

IV SEMESTER B.TECH. (BIOTECHNOLOGY) END-SEMESTER EXAMINATION-MAKEUP SUBJECT: DOWNSTREAM PROCESSES-I (BIO 2222) REVISED CREDIT SYSTEM ANSWER ALL QUESTIONS

TIME: 3 HOURS

MAX. MARKS: 50

Q. NO	QUESTIONS	М	CO	РО	BTL
1A	Describe the process flow involved in downstream purification of penicillin.	5	1	1,5,11	1
1B	Explain the concept of salting in and salting out with a relevant example of low value product	3	3	5,6,12	2
1C	What is role of Electric Double layer in protein or biomolecule aggregation? Explain.	2	2	3	2
2A	Explain the working principle of ultrasonication-based cell lysis.	5	2	3	2
2B	How proteins of same molecular weight can be separated? Explain with an analytical technique.	3	1	1,5,11	6
2C	Explain the principle behind osmolysis? Where this technique is being used?	2	2	9	3
3A	At the end of constant pressure filtration cycle the total filtrate volume of 4 m^3 is collected in total time of 270 s. the filtration equation is given by $\frac{dt}{dv} = 40 V + 16$, where t is in sec and V is in m ³ . The cake is to be washed by through washing in the plate and frame press using a volume of wash water equal to 10 % of filtrate volume. Calculate the filtration cycle time in minutes.	4	3	1,5,11	3
3B	How does the formation of reverse micelles facilitate the extraction process?	2	4	5,6,12	4
3C	A 0.02 molar feed solution containing a macromolecule solute is to be concentrated to 0.1 molar concentration by batch ultrafiltration at 25 °C. The solute rejection is 95 % and the effect of concentration polarization can be ignored for simplicity. If the upstream pressure is 3.5 atm (gauge) and the downstream pressure is essentially atmospheric, calculate the effective pressure driving force at the beginning and the end of the process. Also estimate the fractional reduction in the solvent flux at the end of the process.	4	4	5,6,12	3

4 A	An enzyme is being concentrated in an ultrafiltration module with the feed in cross-flow. Under the given flow condition, the mass transfer coefficient at the membrane surface is estimated to be 3×10^{-5} m/s. the bulk concentration is 0.3 mass%. If the water flux is 0.41 m ³ /m ² .h, calculate the polarization modulus and the concentration of the enzyme in the liquid at the membrane surface. The membrane has a distribution of pore size and 95% rejection of the solute is achieved. If the diffusivity of the enzyme is 8 x 10 ⁻⁷ m ² /s, calculate the thickness of the mass transfer film.	4	4	5,6,12	4	
4 B	How are continuous extraction systems designed and operated to achieve efficient biomolecule extraction?	4	4	5,6,12	4	
4C	Osmotic pressure method is the most useful method to determine the molecular weight of macromolecules. The hydrostatic pressure develop as a result osmosis is a measure of osmotic pressure. Calculate the osmotic pressure of a 0.04 M cane sugar solution at 300 K.	2	4	5,6,12	3	
5A	The partition coefficient value of an organic acid in organic solvent water system is 2.7. (a) calculate the volume of organic solvent required to extract 99 % of the acid from 50 mL of aqueous solution. (b) How many extractions with 50 mL of organic solvent would be required to extract 99 % of the acid?	4	4	5,6,12	3	
5B	What are the potential applications of supercritical fluid extraction of biomolecules in industries such as pharmaceuticals, nutraceuticals, and natural product extraction?	4	4	5,6,12	4	
5C	Aqueous two phase system is used to extract xylanase from a solution. A PEG-Dextran system is used for the same. The partition coefficient is 8. Calculate the maximum possible enzyme recovery when the volume ratio of upper phase to lower phases is 6.	2	4	5,6,12	3	
CO: Course Outcome; BLOOM TAXONOMY LEVEL: 1-Remember, 2-Understanding, 3-Application, 4-Analyzis, 5-Evaluation, 6- Creation						