Short answers question bank

Down Stream Processing (NBT-701)

UNIT-I

1. Describe the role of bioseparation in biotechnological processes.
2. What is the importance of bioseparation in biotechnological processes?
3. What do you mean by RIPP scheme?
4. List down all the important impurities and contaminants present in DSP.
5. Compare bioseparation process with conventional chemical process.
6. What are the problems faced during bioproduct purification?
7. What are the main objectives of bioproduct purification?
8. Write down main requirements of bioproducts purification.
9. Write note on Economics of downstream processing in biotechnology.
10. What are the characteristics of biological material?
11. What are the characteristics of bioseprationm?
12. What are the high value and low volume product?
13. What are the basic features of biological systems?
14. Give selection criteria for downstream processing of a fermentation product.
15. Only mention various unit operations used in the recovery and purification of a fermented product.
16. Discuss in Brief post fermentation treatment of the broth.
17. Briefly discuss the characteristics of fermentation broth.
18. What is the role of biological activity during downstream processing?
19. Discuss briefly intracellular and extracellular products.
20. Discuss briefly capital and operating cost analysis.

UNIT-II

21. Explain the theory involved in batch filtration.
22. Discuss filtration theory for a compressible cake.
23. What is the effect of pressure drop on cake resistance in filtration.
24. Write notes on flocculation.
25. What are differential and density gradient centrifugation.

26. Describe different types of coagulants available and their property.
27. Differentiate between centrifugation and sedimentation.
28. What are proteases? Name few proteases used in industry.
29. Name any four coagulant available.
30. Write down some application of filtration process.
31. What is enzymatic cell disruption?
32. Write short note on chemical cell lysis.
33. Write note on concentration polarization and cross flow filtration.
34. Give the principle of centrifugation of disc-bowl centrifuge.
35. Briefly discuss the principle of rotary drum vaccum filter.
36. Discuss the theoretical principles of constant pressure filtration.
37. Write notes on the operation of tubular bowl centrifuge and disc stack centrifuge.
38. Explain the principle of centrifugal seperation.
39. Write short note on physical and mechanical cell disruption.
40. What is the difference between flocculation and coagulation?

UNIT-III

41. Give the principle of fixed bed adsorption.
42. Discuss adsorption isotherms (Langumir and Freudlich).
43. Write notes on Purification Factor.
44. Principle of solid - liquid extraction process.
45. Configuration of a microfiltration unit.
46. What are the advantages of membrane separation processes
47. Why is protein precipitated after addition of salt in a solution?
48. Describe solid –liquid extraction process.
49. What do you mean by solvent recovery.
50. What is Adsorption? Name any four adsorbent available.
51. Write note on aqueous two-phase extraction.
52. What do you mean by supercritical extraction?
53. What are the advantages of extraction processes compared with other separation processes?
54. Write note on organic solvent precipitation of protein.
55. Write down relation between solubility and precipitation.
56. Define distribution coefficient.
57. What is theory of Reverse Osmosis?

58. Write short note on Ultra filtration.
59. What do you understand surface hydrophobicity?
60. Explain the principle behind ammonium sulphate precipitation of proteins.

UNIT-IV

61. Explain plate and Rate theories of chromatography.
62. Define Retention time, Retention factor and selectivity factor in chromatographic separation.
63. What is zone spreading?
64. Explain the principle of Capillary electrophoresis.
65. What is the basic principles of electrophoresis
66. Application of Isoelectric Focusing.
67. Write note on Gas chromatography.
68. Discuss the principle of HPLC.
69. Define principle of ion-exchange chromatography.
70. Mention the applications of ion- exchangers.
71. Discuss the gel permeation chromatography.
72. Write note on affinity chromatography.
73. What do you mean by reveres phase chromatography?
74. Discuss briefly hydrophobic interaction chromatography.
75. Discuss principle of 2D gel electrophoresis.
76. What do you mean by hybrid separation technologies?
77. Write note on GC-MS.
78. Write note on LC-MS.
79. Define partition coefficient.
80. Mention the applications of affinity chromatography.

UNIT-V

81. What is product polishing?
82. Discuss the principle of crystallization.
83. What are the different parameters considered before crystallising a compound?
84. Write the significance of crystallization in product recovery.
85. How crystallization different from precipitation.
86. Write note on batch crystallization.
87. Define nucleation in crystallization.

88. What is the principle of lyophilization?

89. Write not on advantage of freeze drying.
90. Write note on vacuum shelf dryer.
91. Write note on rotary dryer.
92. Write note on freeze dryer.
93. Write note on spray dryer.
94. Mention the steps involved in DSP of citric acid.
95. What do you mean by primary and secondary drying?
96. Discuss various stages involved in crystallization.
97. Mention the steps involved in DSP of penicillin.
98. How crystallization different from lyophilization.
99. Mention the steps involved in DSP vitamin B12.
100. Mention the steps involved in DSP of hepatitis B vaccine.

Long answers question bank

Down Stream Processing (NBT-701)

1. What is Bio-separation? Describe different methods of recovery of bio molecules.
2. Discuss the role of Down Stream Processing in Biotechnology.
3. Briefly discuss the various cell disruption method used in industry.
4. Discuss the various methods of protein precipitation. What are the various parameters that determine the solubility of proteins?
5. Describe process economics for various downstream processes opted by large scale industries.
6. Discuss various factors to be considered for designing a cost-effective downstream process.
7. Give a detail account of primary separation processes used in downstream processing.
8. Which techniques are available for the separation of insoluble biomass? Describe each technique.
9. Explain Coagulation and flocculation method of product separation. Give an example of any commercial process using this method of separation.
10. Differentiate between sedimentation and centrifugation with reference to their gravitation potential.
11. What is Adsorption? What is Adsorption isotherm? Explain different Adsorption processes used in industries.
12. Clarified fermentation broth of pH contains 180 mg/l of penicillin. It is extracted with butyl acetate. The equilibrium constant K is 57. The feed solvent planned is 420 l/hr and extraction solvent is 40 l/hr. Calculate the extraction factor.
13. Describe different types of liquid-liquid extraction processes in brief.
14. Briefly state the different types of distillation processes.
15. Describe different types of membrane filters. Discuss the laws on which membrane separation process are based.
16. Describe the theory, design and configuration of an ultra filtration unit.
17. Discuss different types of membrane modules available for downstream processing.
18. Calculate the osmotic pressure of a 2mM solution of NaCl at 0 degrees. Where RT=22.41 atm/mol.
19. Briefly describe the different types of centrifuges used in bio-separation.

20. Describe the precipitation method for using ammonium per sulphate.
21. Describe the principle and application of ion exchange chromatography.
22. Discuss the principle and application of gel permeation chromatography.
23. What is product polishing? Write a note on freeze drying and its advantages.
24. Discuss the batch and continuous crystallization process.
25. Discus the steps involved in monoclonal antibodies recovery and purification.
26. Discuss process for antibiotic recovery and purification from fermentation broth.
27. Discus the steps involved in insulin recovery and purification.
28. How precipitation is carried out by using organic solvents?
29. What is the principle of crystallization? Explain different types of nucleation processes.
30. What are different industrial methods of crystallization? Explain each method.
31. What is freeze drying? Explain primary and secondary drying methods.
32. Discuss the recovery and purification process of ethanol in industries.
33. What is Langmuir isotherm adsorption model? Describe the theory and design of fixed-bed absorber with suitable example.
34. How can a protein be precipitated using high molecular weight polymers?
35. What is affinity chromatography? Give examples of affinity tags used. Explain the process of affinity chromatography.
36. What is the principle of chromatography technique? Explain HPLC techniques of chromatography.
37. What is electrophoresis? Discuss the set-up of two-dimensional gel electrophoresis for product purification.
38. Give the criteria by which partition in aqueous two phase systems may be measured. Give the advantages of continuous aqueous two phase extraction over batch wise operation.
39. Discuss various chromatographic techniques for protein separation with their principles. Also mention some matrices used for large-scale chromatography.
40. Give the main steps involved in the separation and purification of an intracellular product from the fermented broth. Discuss various methods of cell disruption with suitable examples.
41. How will you distinguish different types of membrane filtration processes on the basis of force driving the transport through the membrane? Define retention coefficient for pressure driven membrane operations.
42. What are the various external forces affecting the membrane performance? Differentiate cross-flow and dead-end filtration. Give the various categories of module design of membranes.

43. Write short notes on : a) Temperature programming in G.C b) Band seperation c) Electron Capture detector. d) Open tubular column.
44. What is in situ product removal in bioprocessing. What are the disadvantages of using ISPR and the necessary precautions in ISPR operation.
45. (a) Write about different types of stationary phases available for gas chromatography. (b) what is the percentage composition of the mixture of Ethane, propane, butane if in gas chromatography separation the peak areas were 53.2, 14.5 and 31 cm.
46. Discuss about the classical and modern biotechnology consideration of downstream processing in biotech industry.
47. (a) Write the principle of Gel chromatography. (b) What is the retention volume (VR) if external solution (Vo) is 16ml and internal solution is 5ml and fraction of (Vi) acceptable to solute is 12 ml in a gel chromatography column?
48. Write short notes on:
    (a) Peak asymmetry (b) Selectivity factor (c) Stationary phase (d) Gradient elution.
49. Write the mode of separation of compounds by capillary electrophoresis. Discuss the mode of operation by a schematic diagram.
50. What are the parameters used in characterization in fermentation broth? List down all the important impurities and contaminants present in DSP and their removal techniques.