3	CO3
6.	State the Central Limit Theorem	2	K1	CO3
7.	State the properties of good estimators.	2	K1	CO4
8.	State the Confidence intervals for parameter in one sample from normal population.	2	K1	CO4
9.	Define Critical region.	2	K1	CO5
10.	Find 95 percent and 99 percent fiducial limit for a random sample of 16 values with $\bar{x} = 41.5$ *and* $s = 3$.	2	K3	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	A Random variable X has the probability function given below	8	K2	

X	0	1	2	3	4	5	6	7	8
P(x)	a	3a	5a	7a	9a	11a	13a	15a	17a

Find

1) the value of 'a'
2) $P(X < 3)$,
3) $P(X \geq 3), P(0 < X < 5)$and
4) The distribution function of X.

CO1

ii. A fair die is tossed 720 times by using Chebychev's inequality to find lower bound for getting 100 to 140 sixes. 8 K3

(OR)

b) i. Find the Moment generating function of the random variable X whose probability function $P(X = x) = \begin{cases} x & , 0 < x < 1 \\ 2 - x & , 1 < x < 2 \end{cases}$ 10 K2 CO1

ii. A continuous random variable X has the probability density function $f(x) = K(x - x^2), \quad 0 < x < 1$.
Find the value of K , Mean and variance. 6 K3

12. a) i. In a certain goods produced by a machine has a 3% defective rate. What is the probability that the first defective occurs in the 8 K2
1) fifth item inspected?
2) first five inspections?

CO2

ii. The total duration of baseball games in the major league in the 2011 season is uniformly distributed between 452 hours and 541 hours inclusive. Find, 8 K1
1) mean and standard deviation
2) What is the probability that the duration of games for a team for the 2019 season is between 485 and 510 hours?

(OR)

b) i. The mileage which car owners get with certain kind of radial tyre is a random variable having an exponential distribution with mean 4000 km. Find the probability that one of these tyres will last 8 K2
1) at least 2000 km
2) at most 3000 km.

CO2

ii. The time taken to assemble a car in a certain plant is a random variable having a normal distribution of 20 hours and a standard deviation of 2 hours. What is the probability that a car can be assembled at this plant in a period of time 8 K1
1) less than 19.5 hours?
2) between 20 and 22 hours?

13. a) i. Two random variable X and Y have the joint probability density function $f(x, y) = \begin{cases} 8xy, 0 < x < y < 1 \\ 0, \ otherwise \end{cases}$. 8 K2 CO3

1) Find Marginal and conditional density functions of X and Y.

2) Are X and Y are independent?

ii. A random sample of size 100 is taken from a population whose mean is 60 and variance is 400. Using central limit theorem, with what probability can we assert that the mean of sample will not differ from $\mu = 60$ by more than 4? — 8 — K3

(OR)

b) i. Two random variable X and Y have the joint probability density function $f(x) = k(4 - x - y), 0 \le x \le 2$ and $, 0 \le y \le 2$ Find 'k', Marginal density functions of X and Y and conditional density functions of f(x/y), f(y/x). — 8 — K2 — CO3

ii. Find the Mean values of X and Y, correlation coefficient given that the variance of X is 9 and the two lines regressions $8x - 10y + 66 = 0, 40x - 18y - 214 = 0$. — 8 — K3

14. a) i. Show that for random sampling from Cauchy- population with density function $f(x;\mu) = \frac{1}{\pi}\frac{1}{1+(x-\mu)^2}, -\infty \le x \le \infty$ the sample mean is not a consistent estimator for the population mean. — 8 — K2 — CO4

ii. Prove that for a random sample of size n taken from an infinite population, $s^2 = \frac{\sum(x_i-\bar{x})^2}{n}$ is not unbiased estimator of σ^2. Find an unbiased estimate of σ^2. — 8 — K3

(OR)

b) For the random sampling from normal population $N(\mu, \sigma^2)$, find the Maximum likelihood estimators for

i. μ *when* σ^2 is known

ii. σ^2 when μ is known

iii. the simultaneous estimation of μ and σ^2

— 16 — K2 — CO4

15. a) i. Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results. Test whether the two horses have the same running capacity. — 8 — K2

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	27	-

— CO5

ii. Theory predicts that the proportion of beans in 4 groups A,B,C,D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the 4 groups were 882,313,287,118. Does the experiment support the theory? — 8 — K3

(OR)

b) The nicotine contents in milligrams in two samples of tobacco were found to be as follows: Sample I: 24, 27, 26, 21, and 25
Sample II: 27, 30, 28, 31, 22, 36.
Can it be said that two samples come from same normal population. — 16 — K3 — CO5

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9007

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Fourth Semester
Biotechnology
U19BT407 – BIOPROCESS ENGINEERING & TECHNOLOGY
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Sketch the design of Fluidized Bed Reactor.	2	K1	CO1
2.	Mention the significance of simplex design.	2	K2	CO1
3.	Define X_{90} concept.	2	K1	CO2
4.	Compare the merits and demerits of batch sterilization.	2	K2	CO2
5.	Air is sparged at 3 LPM to a fermenter having D_T=60 cm. Calculate the superficial gas velocity.	2	K3	CO3
6.	Justify how the bubble size affects the O2 transfer in fermentation?	2	K2	CO3
7.	Express the kinetic equation representing the product formation.	2	K2	CO4
8.	Infer how do compartmental models are useful in Bioprocess engineering?	2	K2	CO4
9.	Classify the types of interactions occur in mixed cultures.	2	K2	CO5
10.	Write the Weisz's Criteria required to determine the influence of mass transfer on reaction rate.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Design a 5 L fermenter with appropriate measurements.	6	K2	CO1
		ii.	Describe the design considerations of Packed Bed Reactor with suitable diagram.	7		
			(OR)			
	b)		Discuss about the medium optimization by Response Surface Methodology (RSM) and also mention the advantages of RSM over Plackett Burman (PB) method.	13	K2	CO1
12.	a)		Derive the necessary equations employed for continuous sterilizer design.	13	K2	CO2
			(OR)			
	b)		Medium at a flow rate of 5 $m^3 h^{-1}$ is to be sterilized by heat exchange type continuous sterilizer. The liquid contains bacterial spores at a concentration of 5 x 10^{12} m^{-3}; the Activation energy and Arrhenius constant for thermal destruction of these contaminants are 283 kJ $gmol^{-1}$ and 5.7 x 10^{39} h^{-1}, respectively. A contamination risk of one organisms surviving every 30 days operation is considered acceptable. The sterilizer pipe has an inner diameter of 0.1 m; the length of the holding section is 42 m. The Dispersion coefficient and Damkohler number are 25 $m^2 h^{-1}$ and 45 respectively. Determine the following *i. Sterilization Criterion,* *ii. Flow Velocity,* *iii. Peclet Number and* *iv. Sterilizing temperature.*	13	K3	CO2
13.	a)	i.	Explain how oxygen is transferred from gas bubble to microbial cells in the fermenter? Comment on the resistances offered at each step.	3		
		ii.	The value of K_La is 20 hr-1 has been determined by a fermenter at its maximum agitated speed and air is being sparged at 0.5 L gas/L min. E.coli with specific oxygen demand of 15 mM/g hr is to be cultured and critical dissolved oxygen concentration is 0.5 mg/L. The solubility of oxygen from air in the fermentation broth is 7.3 mg/L at 30°C.	3	K3	CO3
		iii.	What maximum concentration of E. coli can be sustained in the fermenter under aerobic condition?	4		
		iv.	What cell concentration should be maintained if pure oxygen was used to sparge the reactor?	3		
			(OR)			
	b)	i.	List out the factors which affect K_La in fermentation process.	5	K3	CO3
		ii.	Consider the scale-up of a fermentation from a 1 L to 1000 L vessel. The small fermenter has an aspect ratio of 4. The impeller diameter is 30% of the tank diameter. Agitator speed	8		

is 500 rpm and three Rushton impellers are used. Determine the dimensions of the large fermenter and agitator speed for:

1. Constant *P/V,*
2. Constant impeller tip speed and
3. Constant Reynolds number.

14.	a)	i.	Derive the expressions for unstructured kinetic model representing the relation between μ and S.	8	K2	CO4
		ii.	Explain about single cell model.	5		
			(OR)			
	b)	i.	Predict the fraction plasmid containing cells in a batch culture under the following circumstances. Cells are maintained at constant, maximal growth rate of 0.663 hr^{-1} during scale up from shake flask through seed fermenters into production fermenters. The total time for this process is 40 hrs. Assume that the inoculum for shake flask was 100% plasmid containing cells. It is known that the growth rate for a plasmid free cell is 0.95 hr^{-1}. The value of p is 0.009.	6	K3	CO4
		ii.	Derive the mathematical expression for Plasmid stability model.	7		
15.	a)		State the Fick's law of diffusion and explain in detail about the diffusional limitations in immobilized cell.	13	K2	CO5
			(OR)			
	b)		Discuss in detail about the design considerations for immobilized enzyme reactors.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	A person is working in a Biotech company and the task is to convert the soluble cellulose into glucose using *Neurospora crassa*. These cells are naturally form a self-immobilized aggregates and having average diameter 6 mm. The effective diffusivity of substrate in the aggregates is 1.85 x 10^{-9} m^2/s. In a fixed-bed reactor, the cellulose conversion rate is at a bulk substrate concentration of 5 x 10^{-3} kg/m^3 is 9.1 x 10^{-5} kg/m^3 s of biomass. The liquid- solid mass transfer coefficient is 5 x 10^{-5} m/s. i. Is the above affected by external mass transfer? ii. What is the external effectiveness factor? What reaction rate would be observed if both internal and external mass transfer resistances were eliminated?	15	K3	CO3
		(OR)			
	b)	Brief about the industrial utilization of mixed cultures for Solid-state fermentation.	15	K3	CO5

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
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Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9011

B.E. / B.Tech DEGREE END-SEMESTER EXAMINATIONS – May 2023

Fourth Semester

Biotechnology

U19BT408 – THERMODYNAMICS FOR BIOTECHNOLOGISTS

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define Helmholtz energy.	2	K1	CO1
2.	How Clausius inequality helps in determine reversible process?	2	K2	CO1
3.	What is activity and activity coefficient?	2	K1	CO2
4.	State Lewis-Randall rule. Give its expression.	2	K2	CO2
5.	Write the relationship between C_p and C_v.	2	K2	CO3
6.	What is Hess's law?	2	K1	CO3
7.	What is Clausius-Clapeyron equation?	2	K1	CO4
8.	Define-volume expansivity and isothermal compressibility.	2	K1	CO4
9.	Infer endergonic reaction with an example.	2	K2	CO5
10.	Write short note on energy coupling process in bioenergetics.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	A paddle-wheel is employed in rigid container for stirring a hot fluid to be cooled. The internal energy of the hot fluid is 1000 kJ. During the cooling process, the fluid losses 600 kJ of heat. For this process, the work done by the paddle-wheel on the fluid is 100 kJ. Calculate the final internal energy of the fluid.	7	K4	CO1
		ii.	Explain the laws of thermodynamics with examples.	6	K1	CO1

(OR)

	b)	i.	Deduce the thermodynamic relationships for non-flow process with its P-V diagram.	8	K2	CO1
		ii.	Explain the spontaneous and non-spontaneous reactions in higher energy bonds and compounds.	5		
12.	a)	i.	Derive Gibbs-Duhem Equation.	7	K2	CO2
		ii.	Estimate the fugacity of a gaseous mixture consisting of 30% component 1 and 70% component 2 by mole, given that at 100°C and 50 bar, the fugacity coefficient of components 1 and 2 are 0.7 and 0.85 respectively.	6	K3	CO2

(OR)

	b)	i.	Prove that $\mu_i = \left(\frac{\partial U^t}{\partial n_i}\right)_{S,V,n_{j\neq i}}$	7	K2	CO2
		ii.	The azeotrope of the ethanol-benzene system has a composition of 44.8% (mol) ethanol with a boiling point of 341.4 K at 101.3kpa. At this temperature the vapour pressure benzene is 68.9 kpa and the vapour pressure of ethanol is 67.4 kpa. What are activity coefficients in a solution containing 10% alcohol?	6	K3	
13.	a)	i.	Explain effect of temperature on heat of reaction using Kirchhoff equation.	7	K3	CO3
		ii.	The following reactions represents transformation of glucose in an organism: $C_6H_{12}O_6\ (s) \rightarrow 2C_2H_5OH\ (l) + 2CO_2\ (g)$ $C_6H_{12}O_6\ (s) + 6O_2\ (g) \rightarrow 6CO_2 + 6H_2O\ (l)$ Calculate the values of ΔH^0_{298} for the above biochemical reaction. Also, identify which of these reactions supplies more energy to the organism. Data: Heat of formation of $C_6H_{12}O_6$ = -1273.0 kJ/mol Heat of formation of C_2H_5OH = -277.6 kJ/mol Heat of formation of CO_2 = -393.5 kJ/mol Heat of formation of H_2O = -285 kJ/mol	6		

(OR)

	b)	i.	Mercury has a density of 13.69×10^3 kg/m^3 in the liquid state and 14.193×10^3 kg/m^3 in the solid state, both measured at the melting point of 234.33 K at 1 bar. If the heat of fusion of mercury is 9.7876 kJ/kg, what is the melting point of mercury at 10 bar?	5	K4	CO3
		ii.	A boiler is fired with a high-grade fuel oil (consisting only of hydrocarbons) having a standard heat of combustion of −43,515 $J \cdot g^{-1}$ at 25°C with CO_2 (g) and H_2O (l) as products. The	8		

temperature of the fuel and air entering the combustion chamber is 25°C. The air is assumed dry. The flue gases leave at 300°C, and their average analysis (on a dry basis) is 11.2% CO_2, 0.4% CO, 6.2% O_2, and 82.2% N_2. Calculate the fraction of the heat of combustion of the oil that is transferred as heat to the boiler.

14.	a)	i.	Derive Maxwell equation and also mention the application.	7	K3	CO4
		ii.	It is desired to produce a 1 kg ice block from water in a freezer box of refrigerator at 273 K while the temperature of the environment is 295 K. Given that the latent heat of fusion of ice at 273 K is 335 KJ/kg. Determine the minimum work requirement and the amount of heat released to the surroundings.	6	K3	
			(OR)			
	b)	i.	Define Joule-Thomson coefficient and explain how it could be used for determining heat capacity of gases.	8	K3	CO4
		ii.	Prove that $TdS = C_V dT + \frac{T\beta}{\alpha} dV$	5	K3	
15.	a)	i.	What is bioenergetics? Explain the energetics of metabolic pathway with a suitable example.	7	K1	CO5
		ii.	Discuss in detail the oxygen requirement and heat generation in aerobic growth.	6	K2	
			(OR)			
	b)	i.	Explain the thermodynamics of protein folding.	6	K1	CO5
		ii.	Discuss the oxidation-reduction process in the catabolism of glucose in the biological cell.	7	K2	

PART – C

(1 x 15 = 15 Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	At 200 K, the compressibility factor of oxygen varies with pressure as give below. Evaluate the fugacity of oxygen at this temperature and 100 bar.	8	K3	CO2

P, bar	Z
1.00	0.99701
4.00	0.98796
7.00	0.97880
10.00	0.96956
40.00	0.8734
70.00	0.7764
100.00	0.6871

ii. The activity coefficient of *n*-propyl alcohol in a mixture of water (A) and alcohol (B) at 298 K referred to the pure liquid standard is given below: 7 K3

x_B	0	0.01	0.02	0.05	0.10	0.20
γ_B	12.5	12.3	11.6	9.92	6.05	3.12

Find γ_A in solution containing 10 percent (mole) *n*-propyl alcohol.

(OR)

b) i. Using Gibbs free energy explain the endergonic and exergonic reactions in photosynthesis and cellular respiration. 7 K3 CO5

ii. It is desired to cool a variety of aromatic oil in a heat exchanger from 515 K to 315 K at a rate of 4750 kg/h. The temperature of the cooling water is 290 K and it is supplied at a rate of 9500 kg/h. The average specific heat capacities of the aromatic oil and water is 3.2 kJ/kg-K and 4.185 kJ/kg-K respectively. Determine the entropy change of the process and check whether the process is reversible or irreversible. 8 K4 CO1

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
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Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9016

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023

Fourth Semester

Biotechnology

U19BT410 - BIOINSTRUMENTATION

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What is electromagnetic radiation? Give the radiation diagram with wavelength.	2	K1	CO1
2.	What are the sources of noise?	2	K1	CO1
3.	Write the ideal characteristics of light source of spectroscopic methods.	2	K2	CO2
4.	Define beer's law.	2	K1	CO2
5.	What is quasistatic thermogravimetry?	2	K1	CO3
6.	How the absorption process takes place X-ray?	2	K2	CO3
7.	List out the application of HPLC.	2	K1	CO4
8.	Differentiate ion exchange from size exclusion chromatography.	2	K2	CO4
9.	Distinguish between Ion selective and Molecular selective electrodes.	2	K2	CO5
10.	Write a short on TEM.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	A transducer can convert one form energy into another form. Explain in which component of the spectrophotometer can do this process of conversion.	13	K2	CO1

(OR)

	b)	Describe the properties of Wave.	13	K1	CO1
12.	a)	In combination with mapping (or imaging), it is possible to generate images based on the sample's spectrum. Illustrate the type of spectroscopy can be used to generate images with neat diagram.	13	K3	CO2
		(OR)			
	b)	Describe the essential components of UV- Visible spectrophotometer. Draw a diagrammatic sketch and explain the functions and working of each unit.	13	K1	CO2
13.	a)	A comprehensive physiochemical, stability, purity of zinc chloride is determined. Which method is used to analyze zinc chloride? Explain the method with diagram.	13	K4	CO3
		(OR)			
	b)	What is X-ray diffraction? How XRD are used to determine the crystal structure?	13	K2	CO3
14.	a)	Deliberate the working principle and applications of HPLC with neat sketch.	13	K1	CO4
		(OR)			
	b)	Volatile mixtures are separated by physical separation process. What method is used to separate volatile mixture? Explain the method with neat diagram.	13	K3	CO4
15.	a)	Define Voltammetry. Write notes on Pulsed and Cyclic Voltammetry.	13	K1	CO5
		(OR)			
	b)	Explain with a neat diagram the working principle and application of AFM.	13	K1	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	What method is used to analyze the amount of hemoglobin present in the given blood sample? Explain the method with neat diagram.	15	K4	CO2
		(OR)			
	b)	Protein is isolated from mammalian cell through sedimentation of intracellular membranes and it is precipitated using 70% of ammonium sulphate saturated. Then it is centrifuged at 10,000 rpm. In order to separate protein from the saturated solution and to identify the size of the protein which method is used. Elaborate the method with neat diagram with its advantages.	15	K4	CO4

Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]

Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9014

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023

Fourth Semester

Biotechnology

U19BT409 – MOLECULAR BIOLOGY

(Regulation 2019)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What are the properties of DNA and RNA?	2	K2	CO1
2.	Define repetitive DNA.	2	K1	CO1
3.	What is Okazaki fragment?	2	K1	CO2
4.	List out certain inhibitors of DNA replication.	2	K2	CO2
5.	Mention any four main differences between prokaryotic and eukaryotic Transcription.	2	K2	CO3
6.	Define RNA Editing.	2	K1	CO3
7.	Write short notes on start and stop codons.	2	K1	CO4
8.	Give any two inhibitors of protein synthesis in eukaryotes along with its action.	2	K2	CO4
9.	Why lac operon switches off in the absence of Lactose in *E.coli*?	2	K2	CO5
10.	Differentiate classical sequencing from automated sequencing.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Give an account on different forms of DNA and describe the Watson & Crick model of DNA in detail.	13	K1	CO1
		(OR)			
	b)	Explain in detail the prokaryotic genome organization.	13	K2	CO1
12.	a)	Describe the sequence of events during DNA replication in eukaryotes and explain the role of various enzymes.	13	K2	CO2
		(OR)			
	b)	Interpret the principle behind PCR and its application in diagnosis of Autoimmune disease.	13	K3	CO2
13.	a)	With the help of suitable diagram, describe the mechanism of transcription in Eukaryotes.	13	K2	CO3
		(OR)			
	b)	Discuss the concept of 5'Capping, Polyadenylation and RNA Splicing with neat diagram.	13	K2	CO3
14.	a)	Highlight the steps involved in the translation of prokaryotes.	13	K2	CO4
		(OR)			
	b)	Write an essay on the types and structure of RNA's.	13	K1	CO4
15.	a)	Summarize eukaryotic gene regulation with suitable diagram.	13	K2	CO5
		(OR)			
	b)	Illustrate the regulation of the tryptophan operon in E. coli.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Elucidate Genetic code and explain the degeneracy through Wobble hypothesis.	15	K4	CO4
		(OR)			
	b)	Lac operon is highly regulated. How? and give its implication in the generation of recombinant proteins.	15	K4	CO5