

PART – B

(5 x 13 = 65 Marks)

Q. No.	Questions	Marks	KL	CO
11. a)	Describe the configuration of a bioreactor with accessories and explain the function of its components. (OR)	13	K2	CO1
b)	i. List the criteria to be considered in designing a fermentation medium.	5	K2	CO1
	ii. Discuss in detail about placket Burman Design method for the optimization of media components.	8		
12. a)	i. Derive an expression for thermal cell death rate kinetics	5	K3	CO2
	ii. A continuous culture system is being contracted. The fermentation tank is to be 50,000L in size and the residt time is to be 2 hrs. A continuous sterilizer is to be used. The unsterilized medium contains 10^4 spores/L. The value of K_d has been determined to be 1 min^{-1} at 121 deg C and 61 min^{-1} at 140 deg . For each temperatures (121 deg C and 140 deg C) determine the required residence time in the holding section so as to ensure that 99% of the time in four weeks of continuous operation can be obtained without contamination. (OR)	8		
b)	Illustrate with neat sketches, and discuss the equipment used for continuous sterilization.	13	K3	CO2
13. a)	Describe the process of oxygen transfer methodology from the air bubble to the cluster of cells in fermentation broth with a neat sketch. (OR)	13	K3	CO3
b)	List the factors that affect K_{La} in fermentation vessels. Explain in detail the gassing out method of K_{La} determination.	13	K3	CO3
14. a)	i. Explain about growth associated and growth non-associated product formation with Leudeking-piret model and representative plots.	8	K4	CO4
	ii. Explain in detail the compartment model of William to illustrate the properties of cell growth kinetics.	5		

(OR)

- b) A strain of mold was grown in a batch culture on glucose and the following data were obtained.

K4 CO4

t(h)	X(g/l)	S(g/l)
0	1.25	100
9	2.45	97
16	5.1	90.4
23	10.5	76.9
30	22	48.1
34	33	20.6
36	37.5	9.38
40	41	0.63

- i. Calculate the maximum net-specific growth rate. 5
- ii. Calculate the apparent growth yield. 4
- iii. What maximum cell concentration could one expect if 200 g of glucose were used with the same size inoculum? 4
15. a) Give the merits of enzyme immobilization. Explain any two bioreactors for the immobilization of cells. 13 K4 CO5
- (OR)
- b) Define mixed culture. Categorize the major interactions that took part in microorganisms and give one example for each. 13 K4 CO5

PART – C

(1 x 15 = 15 Marks)

- | Q. No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 16. a) | Production of Single cell protein from hexadecane is described by the following reaction equation:
$C_{16}H_{34} + aO_2 + bNH_3 \rightarrow CH_{1.66}O_{0.27}N_{0.20} + dCO_2 + eH_2O$
Where $CH_{1.66}O_{0.27}N_{0.20}$ represents the biomass. If RQ is 0.43, determine the Stoichiometry coefficients. | 15 | K3 | CO1 |
| | (OR) | | | |
| b) | An autoclave is used for sterilizing 10L complex media containing 10^5 spores/ml. Due to a problem with the autoclave, the temperature is only 110°C. If the same holding time of 20 mins is maintained, what will be the probability of contaminant compared with a regular autoclave? For these spores, the activation energy for thermal death is 283 kJ gmol ⁻¹ and the Arrhenius constant is $10^{36.2} s^{-1}$, R = 8.314 J/gmol.K | 15 | K3 | CO2 |