Question Paper Code: U4D06

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2024

Fourth Semester

Biotechnology

21UBT402- BIOPROCESS PRINCIPLES

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	If th	e reactor doesn't have the impellers how does it effect in the growth.	CO2–App
2.	List out the components of fermentation process.		CO1 – U
3.	What are the roles of inducers in the medium components? Give examples		CO1 – U
4.	In an aerobic fermentation process, accidentally the oxygen supply was stopped. It was observed that the pH of the medium is approaching to acidic. What could be the reason for the reduction in pH and justify your answer.		CO2–App
5.	Wha	at are various filtration mechanisms?	CO1 – U
6.	In a bioreactor to remove the suspended particles from the compressed air which sterilization can be used? Justify it		CO2–App
7.	Define oxygen demand and suggest a technique to monitor it.		CO1 – U
8.	In an anaerobic fermentation two molecules of CO2 was produced. Now calculate the respiratory quotient of the experiment.		CO2–App
9.	What do you mean by simple unstructured model? Give example		CO1 – U
10.	Fed-batch cultivation is selected to overcome substrate inhibition". Justify this statement.		CO2–App
PART – B (5 x 16= 80 Marks)			
11.	(a)	Mention the list of parameters to be monitored and controlled in CO1-U the bioreactor and explain with neat sketch of any two parameters	(16)
Or			
	(b)	Categorize the different ranges of bioproducts and components of CO1-U bioprocess. Explain the significant impact of bioprocess engineers in the society	(16)

12. (a) Enlist the criteria for good medium and discuss about Carbon, CO1-U (16) Nitrogen and Minerals.

Or

- (b) Explain in detail about the Plackett- Burmann design for CO1- U (16) determining influencing parameter in the process.
- 13. (a) Discuss on the design of batch and continuous sterilization CO1-U (16) process with block diagram

Or

- (b) Explain the design of depth filter with necessary equation to CO1-U (16) sterilize air.
- 14. (a) The carbon substrate was converted to biomass with an efficiency CO3– App (16) of 34 % w/w by a culture of microbes. Calculate the stoichiometric coefficients for the following biological reaction and also determine the degree of reduction of the substrate molecule and respiratory quotient

 $C_6H_{12}O_6 + a O_2 + b NH_3 \rightarrow c [C_{2.2}H_{3.7}N_{0.43}O_{0.6}] + d H_2O + e CO_2$

Or

- (b) Production of single cell protein from hexadecane is described by CO3– App (16) the following reaction equation $C_{16}H_{34} + aO_2 + bNH_3 \rightarrow cCH_{1.66}O_{0.27}N_{0.20} + dCO_2 + eH_2O$ Where, $CH_{1.66}O_{0.27}N_{0.20}$ represents the biomass. If RQ = 0.43,

 - a. Determine the stoichiometric coefficients.
 - b. Determine degree of reduction of the substrate molecule
 - c. Determine the yield coefficient with respect to each of the reactants.
- 15. (a) In the Research and Development department of a company, your CO4–Ana (16) team is assigned to design a cultivation strategy to produce secondary metabolite. Choose the appropriate strategy and comment on your selection with necessary block diagram and design equation.

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(b) Scientists at ICMR are working on laboratory of Metabolic CO4–Ana Research. They have identified X and Y as products. They were confused in identifying primary and secondary metabolites among X and Y. As part of Research, they are at the analysis point now. X is produced in large quantities and Y is produced in low quantity. X has shown importance in growth and reproduction while Y has actively involved in defensive action. Identify X and Y, Which among X and Y are produced in log phase, Draw the graph of microbial growth curve and various stages in detail. (16)

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