Seat No. : _____

NC-116

November-2021

B.Sc., Sem.-V

CC-302 : Biotechnology (Biochemical Engineering) (Old)

Time : 2 Hours] **[Max. Marks : 50**

Instructions : (1) Draw figures wherever necessary.
(2) Write question number against each answer.
(3) Answer any **three** out of initial **eight** main questions. Question **9** is compulsory.

Section-I

1.	(A)	Explain aeration and agitation of a bioreactor.	**7**
	(B)	Write about stirred tank reactor.	**7**
2.	(A)	Give a brief account of perfusion reactors for growing animal cell cultures.	**7**
	(B)	Explain in brief airlift bioreactor and its applications.	**7**
3.	(A)	Describe physical control parameters.	**7**
	(B)	Write about multiple internal reflection spectroscopy.	**7**
4.	(A)	Discuss PID controls.	**7**
	(B)	Write about applications of biosensors in process controls.	**7**
5.	(A)	What is KLa ? What are the methods to determine KLa ?	**7**
	(B)	Write about two film theory.	**7**
6.	(A)	Explain heat transfer methods in fluids.	**7**
	(B)	Write about rheological properties of fluids and its importance.	**7**
7.	(A)	Outline steps in downstream processing.	**7**
	(B)	Explain physical and enzymatic methods of cell disruption.	**7**
8.	(A)	Write about liquid-liquid extraction.	**7**
	(B)	Explain two chromatographic techniques used in downstream processing.	**7**

Section-II

9. Answer any **eight** of the following : **8**

(1) What happens when dissolved oxygen levels are reduced in a bioreactor ?

(2) What is containment ?

(3) A fermenter should preferably be filled with a specific medium up to _____ percent of its total capacity.

(4) What is scale up process ?

(5) Fed batch culture is used to produce _____.

(6) Write principle of biosensor.

(7) Write two anti-foaming agents used in fermentation process.

(8) What is maximum rotating speed of a tubular centrifuge ?

(9) Mixing is usually better in external-loop than internal-loop reactors in air-lift reactors. (True/False)

(10) What is the pore size used to separate bacteria in micro-filtration ?

(11) What is crystallization ?

(12) What are load cells ?

(13) What is error in automatic controllers.

(14) In-situ or on-line measurement is appropriate for biomass analysis in fermentation. (True/False)

(15) What is flocculation ?

(16) What is redox potential ?

(17) What are the units for heat transfer co-efficient ?

(18) Write the importance of pH control.

(19) Name simplest heat exchanger used in the industry.

(20) What are the applications of liquid membrane in separation of products ?

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Instructions : (1) Draw figures wherever necessary.
(2) Write question number against each answer.
(3) Answer any **three** out of initial **eight** main questions. Question **9** is compulsory.

Section-I

1.	(A)	Explain in brief about materials used to design a bioreactor.	**7**
	(B)	Write about stirred tank reactor.	**7**
2.	(A)	Give a brief account of perfusion reactors for growing animal cell cultures.	**7**
	(B)	Explain in brief hollow fiber bioreactor and its applications.	**7**
3.	(A)	Describe physical control parameters.	**7**
	(B)	Write about multiple internal reflection spectroscopy.	**7**
4.	(A)	Discuss PID controls.	**7**
	(B)	Write about applications of biosensors in process controls.	**7**
5.	(A)	What is KLa ? What are the factors affecting KLa ?	**7**
	(B)	Write about two film theory.	**7**
6.	(A)	Explain heat transfer methods in fluids.	**7**
	(B)	Write about Newtonian fluids and Non-Newtonian fluids and its importance.	**7**
7.	(A)	Write steps in downstream processing.	**7**
	(B)	Explain rotary drum vacuum and membrane filters.	**7**
8.	(A)	Write about liquid-liquid extraction.	**7**
	(B)	Explain two chromatographic techniques used in downstream processing.	**7**

Section-II

9. Answer any **eight** of the following : **8**

(1) What happens when dissolved oxygen levels are reduced in a bioreactor ?

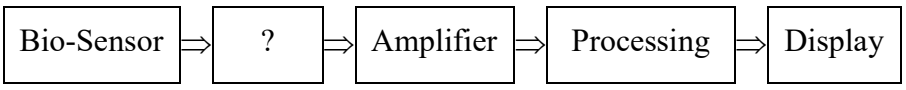
(2) What is containment ?

(3) A fermenter should preferably be filled with a specific medium up to _____ percent of its total capacity.

(4) What is scale up process ?

(5) Fed batch culture is used to produce _____.

(6) Identify the unmarked component from the given diagram of biosensor :



(7) Write two anti-foaming agents used in fermentation process.

(8) What is maximum rotating speed of a tubular centrifuge ?

(9) Mixing is usually better in external-loop than internal-loop reactors in air-lift reactors. (True/False)

(10) What is the pore size used to separate bacteria in micro-filtration ?

(11) What is crystallization ?

(12) Name two enzymes used in cell disruption method.

(13) What is error in automatic controllers ?

(14) In-situ or on-line measurement is appropriate for biomass analysis in fermentation. (True/False)

(15) What is rheology ?

(16) What is redox potential ?

(17) What are the units for heat transfer co-efficient ?

(18) Write the importance of pH control.

(19) Name simplest heat exchanger used in the industry.

(20) What are the applications of liquid membrane in separation of products ?

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