Indian Institute of Technology Delhi
Department of Biochemical Engineering and Biotechnology

Course Code: BBL743 Course Name: High Resolution Methods in Biotechnology
Major Exam Date: 20th November 2016
Time: 2 hours Marks: 30 Marks

Section A

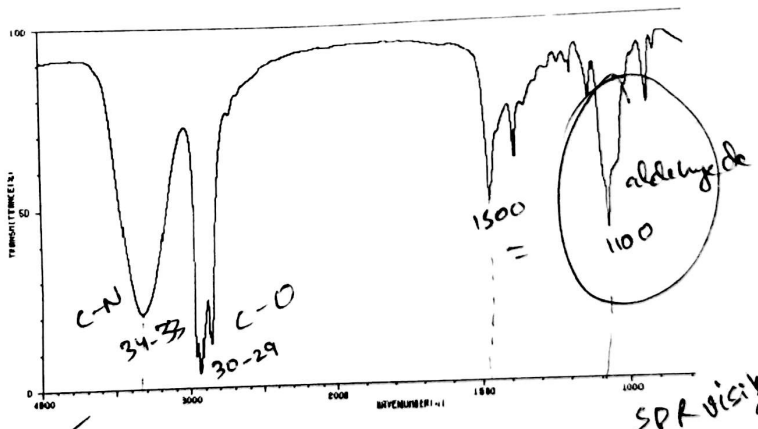
Attempt Section A and Section B in two different copies

Q. 1 An investigator expressed a protein fused to GFP on the surface of a bacteria using bacterial cell surface display system. Suggest which type of microscopy technique he should prefer for studying the display of GFP on the surface. Describe the technique. 2

Q.2 Show diagrammatically, how a confocal microscope removes out of focus light. 1.5

Q. 3 Write the similarities and differences between a compound microscope, fluorescence microscope and confocal microscope. Describe briefly the basic principle behind two-photon microscopy and discuss its applications. 2.5

Q. 4 Describe in detail all the components of an IR spectrometer. What is the matrix used in sample preparation for IR spectroscopy and why? Identify the functional group (s) in the spectra below 2.5



Q. 5 What is the difference between a BIACORE equipment and FTIR in ATR mode. Describe one application of each of the equipment types. The spectrum of a polymer film (refractive index, 1.5) was produced by using an ATR cell made of a material with (refractive index, 2.4). If the incident radiation enters the cell crystal at an angle of 60°, calculate the depth of penetration into the sample surface at 1000 and 1500cm^{-1}. 4

Q. 6 On exposing the *Saccharomyces cerevisiae* cells to a drug, a decrease or increase in total DNA content was observed. Describe a technique to determine the distribution of the two cell types in a population. 2

Q. 7 Describe the method for determining genome equivalents in a bacterial cell. 1

Q. 8 What are the differences between hollow cathode lamp and electrodeless discharge lamp? Describe the different background correction methods employed in AAS. 3

Q. 9 In a yamuna water sample collected, metal estimation was performed. Which technique you would prefer when the concentration is in ppt amounts. Describe briefly the basic principle behind that. 1.5

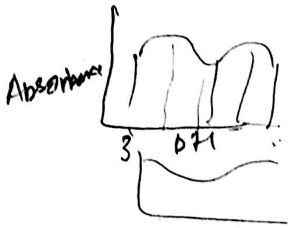
Q. 10 Differentiate between 2.5

a) Achromat, apochromat and PlanApochromat objectives

b) upright and inverted microscope

Section B

Q. 1 What role pH & salt play in Immobilized Metal ion Affinity Chromatography (IMAC)? Explain your answer with respect pH & salt requirement for sample loading, column washing after sample is loaded, elution of target molecule and regeneration of column. Be brief. 7.5



2. Write in about 200 words the message conveyed by the ANY TWO of the following videos used in the course: (10)
   a. Modern Technology – The Untold Story
   b. His Goodwill
   c. Meals Ready
   d. Doing Time, Doing Vipassana
3. You may have observed the fanfare during the festival *Rendezvous*. You may also be aware that the budget for the celebration of such a festival runs into tens of million rupees. You would also recall the exercises on dream salaries, interview of a person from lower economic stratum and happiest moments in life. Connect these and express your views on such large scale, high profile celebrations. (400 words) (10)
4. Write in about 200 words about ANY TWO of the methods of Self-Development, and explain how the method works in an individual who adopts the method. (10)
5. Discuss about ANY ONE of the invited talks (Kabir-Preeti Vajpeyi / Jaya Prakash Dabral) in about 200 words, on what you were most impressed with, and why. Relate the message of the talk to the theme of VEL700 course. (5)