QPC: RJ18001135 AR - 18 Reg. No.

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

BBTPC6030 - Downstream Process Engineering

(Biotechnology)

Time: 2 hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions			[CO#]	[PO#]
a.	Downstream processing include (i) Purification (ii) Cell rupture (iii) Recovery (iv) All of them		1	1
b.	The ultrafiltration involves the separation of biological macromolecules by using a membrane with pore sizes of (i) 0.02 to 10μm (ii) 1-10A° (iii) 10-10μm (iv) None of them		1	1
c.	The distribution coefficient for a system which requires less solvent and produces a more concentrated extract phase is desired to be- (i)Large (ii) small (iii) very small (iv) Constant		1	1
d.	The surfactant used in Cell disruption is -		2	1
	(i) Sodium Hydroxide (ii) Sodium Sulfonate (iii) Lysozyme (iv) Sodium bicarbonate			
e.	Downstream processing occurs after		2	1
	(i) Fermentation step (ii) Cell disruption (iii) Purification iv) All of them			
f.	What is the use of batch electrophoresis in purification of bio product?		3	1
	(i)To get high resolution carbohydrates	(ii)) To purifies the product completely		
	(iii) To get high resolution protein content	(iv) To concentrate targeted product		
g.	The depreciation cost in a fermenter system varies from ----- (i) 6-7% of the capital cost (ii) 6-8% of the capital cost (iii) 6-10% of the capital cost (iv) 8-10% of the capital cost		3	1
h.	A tubular centrifuge has a bowl of diameter 2 to 5 inch and height of 9 to 30 inch with a maximum rpm of- (i) 15,000 to 50,000 rpm (ii) 50,000 to 100,000 rpm (iii) 100,000 to 150,000 rpm (iv) 150,000 to 200,000 rpm		4	1
i.	Which of the following belong to mechanical means of cell disruption- (i) Homogenization (ii) Milling (iii) Ultra sonication (iv) All of them		4	1
j.	Which of the following is an alternative process for penicillin recovery? (i) Direct crystallization (ii) Adsorption on activated carbon (iii) Degumming (iv) Distillation		4	1

PART – B: (Short Answer Questions) **(2 x 5 = 10 Marks)**

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. Write the importance of cell disruption. List out the various methods for cell disruption.	1	1
b. The total mass of a fermentation product is 200kg and the impurities present are 500g, what is the purity of the bioproduct?	1	2
c. Write the composition of ion exchange resin.	2	1
d. Define partition coefficient. Write the logarithmic equation for the partition coefficient.	3	1
e. Write the major disadvantages of enzymatic process in cell disruption.	4	1

PART – C: (Long Answer Questions) **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions	Marks	[CO#]	[PO#]
3. The following experimental results were recorded in a constant-pressure filtration unit for filtration of a yeast suspension. Time (min) 4 20 48 76 120 Filtrate Volume (Litre) 115 365 680 850 1130 Data given surface area of the filter = 0.28 m^2 weight of the cake deposited per unit volume of filtrate = 1920 kg/m3 Viscosity = 2.9 x 10 -3 kg/m-s Average specific resistance of cake = 4 m/kg a. Calculate the pressure drop across the filter. b. Calculate he filter medium resistance. c. What will be the size of filter for the same pressure drop to process 4000 litre of cell suspension in 20 min.	(6)	1	2
4. Explain the step-by-step procedure involved in economic evaluation of a project for manufacturing a biological product.	(6)	1	1
5. Write the important parameters in chromatography and explain their role in designing and operating the chromatograph.	(6)	2	1
6. Discuss the importance of downstream processing in biotechnological processes.	(6)	2	1
7. What is break point? Explain how break point can be used to design adsorption unit. Explain the key factors that affect adsorption process.	(6)	3	1
8. You need to extract penicillin from a fermentation broth using pure isoamylacetate as the organic solvent (pH 4.0) in a continuous counter current cascade extraction unit. The distribution coefficient of penicillin between organic and aqueous phases at pH = 4 is 32. If the penicillin concentration in the feed stream is 400mg/l, determine the number of ideal stages required to recover 96% of penicillin in the feed. The flow rates of organic solvent and aqueous phases are 30 L/hr and 500 L/hr, respectively. What will be the percentage of recovery if you use three counter current stages?	(6)	3	2
9. Explain the design and working principle of dialysis, ultra-filtration, and reverse osmosis.	(6)	4	1
10. What is adsorption isotherm? Explain in brief about the types of adsorption isotherms.	(6)	4	1

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