BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI – DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2013 – 2014
BIOT F344 DOWNSTREAM PROCESSING
COMPREHENSIVE EXAMINATION (CLOSED BOOK)

Duration: 3h. **Date: 26.5.2014**
Weightage: 30% **Max. Marks: 30**

Note: a) answer all the questions, b) answer to the point and c) draw schematic diagrams if required.

1. What are the major steps involved in an idealized process? Explain with suitable flow/schematic diagram of a typical penicillin downstream process. Give examples for methods and molecules involved in each steps. [3.0]

2. How the plate and frame, horizontal plate and rotary vacuum filter type filtration units are useful? Explain the method, principle and mention advantages and disadvantages with suitable diagrams. [3.0]

3. Why laboratory tests are important in downstream process applications? Explain with suitable diagram and examples on pretreatment, funnel filtration and filter leaf tests. Mention how results obtained from such tests is useful in large scale applications. [4.0]

4. Explain any two methods each for mechanical and chemical cell membrane disruption. Give schematic diagram on principles, operation, advantages and disadvantages of each method. [4.0]

5. How the target compounds can be extracted by changes in solute via ion pairs and changes in solute via pH? Explain. [3.0]

6. Explain with suitable schematic diagram of any two types each for batch and differential extractors. Give applications for each method. [3.0]

7. Give any two types of solid phases used for elution chromatography and explain the mechanism of product separation. Mention advantages and disadvantages of each. [2.0]

8. How the modeling elution chromatography with rate processes are done? Explain the role of kinetic analysis of dispersion and adsorption on such studies and its applications?[3.0]

9. Briefly discuss on precipitatation with non-solvent and precipitation with salts. [2.0]

10. How large scale precipitations are achieved? Explain each steps. [3.0]

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TEST-II (OPEN BOOK)

Duration: 50 min. **Date: 23.4.2014**
Weightage: 20% **Max. Marks: 20**

Note: a) answer all the questions, b) answer to the point and c) draw schematic diagrams if required.

1. What principle organic solvents are used to extract solutes from the fermented liquids containing industrially important compounds? Explain with any two examples with suitabile diagram. [4.0]

2. The Batch, staged and differential extractions are used to separate solutes. Which method would be more efficient, economical, and environment friendly technology? Justify for each method and which one you may prefer overall based on the above parameters. [6.0]

3. Which type of solute-adsorbent interactions are most preferred for biomolecule separations? Explain for the case that the target compound with non-ionic, cationic, anionic and protein/peptide separations with suitable schematic diagram on molecular interactions with suitable examples. [4.0]

4. Develop a strategy for separation of the following compounds with schematic diagrams: [6.0]
    a. Ethanol from fermentation medium
    b. Crystalizable solutes like sucrose
    c. High purity biomolecules like proteins for clinical applications.

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TEST-I (CLOSED BOOK)

Duration: 50 min. **Date: 5.3.2014**
Weightage: 20% **Max. Marks: 20**

Note: a) answer all the questions, b) answer to the point and c) draw schematic diagrams if required.

1. Briefly discuss on an idealized process for most bioseparations with suitable examples. [4.0]

2. Briefly discuss on the individual steps using a flow diagram for ethanol production.[4.0]

3. Explain in detail on any one conventional of filtration for open and closed types each. Mention advantages and disadvantages. [4.0]

4. What are filter aids and mention the typical properties of filter aids? Classify the filter aids based on adsorption properties and applications. [4.0]

5. Why laboratory tests are required in bioseparations process? Explain on pretreatment, funnel filtration and filter leaf tests. [4.0]

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QUIZ-I (CLOSED BOOK)

Duration: 20 min. **Date: 26.3.2014**
Weightage: 5% **Max. Marks: 5**

Note: a) answer all the questions, b) answer to the point and c) draw schematic diagrams if required.

1. Differentiate the microfiltration membrane (filter medium) properties over the conventional filtration with any two points each. [1.0]

2. Why the cell lysis is required in industrial applications and how the heating associated with cell lysis process is detrimental to the downstream processing. [1.0]

3. How the cell membrane properties determine the method of cell lysis to be adopted? Identify any four properties. [1.0]

4. List any four surfactants/ detergents for cell solubilization process. [1.0]

5. How will you justify the chemical or mechanical method of cell lysis procedure to be adopted for industrial applications? Give advantages and disadvantages of any two methods for each. [1.0]