BT (6)

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: 9003

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Seventh Semester
Biotechnology
U19BT726 – PROTEOMICS AND GENOMICS
(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.	Differentiate between the structural organization of the genomes of prokaryotes and eukaryotes.	2	K2	CO1
2.	What are the web resources available to access and retrieve information on the genome project?	2	K1	CO1
3.	Distinguish between Physical mapping and genetic mapping.	2	K2	CO2
4.	What are ESTs & SNPs? How are they used in genome analysis?	2	K2	CO2
5.	State the principle of Yeast two hybrid system.	2	K1	CO3
6.	How is the N-terminus of a protein sequenced?	2	K2	CO3
7.	What are the challenges and limitations of high throughput screening in genome for drug discovery?	2	K4	CO4
8.	What makes personalized medicine unique from traditional medicine?	2	K4	CO4
9.	How is the analysis and normalization of microarray data done?	2	K2	CO5
10.	How does protein and peptide microarray-based technology work?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Describe the fundamentals of DNA sequencing and how they have been applied to large scale projects like Human Genome Project.	13	K2	CO1
		(OR)			
	b)	How are noncoding and coding sequences recognized in a genome and what are the methods used for gene annotation?	13	K2	CO1
12.	a)	Using 16s rRNA sequencing, how can you identify and classify a microbe?	13	K4	CO2
		(OR)			
	b)	Classify the tools used for genome analysis and explain how they can be used.	13	K3	CO2
13.	a)	Interpret how differential display proteomics differ from other proteomic techniques, and elaborate it.	13	K4	CO3
		(OR)			
	b)	How does LC/MS-MS help in the identification of proteins and modified proteins?	13	K2	CO3
14.	a)	Describe the steps involved in drug development, with a neat flow sheet.	13	K2	CO4
		(OR)			
	b)	Narrate the role of pharmacogenetics in personalized medicine.	13	K2	CO4
15.	a)	What are transcriptomics and metabolomics? How they are used in biological research?	13	K2	CO5
		(OR)			
	b)	What is structural proteomics? What are the techniques used in this field?	13	K2	CO3

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	SAGE – Analyze its role in proteomics and discuss in detail.	15	K5	CO5
		(OR)			
	b)	Predict the significance of structural biology in understanding the complex biological systems.	15	K5	CO3

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Question Paper Code: 9004

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Seventh Semester
Biotechnology
U19BT727 – BIOPHARMACEUTICAL 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.	What determines the route of drug administration?	2	K2	CO1
2.	Indicate the physiological properties of drug molecules.	2	K2	CO1
3.	State the importance of animals in drug discovery.	2	K2	CO2
4.	List the main objectives of Drugs and Cosmetics Act.	2	K1	CO2
5.	What is bioavailability of Drug?	2	K1	CO3
6.	Define the term 'Bioequivalence'.	2	K1	CO3
7.	Infer the advantages of transdermal drug delivery.	2	K2	CO4
8.	Mention the challenges to the oral delivery of nucleic acids.	2	K2	CO4
9.	Who discovered COVAXIN?	2	K1	CO5
10.	Quote the mechanism of action of antitumor drugs.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Define 'Drug Targets' from a pharmacological viewpoint and list different targets for drug action.	4+9	K2	CO1
		(OR)			
	b)	What are the challenges in drug classification and how they are classified?	5+8	K2	CO1
12.	a)	Discuss the different steps in clinical trial phases of drug development.	13	K2	CO2
		(OR)			
	b)	Give an overview of pharmacovigilance highlighting its role and challenges.	13	K4	CO2
13.	a)	Summarize the factors that significantly affect biotransformation.	13	K2	CO3
		(OR)			
	b)	Discuss on the factors that can influence the way a drug is absorbed, distributed, metabolized, and eliminated from the body.	13	K2	CO3
14.	a)	Narrate the steps involved in manufacturing of capsules, with a neat flow sheet.	13	K2	CO4
		(OR)			
	b)	What is an ointment? Discuss its production process.	4+9	K2	CO4
15.	a)	List the important attributes of an ideal drug preservative and explain in detail.	13	K2	CO5
		(OR)			
	b)	Exemplify the modes of action of; i. Laxatives. ii. Analgesics and Antibiotics.	4+9	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Classify the different types of pharmaceutical dosage forms and explain each. Add their advantages and disadvantages.	10+5	K2	CO4
		(OR)			
	b)	With an example case study, discuss the importance of pharmaceuticals in Gene therapy.	15	K5	CO5

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Question Paper Code: 9008

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BT514 – PRINCIPLES OF GENETIC ENGINEERING
(Regulation 2019)

Time: 3 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 any three characteristics of cloning vectors.	2	K2	CO1
2.	List the major difference between YACs and BACs.	2	K2	CO1
3.	List out the names of enzymes necessary for the construction of recombinant DNA molecules.	2	K1	CO2
4.	Show the Luciferace enzyme reaction for the selection.	2	K3	CO2
5.	What is alpha-complementation?	2	K1	CO3
6.	What is a cDNA library?	2	K1	CO3
7.	State the importance of labeling DNA and RNA probes.	2	K4	CO4
8.	Define RNA interference (RNAi).	2	K1	CO4
9.	What are gene editing tools? Give a few examples.	2	K2	CO5
10.	Write any four applications of genetically modified organisms (GMOs).	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Compare and contrast different types of cloning vectors in terms of their structure and applications.	13	K2	CO1
		(OR)			

	b)	How do reporter genes and selectable markers aid in the selection and evaluation of transformed plants?	13	K3	CO1
12.	a)	Describe the process by which recombinant DNA is transferred into host organisms using calcium chloride. What kinds of organisms is this technique appropriate for?	13	K3	CO2
		(OR)			
	b)	Describe the concept of recombinant selection based on antibiotic resistance. What does blue-white screening entail and why is it important?	13	K3	CO2
13.	a)	Explain the principle of purification using a Ni+ column, including the binding and elution steps.	13	K3	CO3
		(OR)			
	b)	How are cDNA and genomic libraries screened to identify specific DNA sequences of interest?	13	K3	CO3
14.	a)	What is PCR? Write the principle and steps of PCR.	13	K2	CO4
		(OR)			
	b)	Explain Chemical-Degradation and chain termination methods of sequencing.	13	K4	CO4
15.	a)	Differentiate between BSL-1, BSL-2, and BSL-3 containment facilities. List some of the research works carried out using these facilities.	13	K5	CO5
		(OR)			
	b)	Explain the concept of transgenic BT cotton and its benefits in agriculture.	13	K5	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Briefly describe the DNA replication in eukaryotes with emphasis on its enzymology. Add a note on the replication of telomeric DNA.	15	K2	CO3
		(OR)			
	b)	Describe the principles and applications of gene editing tools, including CRISPR-Cas9 and the Zinc Finger technique. How have these tools transformed genetic engineering and medical research?	15	K5	CO5

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Question Paper Code: 9017

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BTV45 – CONFECTIONERY PRODUCTS
(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.	How does water activity play an important role in the shelf life of bakery products?	2	K2	CO1
2.	Name two emulsifiers used in bread making.	2	K1	CO1
3.	List any four utensils and equipment used in the bakery industry with their purpose.	2	K1	CO2
4.	What is proofing?	2	K2	CO2
5.	Cite the causes of improper shapes of breads.	2	K2	CO3
6.	Mention the internal characteristics of good bread.	2	K1	CO3
7.	Write the importance of wafer maturing.	2	K1	CO4
8.	Differentiate developed dough from short doughs.	2	K2	CO4
9.	Define hydrocolloids.	2	K1	CO5
10.	What is intense sweeteners? Give one example.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Mention the composition of wheat flour. Explain the function of each in bakery products.	8	K1	CO1
		ii.	Classify bakery products and write short notes about each.	5		

		(OR)			
	b)	Write short note on: i. Shortening ii. Leaveners	13	K1	CO1
12.	a)	Discuss the working principle of Batch and continuous mode of dough mixers.	13	K2	CO2
		(OR)			
	b)	Write a short note on the following i. Dough dividers ii. Slicers	13	K1	CO2
13.	a)	i. Write the principle behind the development of bread dough.	9	K2	CO3
		ii. What are the procedures in no time dough process?	4		
		(OR)			
	b)	Explain the causes of Bread spoilage.	13	K2	CO3
14.	a)	Describe in detail the reason behind the ingredients used in cake making.	13	K3	CO4
		(OR)			
	b)	Elaborate the formation of puff pastry.	13	K2	CO4
15.	a)	i. What is recrystallization? What effect does it cause in confectionary and how it can be prevented?	9	K1	CO5
		ii. Write a short note on fondant.	4		
		(OR)			
	b)	Give a detailed account on the optimization of sugar-boiled confectionary.	13	K1	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	How the deformation and flow behavior of dough was measured? Explain.	15	K4	CO3
		(OR)			
	b)	In detail, compare and contrast the bulk fermentation bread-making from Chorley wood and the activated dough development process.	15	K4	CO4

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Question Paper Code: 9018

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 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.	What is the role of chelator in media and give examples?	2	K1	CO1
2.	Discuss the effect of impeller speed with respect to oxygen delivery system in a stirred tank reactor.	2	K2	CO1
3.	Write shortly on Richard's rapid method for the design of sterilization cycles.	2	K2	CO2
4.	List the equipments used for sterilization.	2	K1	CO2
5.	What are the different types of Non-Newtonian fluids. Give examples.	2	K1	CO3
6.	Write shortly on Impeller Viscometer.	2	K1	CO3
7.	Give the mathematical expression of monod equation.	2	K2	CO4
8.	Define plasmid.	2	K1	CO4
9.	List out few examples of Industrial utilization of mixed cultures.	2	K1	CO5
10.	Define Damkohler Number.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Discuss the basic designs involved in the construction of a fermenter.	13	K2	CO1
		(OR)			

b) Using Plackett–Burman method solve the below table. Assume variable D is dummy. 13 K3 CO1

Trial	A	B	C	D	E	F	G	Yield
1	H	H	H	L	H	L	L	2.5
2								3.6
3								2.1
4								8.0
5								5.0
6								9.0
7								1.1
8								4.1

12. a) It is required to provide a 20 $m^3 min^{-1}$ fermenter with air at a rate of 10 m for a fermentation lasting 100 hours. From an investigation of the filter material to be used, the optimum linear air velocity was shown to be 0.15 m sec^{-1}, at which the value of k was 1.535 cm^{-1} follows: The dimensions of the filter may be calculated as. The log penetration relationship states that: 13 K3 CO2

$\ln (N / N_o) = - k x.$

The air in the fermentation plant contained approximately 200 microorganisms m^{-3}.

(OR)

b) Illustrate the design of continuous sterilization process. 13 K3 CO2

13. a) List the factors that affect k_La in fermentation vessels. Explain in detail the gassing out method of k_La determination. 13 K2 CO3

(OR)

b) Elaborate the scaling up of bioreactors. 13 K4 CO3

14. a) For a Chemostat with recycle stream with as the recycle ratio and C as the concentration factor prove that: 13 K3 CO4

$$\frac{K_s \mu_g}{\mu_m - \mu_g}$$

(OR)

b) In a fed-batch culture operating with intermittent addition of glucose solution, values of the following parameters are given at time $t = 2$ h, when the system is at quasi-steady state. V = 1000 ml, S_o = 100 g glucose/l, K_s = 0.1 g glucose/l, X_o^t = 30 g, F = 200 ml/h, μ_m = 0.3 h^{-1}, $Y^M_{X/S}$ = 0,5 g dw cells/ g glucose K3 CO4

i. Find V_o(The Initial volume of the culture), and determine the dilution factor and the concentration of growth limiting substrate in the vessel at quasi-steady state. 9

ii. Determine the concentration and total amount of biomass in the vessel. 4

15. a) Elaborate the diffusional limitations in Immobilized cell. 13 K2 CO5

(OR)

b) Explain varies methods of cell immobilization. 13 K2 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Aerobic growth of *S. cerevisiae* on ethanol is simply described by the following overall reaction: $C_2H_5OH + aO_2 + bNH_3 \longrightarrow cCH_{1.704}N_{0.149}O_{0.408} + d\,CO_2 + e\,H_2O$			
		i. Determine the coefficients a, b, c, d and e, where RQ = 0.66.	10	K3	CO1
		ii. Determine the degree of reduction for substrate and biomass.	5		
		(OR)			
	b)	*E.coli* is cultivated in continuous culture under aerobic conditions with a glucose limitation. When the system is operated at $D = 0.2h^{-1}$, determine the effluent glucose and biomass concentrations by using the following equations (S_o = 5 g/l):			
		i. Monod equation: $\mu_m = 0.25\ h^{-1}$, K_s = 100 mg/l.	5	K3	CO4
		ii. Contois equation: $\mu_m = 0.25\ h^{-1}$, $K_{sx} = 0.005$, $Y_{X/S} = 0.4$ g of biomass/g of substrate.	10		

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Question Paper Code: 9001

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BT513 – COMPUTATIONAL 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 is Bioinformatics and define its importance in biology?	2	K2	CO1
2.	What is the difference between BLAST and FASTA?	2	K2	CO1
3.	What are hidden Markov models?	2	K2	CO2
4.	What are the applications of Artificial Neural Networks?	2	K1	CO2
5.	Define Phylogeny and its applications.	2	K1	CO3
6.	What is an Ultrameric Phylogenetic Tree?	2	K1	CO3
7.	What is a Ramachandran Plot?	2	K1	CO4
8.	What is the SWISS-MODEL theory?	2	K1	CO4
9.	What is RMSD and RMSF molecular dynamics?	2	K2	CO5
10.	What is a DNA microarray?	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Emphasize on different biological databases and their applications.	7+6	K2	CO1
		(OR)			
	b)	Define sequence alignment and discuss on different algorithms, types, methods, and applications.	5+8	K2	CO1

12.	a)	Write a detailed note on the applications of Machine Learning in Bioinformatics.	13	K2	CO2
		(OR)			
	b)	Write a note on a) Clustering and Prediction b) DNA computing.	7+6	K2	CO2
13.	a)	Describe in detail the various methods of constructing phylogenetic trees.	13	K4	CO3
		(OR)			
	b)	What is molecular phylogenetics? Write a detailed note on its importance in evolutionary biology.	8+5	K4	CO3
14.	a)	Write a detailed note on novel protein structure prediction tools and analysis.	13	K3	CO4
		(OR)			
	b)	Write a note on the classification of protein structures with examples.	13	K3	CO4
15.	a)	Write a note on Next Generation Sequencing and highlight its applications.	13	K2	CO5
		(OR)			
	b)	Write a note on Molecular docking and Dynamic simulations by taking any one protein as an example.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Write in detail the importance and applications of Genomics and Proteomics in disease biology.	15	K3	CO5
		(OR)			
	b)	Discuss about tools available for structure visualization and its application.	15	K3	CO4

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Question Paper Code: 9019

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 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 first law of thermodynamics.	2	K1	CO1
2.	Write the application of second law of thermodynamics.	2	K2	CO1
3.	Define chemical potential. What is its physical significance?	2	K1	CO2
4.	State Raoult's Law.	2	K2	CO2
5.	How is the Hess's law of constant heat summation useful in thermochemical calculation?	2	K2	CO3
6.	Define standard heat of formation.	2	K1	CO3
7	Write the application of Carnot cycle.	2	K2	CO4
8.	Define Helmholtz free energy.	2	K1	CO4
9.	Differentiate aerobic and anerobic metabolism.	2	K1	CO5
10.	What are the four types of protein interaction?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11. a.	i.	A spherical manometer fluid has a specific gravity of 2.95 and is used to measure a pressure of 1.15 bar at a location where the barometric pressure is 760 mm Hg. What height will the manometer fluid indicate?	8	K3	CO1
	ii.	Write the role of higher energy compounds in metabolism.	5	K1	CO1

(OR)

	b.	How do you state mathematically the first law of thermodynamics that can be used for solving steady state fluid flow process?	13	K2	CO1
12.	a.	Discuss the Gibbs duhem equation and its various forms. What are the major fields of application of the Gibbs duhem equation?	13	K2	CO2
		(OR)			
	b.	At 300 K and 1 bar the volumetric data for a liquid mixture of benzene and Cyclohexane are represented by $V = 109.4 \times 10^{-6} - 16.8 \times 10^{-6} - 2.64 \times 10^{-6}x^2$, where x is the mole fraction of benzene and V has the units of m^3/mol. Find expressions for the partial molar volumes of benzene and Cyclohexane.	13	K3	CO2
13.	a.	Calculate the heat of formation of methane gas from the following heat combustion data: 1) CH_4 (g) + $2O_2 \rightarrow CO_2$(g) + $2H_2O$(l); ΔH_{298}^{o} = - 890.94kJ 2) C (s) + O_2 (g) $\rightarrow CO_2$(g); ΔH^{o}_{298} = -393.78 kJ 3) H_2 (g) + ½ O_2 (g) $\rightarrow$ H_2O(l) ; ΔH^{o}_{298} = -298.03kJ	13	K4	CO3
		(OR)			
	b.	How is standard heat of reaction evaluated using 1. The standard heat of formation and 2. The standard heat of combustion of the various components.	13	K2	CO3
14.	a.	What are maxwell equation and what is their importance in establishing relationships between thermodynamics properties?	13	K3	CO4
		(OR)			
	b.	i. Derive the expression for Enthalpy and Entropy changes in ideal gases.	7	K2	CO4
		ii. Differentiate between reference properties, energy properties and derived properties.	6	K2	CO4
15.	a.	What is NADH and ATP? How it helps in energy producing process? Explain.	13	K2	CO5
		(OR)			
	b.	How do you determine the oxygen requirement and heat generation in aerobic growth? Discuss in detail.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q. No		Questions	Marks	KL	CO
16.	a)	Chemical potential can be equated do the partial derivatives of U, A, H or S under certain constraints. However, it cannot be treated as the partial molar internal energy, partial molar enthalpy etc. Explain.	15	K3	CO3
		(OR)			
	b)	Estimate the standard free energy change and equilibrium constant at 700 K for the reaction $N_2(g) + 3H_2(g)$ --- $2NH_3(g)$ Given that the standard heat of formation and standard free energy of formation of ammonia at 298 K to be – 46100 J/mol and -16,500 J/mol respectively. The specific heat (J/mol K) data are given below as function of temperature (K) $C_p = 27.27 + 4.93 \times 10^{-3}$ T for N_2 $C_p = 27.01 + 3.51 \times 10^{-3}$T for H_2 $C_p = 29.75 + 25.11 \times 10^{-3}$ T for NH_3	15	K4	CO2

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Question Paper Code: 9020

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 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 do you mean by instrumental noise?	2	K1	CO1
3.	Define Beer's Law.	2	K1	CO2
4.	List out the merits and demerits of atomic absorption spectroscopy.	2	K2	CO2
5.	Differentiate NMR and X-Ray diffraction method.	2	K2	CO3
6.	What is chemical shift? State the factors involving in shift.	2	K1	CO3
7.	Name the carrier gases used in GC and find its characteristics.	2	K1	CO4
8.	List out the application of size exclusion chromatography.	2	K2	CO4
9.	How does the SEM work?	2	K1	CO5
10.	Define Amperometry.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

S.No.		Questions	Marks	KL	CO
11.	a)	Explain the terms: reflection, refraction, diffraction and scattering.	13	K2	CO1
		(OR)			
	b)	Describe about the hardware and software techniques available for S/N ratio enhancement.	13	K2	CO1

12.	a)	Discuss the working principles, components and application of UV- Visible spectroscopy with neat sketch.	13	K2	CO2
		(OR)			
	b)	Illustrate the working mechanism, components and application of AES.	13	K2	CO2
13.	a)	Explain in detail the theory of NMR. Comment on NMR spectra in general.	13	K2	CO3
		(OR)			
	b)	How XRD are used to determine the crystal structure? Summarize the analysis.	13	K2	CO3
14.	a)	Deliberate the working principle and applications of HPLC with proper diagram.	13	K2	CO4
		(OR)			
	b)	Discuss the principle and application of gel filtration chromatography. Explain how is it used for the determination of protein molecular weight.	13	K3	CO4
15.	a)	Define voltammetry. Write short notes on pulsed and cyclic voltammetry.	13	K1	CO5
		(OR)			
	b)	Enumerate the details of working principle & application of AFM.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Write a short notes on the following			
		i. Applications of ^{1}H and ^{13}C NMR	7	K2	CO2
		ii. Thermo-gravimetric methods	8		
		(OR)			
	b)	Elucidate the theory, instrumentation and applications of differential scanning calorimetry with diagram.	15	K2	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: 9001

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

Seventh Semester

Biotechnology

U19BT725 – DOWNSTREAM PROCESSING

(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 different stages in downstream processing?	2	K1	CO1
2.	List the physio-mechanical methods of Cell disruption.	2	K1	CO1
3.	What are filter aids? Give some examples.	2	K2	CO2
4.	Which type of centrifuge is used to separate starch from gluten and cream from milk?	2	K3	CO2
5.	Define partition coefficient (K) in extraction.	2	K2	CO3
6.	Differentiate between 'Salting in' and 'Salting out' of proteins.	2	K2	CO3
7.	Define the terms 'Retention time' & 'Retention volume' in chromatography.	2	K2	CO4
8.	Define the terms 'available capacity' & 'total ionic capacity' of ion exchangers.	2	K2	CO4
9.	Quote the industrial applications of dryers.	2	K1	CO5
10.	Write the different steps of crystallization process.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Draw the generalized block diagram of downstream processing of bioproducts and explain briefly the unit operations involved in primary, intermediate and final purification stages.	13	K4	CO1

		(OR)			
	b)	Give a detailed note on the non-mechanical methods of cell disruption.	13	K2	CO1
12.	a)	With neat diagram, explain the working principle of rotary vacuum filters.	13	K2	CO2
		(OR)			
	b)	Derive the relation to estimate the volumetric capacity of Tubular Bowl Centrifuge.	13	K3	CO2
13.	a)	Write notes on:			
		i. Aqueous two-phase extractions.	8	K2	CO3
		ii. Reverse osmosis.	5		
		(OR)			
	b)	i. Classify the different methods of protein precipitation and brief each.	9	K3	CO3
		ii. Discuss the various factors that affect the membrane separation processes.	4		
14.	a)	Explain the basic principles and applications of:			
		i. Affinity chromatography.	6	K2	CO4
		ii. Reverse phase chromatography.	7		
		(OR)			
	b)	Explain the principle involved in gel permeation chromatography and write a note on applications in Separating the biomolecules.	13	K2	CO4
15.	a)	With a suitable diagram explain the principle, theory and application of crystallization.	13	K2	CO5
		(OR)			
	b)	With a neat labelled sketch explain the freeze-drying process.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	In the fermentation industry the product has been carried out by disc bowl centrifuge is available for the separation of cells with settling velocity (V_t) of 1 x 10^{-4} cm/sec. The centrifuge has 100 discs with an angle of 40°, an outer radius of 16.8 cm and inner radius of 5.2 cm. The centrifuge is operated at 6,000 r.p.m. Estimate the volumetric capacity.	15	K5	CO2
		(OR)			
	b)	i. Pretreatment of filtration broth is necessary before filtration. Justify.	5	K6	CO1
		ii. Write a case study on the bio separation process needed for the recovery of recombinant protein with a neat flowsheet.	10		CO5

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UTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
layampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9002

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BT513 – COMPUTATIONAL 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.	Write a note on the differences between the Local Alignment and Global Alignment.	2	K1	CO1
2.	What is BLAST? What are the types of BLAST?	2	K1	CO1
3.	Define DNA computing.	2	K1	CO2
4.	What are Artificial Neural Networks?	2	K2	CO2
5.	Write a note on ultrametric trees.	2	K2	CO3
6.	What is a cladogram and a phylogram?	2	K2	CO3
7.	Define Protein structure classification.	2	K2	CO4
8.	Define abinitio approaches of protein structure modeling.	2	K2	CO4
9.	What is Molecular dynamics simulation?	2	K3	CO5
10.	What is Peptide Mass Fingerprinting?	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	What are biological databases? What are the major classifications of the databases and elaborate about various biological databases with their applications?	6+7	K2	CO1

		(OR)			
	b)	What is Multiple Sequence Algorithm? Write a note on various algorithms used in MSA and give a brief account on the applications of MSA?	5+8	K1	CO1
12.	a)	What is HMM? How is it used in gene prediction and protein secondary structure identification?	5+8	K3	CO2
		(OR)			
	b)	Write a detailed note on the applications of Machine Learning in Bioinformatics.	13	K3	CO2
13.	a)	What is evolutionary distance-based methods for constructing phylogenetic tree? Explain in detail about various methods in constructing a phylogenetic tree.	6+7	K3	CO3
		(OR)			
	b)	List out the steps involved in phylogenetic tree construction and discuss with a character-based method.	6+7	K3	CO3
14.	a)	Write a detailed account of various methods of predicting protein secondary structures?	13	K3	CO4
		(OR)			
	b)	Write an essay about Homology modelling and various methods to validate the protein structure model?	5+8	K2	CO4
15.	a)	Explain Next Generation Sequencing along with the basic workflow / steps involved. Elaborate various sequencing platforms currently available.	6+7	K4	CO5
		(OR)			
	b)	What is microarray technology? Explain about microarray data analysis.	6+7	K4	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Compare and Contrast Genomics and Proteomics. Discuss in detail the different types of genomics and proteomics with applications.	7+8	K3	CO5
		(OR)			
	b)	Discuss in detail about the Ramachandran plot and its involvement in validation of protein model structure with an example.	8+7	K3	CO4

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

Question Paper Code: 9005

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BT515 – IMMUNOLOGY AND IMMUNOTECHNOLOGY
(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.	Name TWO major cells involved in Cell-Mediate Immunity.	2	K1	CO1
2.	What are regulatory T cells?	2	K1	CO1
3.	Describe- Plasma cells.	2	K1	CO2
4.	What is the major function of the Complement system?	2	K2	CO2
5.	Name two antigen-presenting cells.	2	K1	CO3
6.	What is phagocytosis?	2	K2	CO3
7.	Explain the Type 1 hypersensitivity reaction.	2	K2	CO4
8.	Name two mAbs used as anticancer drugs.	2	K1	CO4
9.	Describe the use of ELISA in diagnosis of viral infections.	2	K3	CO5
10.	Write the uses of confocal microscopy in cancer diagnosis.	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Draw the structure of a lymph node and explain how lymph nodes are involved in Cell-mediate immunity.	13	K1	CO1

(OR)

	b)	What are antigens? How does their chemical nature affect the immune response?	13	K2	CO1
12.	a)	Write a note on the development, differentiation, and maturation of B cells.	13	K2	CO2
		(OR)			
	b)	Draw the Structure of immunoglobulin and explain its critical functions in humoral immunity.	13	K2	CO2
13.	a)	Write a note on antigen processing and presentation in the MHC class I pathway.	13	K2	CO3
		(OR)			
	b)	i. Explain- T cell activation.	5	K1	CO3
		ii. How activated T cells regulate immunity.	8	K2	
14.	a)	Write a detailed note on immunology involved in the rejection of a transplanted kidney.	13	K4	CO4
		(OR)			
	b)	i. Define- Autoimmune diseases and list some examples.	5	K1	CO4
		ii. Explain the mechanism of development.	8	K3	
15.	a)	Explain the development of monoclonal antibodies with a flow diagram.	13	K3	CO5
		(OR)			
	b)	i. Write a detailed note on inactivated vaccines.	8	K2	CO5
		ii. Explain its use with suitable examples.	5	K3	

PART – C

(1 x 15 = 15 Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	Describe methods to develop RNA vaccines against COVID-19.	8	K3	CO5
		ii.	Explain how the RNA vaccines will develop immunity against COVID-19.	7	K3	CO5
			(OR)			
	b)	i.	Explain the methods involved in the production of monoclonal antibodies used for the treatment of breast cancer.	8	K4	CO4
		ii.	How cancers can be cured with the help of monoclonal antibodies. Explain with suitable examples.	7	K5	CO4

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[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 9012

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BT516 - HEAT & MASS TRANSFER
(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.	Process of heat transfer can be explained with the help of Temperature and heat. Justify the statement.	2	K2	CO1
2.	Write the principle behind natural convection with an example.	2	K2	CO1
3.	Write the classification of heat exchangers based on its contact mode.	2	K1	CO2
4.	List the applications of heat exchanger in any two bioprocess industries.	2	K1	CO2
5.	Define diffusivity in mass transfer and its significance.	2	K1	CO3
6.	How do the mass transfer coefficient vary with diffusivity as per penetration and surface renewal theory?	2	K2	CO3
7.	How will you relate the packed height and theoretical plates?	2	K1	CO4
8.	If the two phases of liquids have comparable density and viscosities are high, how does it affect extraction?	2	K2	CO4
9.	At 760 mm of Hg, the boiling point of benzene and toluene is 80.1 and 110.6°C. At temperature 85°C, the vapor pressure of benzene and toluene is 877 mm Hg, and 345 mm Hg respectively. Calculate the mole fraction of the more volatile component at 85°C.	2	K3	CO5
10.	Write the application of adsorption in bioprocess industries.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Consider a composite wall consisting of four layers of materials 1, 2, 3 and 4 having thickness L_1, L_2, L_3 and L_4 with thermal conductivities of k_1, k_2, k_3 and k_4 respectively. The outer temperature of the wall of material 1 and 4 are T_1 and T_2 respectively. Obtain the expression for (i) Temperature drop, (ii) the rate of heat transfer (iii) Express this with electrical analogue. State your assumptions clearly.	13	K3	CO1
		(OR)			
	b)	Water is flowing through a tube of 16 mm outer diameter & 13.85 mm inner diameter with length of 5 m at a velocity of 3 m/s. The temperature of the tube is 24°C and the water enters at 80°C and leaves at 36°C. Using Dittus-Boelter equation and Sieder-Tate Equation, calculate heat transfer coefficient. The properties of water at average temperature is: ρ = 984.1 kg/m, C_P = 4.178 kJ/kg K, $\mu = 485 \times 10^{-6}$ Pa. S, k = 0.657 W/m K. Calculate the heat transfer rate also.	13	K3	CO1
12.	a)	How will you conduct the pool boiling experiment? Explain the phenomenon of this using boiling curve.	13	K3	CO2
		(OR)			
	b)	5 Tons per hour of solution having solute concentration 1 wt % is fed at 30°C into the evaporator to concentrate the solution to 2.5 wt%. The saturated steam is supplied at steam pressure 1.43 bar for heating. The evaporator operates at 1 atm pressure. Assume the overall heat transfer coefficient as 2750 W/m^2 K. Calculate the area of the evaporator. If the evaporator pressure is reduced to 40 kPa, what will be the change in area?	13	K3	CO2
13.	a)	In a biochemical process industry, 50 litres of fluid is spilled over a level of surface area of 8 m^2. The air temperature is 298 K. The diffusivity of the fluid is 0.65 m^2/h. Evaporation took place through a film of air of 2 m thickness. Vapor pressure of fluid is 76 mm Hg at 298 K. Take the density of the fluid is 720 kg/m^3 and the molecular weight is 200 kg per kgmole. Estimate the time required for the fluid to evaporate into the stagnant air above the surface of the liquid.	13	K4	CO3
		(OR)			
	b)	Write short notes on:			
		i. Two film theory.	5	K2	CO3
		ii. Comparison of parallel and counter current contactors for mass transfer operation.	4		
		iii. Draw a schematic of tray contactors and mark its components.	4		

14. a) A mixture of air and acetone vapor containing 85% air by volume is stripped of 95% of its acetone content with a stream of water in a bubble cap column operating at 298 K and 1 atm. An overall plate efficiency of 30% can be assumed. If 1.25 times the minimum liquid rate is used. Find the actual number of plates required. 13 K4 CO4

Equilibrium Data:

Mole % of acetone in liquid	3.33	7.2	11.7	17.10
Partial pressure of acetone in gas (mm Hg)	3	29.6	61.8	103

(OR)

b) 1 Ton per hour of water – dioxane solution containing 18% dioxane is to be continuously extracted in counter current manner with benzene at 298 K to recover 90% dioxane. Water and Phenol are essentially insoluble and the equilibrium distribution of dioxane between them is as follows: 13 K4 CO4

Wt % of dioxane in water	5.1	18.9	25.2
Wt % of dioxane in phenol	5.2	22.5	32

Determine the number of stages required, if the solvent rate is 1.5 times the minimum and pure benzene is used in the process.

15. a) i. Explain T-x-y diagram of (i) normal binary mixture (ii) low boiling azeotrope, (iii) high boiling azeotrope 6 K1 CO5

ii. From first principles of vapor liquid equilibria, prove that 7 K3

$$x = \frac{y}{y + \alpha(1 - y)}$$

where x and y are mole fraction of a component in liquid and vapor phase and α is relative volatility of the component.

(OR)

b) Explain the variation of the concentration of adsorbate in the fixed bed adsorption with neat diagram. Also explain for (i) narrow and (ii) wide mass transfer zone. 13 K3 CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Ammonia gas flows on shell side of a tubular heat exchanger at the rate of 750 m^3/hr at 10 atm g. It is to be cooled from 195°C and 35°C using water. Water enters at 2 atm g with velocity of 2.44 m/s and at a temperature of 29°C and leaves at 35°C. The tube dimensions of the exchanger are as follows: Copper tubes of length : 5 m. ID : 1.575 cm, OD: 1.9 cm, arranged in tri angular pitch of 2.48 cm. Baffle spacing : 30.48 cm. Shell side cross flow area : 0.0362 m^2, Specific heat of NH_3 gas : 0.53 cal/gm °C, Water film co efficient is $31.74x10^3$ kcal/hr m^2 °C, Shell side heat transfer coefficient can be estimated using the expression, $h_s = 5.5\ G^{0.8}$ where G is shell side mass velocity in kg/m^2 sec. Take LMTD Correction factor as 0.837, Neglect the tube wall resistance. Calculate the following: i. Shell diameter, ii. If the dirt factor is 0.0014 m^2 K/W, what is the Overall heat transfer coefficient, iii. The number of tubes and passes.	15	K4	CO2
		(OR)			
	b)	Sulphur dioxide is absorbed from air using water at a point in the equipment. The gas contained 10% SO_2 by volume and was in contact with the solvent containing 0.4% SO_2. The overall mass transfer coefficient based on gas concentration was $K_g = 7.36 \times 10^{-5}$ % kmol/m^2 sec atm. Of the total resistance, 50% lies in the gas phase and remaining in the liquid phase. The temperature was 323 K and total pressure was 1 atm. Density of solvent: 990 kg/m^3 Calculate i. the overall coefficient based on liquid concentration, ii. the interphase composition and iii. the mass flux Equilibrium Data:	15	K4	CO3

kg of SO_2 per kg of solvent	0.2	0.3	0.5	0.7
Partial pressure of SO_2 in mm Hg	2.9	46	83	119

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

Question Paper Code: 9014

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BTV51 – FERMENTATION 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.	What role does aeration play in the fermentation process?	2	K1	CO1
2.	In what scenario, the continuous fermentation is preferred over the batch fermentation?	2	K1	CO1
3.	List out the various probes used for monitoring parameters during fermentation. Provide examples of parameters that can be measured using probes and their significance.	2	K2	CO2
4.	State the importance of real-time monitoring and data logging in fermentation processes.	2	K2	CO2
5.	Explain the consequences of inadequate air sterilization in pharmaceutical manufacturing and biotechnology laboratories.	2	K2	CO3
6.	Differentiate between pasteurization and sterilization.	2	K2	CO3
7.	Differentiate between primary and secondary recovery methods in product isolation.	2	K3	CO4
8.	How does charge and mass affect the separation of molecules in electrophoresis?	2	K3	CO4
9.	Enumerate two key differences between beer and wine fermentation.	2	K3	CO5
10.	What is the role of genetically modified microorganisms in the production of microbial fungicides?	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	What are the primary steps involved in the isolation of microorganisms for industrial fermentation purposes?	7	K1	CO1
		ii.	Discuss the methods used to genetically improve strains for enhanced fermentation performance.	6		
			(OR)			
	b)		Illustrate on the various stages of the fermentation process, with a specific focus on the composition and the importance of the fermentation medium.	13	K1	CO1
12.	a)		Discuss the design and construction of body and various parts of fermentor. Explain role of agitator and baffels and their placement within the vessel.	13	K2	CO2
			(OR)			
	b)		Describe the design and working principle of an Airlift fermentor. How does it differ from other types of fermentors? Highlight the key differences in their design and operation.	13	K2	CO2
13.	a)		Describe the design of a continuous sterilization process for media and discuss its advantages over batch sterilization.	13	K3	CO3
			(OR)			
	b)	i.	Discuss and derive the kinetics for batch sterilization.	5	K3	CO3
		i.	Explain the concept of the thermal death time and how time influences the effectiveness of sterilization?	8		
14.	a)	i.	Describe the principle behind aqueous two-phase separation and explain phase diagram in detail.	5	K3	CO4
		ii.	Explain ATPS application in the field of bioprocessing.	8		
			(OR)			
	b)	i.	Describe the concept of whole broth processing and its advantages in certain bioprocessing applications.	5	K3	CO4
		ii.	Highlight the challenges associated with product isolation and strategies to overcome them.	8		
15.	a)		Write note on HOPS used for beer production and processes involved in brewhouse with a neat flow chart.	13	K3	CO5
			(OR)			
	b)		Describe the role of microorganisms in the development and application of microbial fungicides and pesticides.	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16. a)	i.	Explore the challenges and considerations involved in scaling up a batch sterilization process from laboratory-scale to industrial-scale production.	8	K4	CO3
	ii.	Discuss the critical factors that must be addressed to maintain product quality and safety during the scale-up process.	7		
		(OR)			
b)		Investigate the integration of solvent extraction, chromatography, and electrophoresis methods can be effectively utilized within a bioprocessing framework to attain the isolation of high-purity products.	15	K4	CO4

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

Question Paper Code: 9013

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BTV11 – WASTE WATER TREATMENT
(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.	Highlight the standards for potable water.	2	K1	CO1
2.	Summarize few physical process for water purification.	2	K2	CO1
3.	List the components of industrial waste water.	2	K1	CO2
4.	State the permissible limits for pollutants in air.	2	K2	CO2
5.	Discuss the methods for iron and manganese removal from water.	2	K1	CO3
6.	Why the need for desalination of drinking water.	2	K2	CO3
7.	Show the mechanism of lagoons for waste water treatment.	2	K1	CO4
8.	Illustrate trickling filter water treatment process.	2	K2	CO4
9.	Mention the application of steam stripping.	2	K1	CO5
10.	List few advanced technologies used for waste water treatment.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Describe the physical, chemical and biological parameters for drinking water.	13	K2	CO1
		(OR)			
	b)	Explain the various chemical and biological process used for water purification.	13	K2	CO1

12.	a)	i.	Describe the types, importance and benefits of environmental auditing.	8	K2	CO2
		ii.	Outline the regulations and permits for solid waste.	5	K2	CO2
			(OR)			
	b)		Summarize the salient features of national environmental policy act and occupational safety and health act.	13	K2	CO2
13.	a)	i.	Elaborate the mechanism of activated carbon used for color removal.	8	K3	CO3
		ii.	Brief the application of Ion exchange methods in waste water treatment.	5	K3	
			(OR)			
	b)		Discuss the harmful effects of fluorine in drinking water and explain the different methods used for defluorination.	13	K3	CO3
14.	a)	i.	Explain the process of activated sludge for waste water treatment.	8	K2	CO4
		ii.	Illustrate the working of rotating biological contactors.	5	K2	
			(OR)			
	b)		Explain the mechanism and working of UASB reactors in waste water treatment.	13	K2	CO4
15.	a)	i.	Describe the merits and demerits of advanced oxidation process.	8	K2	CO5
		ii.	Brief the mechanism of chemical precipitation method for waste water treatment.	5	K2	CO5
			(OR)			
	b)	i.	Explain the need for electrolysis in water treatment and its applications.	8	K2	CO5
		ii.	Describe the methods followed for safe disposal of sludge.	5	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Exploit the different biological treatment methods for waste water treatment. Describe how these methods are effective than physical and chemical process with help of a case study considering any industrial waste water.	15	K5	CO4
		(OR)			
	b)	List the heavy metals which are commonly present in effluents. Outline the source of heavy metals in waste water and explain the methods used for removal and disposal. Emphasize on few advanced technologies for metal removal.	15	K5	CO5

(9)

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: 9005

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BT515 – IMMUNOLOGY AND IMMUNOTECHNOLOGY
(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.	Name TWO major cells involved in Cell-Mediate Immunity.	2	K1	CO1
2.	What are regulatory T cells?	2	K1	CO1
3.	Describe- Plasma cells.	2	K1	CO2
4.	What is the major function of the Complement system?	2	K2	CO2
5.	Name two antigen-presenting cells.	2	K1	CO3
6.	What is phagocytosis?	2	K2	CO3
7.	Explain the Type 1 hypersensitivity reaction.	2	K2	CO4
8.	Name two mAbs used as anticancer drugs.	2	K1	CO4
9.	Describe the use of ELISA in diagnosis of viral infections.	2	K3	CO5
10.	Write the uses of confocal microscopy in cancer diagnosis.	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Draw the structure of a lymph node and explain how lymph nodes are involved in Cell-mediate immunity.	13	K1	CO1

(OR)

	b)	What are antigens? How does their chemical nature affect the immune response?	13	K2	CO1
12.	a)	Write a note on the development, differentiation, and maturation of B cells.	13	K2	CO2
		(OR)			
	b)	Draw the Structure of immunoglobulin and explain its critical functions in humoral immunity.	13	K2	CO2
13.	a)	Write a note on antigen processing and presentation in the MHC class I pathway.	13	K2	CO3
		(OR)			
	b)	i. Explain- T cell activation.	5	K1	CO3
		ii. How activated T cells regulate immunity.	8	K2	
14.	a)	Write a detailed note on immunology involved in the rejection of a transplanted kidney.	13	K4	CO4
		(OR)			
	b)	i. Define- Autoimmune diseases and list some examples.	5	K1	CO4
		ii. Explain the mechanism of development.	8	K3	
15.	a)	Explain the development of monoclonal antibodies with a flow diagram.	13	K3	CO5
		(OR)			
	b)	i. Write a detailed note on inactivated vaccines.	8	K2	CO5
		ii. Explain its use with suitable examples.	5	K3	

PART – C

(1 x 15 = 15 Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	Describe methods to develop RNA vaccines against COVID-19.	8	K3	CO5
		ii.	Explain how the RNA vaccines will develop immunity against COVID-19.	7	K3	CO5
			(OR)			
	b)	i.	Explain the methods involved in the production of monoclonal antibodies used for the treatment of breast cancer.	8	K4	CO4
		ii.	How cancers can be cured with the help of monoclonal antibodies. Explain with suitable examples.	7	K5	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: 9011

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Fifth Semester
Biotechnology
U19BTV44 – 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.	Define malnutrition.	2	K1	CO1
2.	What is the recommended dietary intake for women?	2	K2	CO1
3.	List the factors affecting basal metabolic rate.	2	K1	CO2
4.	Why is fibre important in the diet?	2	K2	CO2
5.	What are the benefits of taking folic acid during pregnancy?	2	K1	CO3
6.	How does the physiological change affect the nutritional intake of Senior Citizens?	2	K3	CO3
7.	Define perishable foods and give an example.	2	K2	CO4
8.	Mention the flavoring substances used in foods.	2	K1	CO4
9.	Cite the general considerations for a healthy gut.	2	K1	CO5
10.	Differentiate soft diet from normal diet.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	With the neat diagram explain the steps involved in the digestion process.	13	K2	CO1
		(OR)			

	b)	i.	Classify five classes of food groups. Explain each with an example.	7	K1	CO1
		ii.	Write a short note on the nutrition scenario in India.	6		
12.	a)	i.	List the nutrients, which supply energy. Discuss the factors which affect the energy needs of the body.	6	K2	CO2
		ii.	Summarise the function of essential fatty acids and their effects in deficiency.	7		
			(OR)			
	b)	i.	How is acid-base balance regulated in the body? Explain.	8	K1	CO2
		ii.	Write down the functions of water, and potassium in the body.	5		
13.	a)		What does development happen at the onset of puberty? Why does nutrition need to change at this stage?	13	K2	CO3
			(OR)			
	b)	i.	How do the complications of pregnancy impact the nutritional status?	8	K2	CO3
		ii.	Analyse the factors, which need attention to ensure successful lactation.	5		
14.	a)		Give a detailed account on foodborne diseases at various stages of food processing.	13	K1	CO4
			(OR)			
	b)		Classify the food adulterants with an example and detail the methods to identify the same.	13	K2	CO4
15.	a)	i.	What is a therapeutic diet? Classify it.	8	K1	CO5
		ii.	Recall the function of IDA.	5		
			(OR)			
	b)		Summarize the dietary considerations for an infected person.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Give a diagrammatic representation of the food pyramid and highlight its role as a guide in menu planning.	15	K3	CO2
		(OR)			
	b)	How do you plan a diet for an underweight person?	15	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: 9010

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Seventh Semester
Biotechnology
U19BTE12 – NANOBIOTECHNOLOGY
(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.	State the importance of Nano-dimension.	2	K2	CO1
2.	What are the Surface effects of nano-material?	2	K2	CO1
3.	Define Nanostructures. Give examples.	2	K1	CO2
4.	Compare and contrast green synthesis and chemical synthesis of nanoparticles.	2	K2	CO2
5.	Write the use of DNA molecules in nanomechanics.	2	K1	CO3
6.	How nanoparticles are used in biosensors?	2	K2	CO3
7.	What is the structure and function of the extracellular matrix?	2	K1	CO4
8.	Indicate is the concept of nano artificial cells.	2	K2	CO4
9.	Mention the cytotoxic and genotoxic effects of nanomaterial.	2	K1	CO5
10.	What is nanotoxicology? How it affects the health of living organism?	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain in detail about Top down and bottom-up approach for the synthesis of nanomaterials.	13	K3	CO1

(OR)

	b)	Classify the various characterization techniques of nanomaterials and explain each.	13	K3	CO1
12.	a)	Illustrate the following methods to prepare Nano particles of different types.			
		i. Sol-gel processing	7	K2	CO2
		ii. Gas condensation processing	6		
		(OR)			
	b)	Schematically describe the synthesis of nanomaterials by biological methods.	13	K2	CO2
13.	a)	i. What is DNA origami? How DNA can be used as structural material?	7	K2	CO3
		ii. Exemplify the role of genetic engineering in DNA nanotechnology.	6		
		(OR)			
	b)	i. How to construct bio nanomachines? Explain with a suitable example.	6	K2	CO3
		ii. Write short notes on Carbon nanotube and its bio-applications.	7		
14.	a)	Describe the importance of scaffolds in tissue engineering.	13	K2	CO4
		(OR)			
	b)	Write short notes on the following:			
		i. Electrospinning	7	K2	CO4
		ii. Nanotechnology in organ printing	6		
15.	a)	Parasphrase the importance of nanobiotechnology in diagnosis and treatment of following diseases			
		i. Cancer	7	K2	CO5
		ii. Respiratory diseases	6		
		(OR)			
	b)	Justify the role of nanotechnology in the following areas:			
		i. Nanosurgery	7	K2	CO5
		ii. Optical detection	6		

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Nanobiotechnology is playing an important role in the field of drug delivery. Justify your statement with suitable examples.	15	K4	CO5
		(OR)			
	b)	Outline the various applications of nanotechnology in agriculture.	15	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: 9009

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2023
Seventh Semester
Biotechnology
U19BTE11 – DAIRY 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.	List the major constituents of milk.	2	K1	CO1
2.	Expand MMPO- Mention its function in Indian Milk market.	2	K2	CO1
3.	How milk adulteration with water can be detected?	2	K2	CO2
4.	Differentiate between Homogenized milk and Pasteurized milk.	2	K2	CO2
5.	How does churning cream make butter?	2	K2	CO3
6.	State the principle behind manufacturing of Paneer.	2	K1	CO3
7.	Distinguish between Whey protein and Casein.	2	K2	CO4
8.	Quote any TWO beneficial values of Almond milk and Soya milk.	2	K1	CO4
9.	Write a short note on the Milk distribution chain in India.	2	K1	CO5
10.	Indicate any FOUR commonly used packing materials for milk and milk products.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Exemplify the physico chemical properties of milk.	10	K2	CO1
		ii.	Figure out the current status of Per Capita Availability of Milk in India.	3	K2	
			(OR)			
	b)	i.	Illustrate the role of microbes in dairy processing.	10	K2	CO1
		ii.	Classify the common systems for collection of milk in India.	3	K2	

12.	a)	i.	Schematically explain the working principle of UHT processing of milk.	8	K2	CO2
		ii.	Substantiate the role of membrane processes in the concentration of milk proteins.	5	K3	
			(OR)			
	b)	i.	Categorize the different non thermal methods of processing milk and describe any ONE in detail.	10	K2	CO2
		ii.	Suggest some of the suitable methods for preventing milk fouling in heat exchangers.	3	K3	
13.	a)	i.	Demonstrate the manufacturing process of Cheddar cheese with a flow diagram.	8	K2	CO3
		ii.	Outline the role of fermentation in yoghurt production and brief its nutritive value.	5	K2	
			(OR)			
	b)		With neat labeled sketches, portray the different manufacturing equipments employed in drying of milk.	13	K2	CO3
14.	a)		What is meant by Skimmed milk? Illustrate the manufacturing process of Skim milk. Add its composition.	13	K2	CO4
			(OR)			
	b)		What is Vegan milk? Explain the generalized method of manufacturing vegan milk with a clear flow chart.	13	K2	CO4
15.	a)		Elaborate the principle and techniques involved in aseptic packaging of dairy products, with neat sketch. Brief on its advantages.	13	K2	CO5
			(OR)			
	b)	i.	Compare and contrast the different methods of disposing waste packaging materials.	8	K2	CO5
		ii.	Express the various human health benefits from various dairy products.	5	K2	

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	With a neat flow sheet, explain in detail the steps involved in the large scale manufacturing process of ice cream in industries.	15	K4	CO3
		(OR)			
	b)	With an example case study, discuss the technological innovations in the area of packaged dairy products.	15	K5	CO5