

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH(BT)/SEM-3/MBT-316D/2012-13**

**2012**

**ADVANCED INSTRUMENTATION IN BIOTECHNOLOGY**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

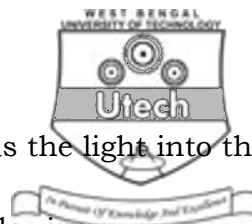
**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

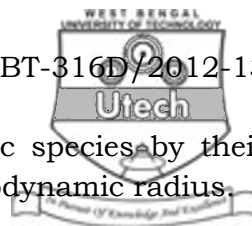
- i) ..... have been utilized primarily for molecular weight determinations of molecular ions and enzymatic digests leading to structural information of proteins. Fill up with suitable word from the list :
- a) Linear and reflectron TOF-MS
  - b) MALDI-TOF-MS
  - c) 2D gel electrophoresis.
- ii) Phase contrast depends on
- a) diffraction
  - b) spectral region
  - c) source of the light
  - d) condenser.



- iii) The function of ..... is to focus the light into the plane of object.

Fill up with suitable word from the following :

- a) objective lens
  - b) compound microscope
  - c) eye piece
  - d) condenser.
- iv) Tick the ODD option out :
- a) Gel filtration chromatography
  - b) Principle : molecular sieving
  - c) Size exclusion chromatography
  - d) High pressure liquid chromatography.
- v) The solute component having maximum interaction with the stationary phase will have
- a) maximum retention time
  - b) minimum elution time
  - c) minimum retention time
  - d) will not be eluted at all.
- vi) .....is used to separate ionic species by their charge and frictional forces and hydrodynamic radius.
- a) Flow cytometry
  - b) Capillary electrophoresis
  - c) Isotacophoresis
  - d) Electrosmosis.
- vii) Full form of HPLC is
- a) High Pressure Liquid Chromatography
  - b) High Performance Liquid Chromatography
  - c) both (a) and (b)
  - d) none of these.
- viii) Electrostatic forces play a role in ..... type of chromatography.
- |                |                   |
|----------------|-------------------|
| a) adsorption  | b) gel-filtration |
| c) hydrophobic | d) ion-exchange.  |



- ix) ..... is used to separate ionic species by their charge and frictional forces and hydrodynamic radius.
- Flow cytometry
  - Capillary electrophoresis
  - Isotacophoresis
  - Electrosmosis.
- x) ..... works on identification of combination of scattered and fluorescent light.
- Flow cytometry
  - Capillary electrophoresis
  - FACs
  - All of these.
- xi) Isotachophoresis is based on separation of
- leading and terminating electrolytes
  - intermediate electrolytes
  - moving oil droplets in buffer
  - analytes in organic solvent.
- xii) Electrokinetic chromatography involves
- electrosmosis
  - electrophoresis
  - chromatography
  - all of these.

### GROUP – B

#### ( Short Answer Type Questions )

Answer any *three* of the following  $3 \times 5 = 15$

- Give a brief description of the Capillary Zone Electrophoresis technique.
- What is HPLC ? Write the working principle of HPLC.
- Derive an expression for measuring  $R_f$  in HPLC and mention its significance.
- Define the following terms and mention the relationship among them :  
magnification, resolution, contrast.



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

6. a) Discuss the basic principle of Microarray technique.  
b) How does microarray help in the gene expression profiling ?  
c) What do you mean by ToxBolt assay ?  $5 + 5 + 5$
7. a) A solute protein is to be separated from a liquid phase in a chromatographic column. The adsorption isotherm is given by the following equation :  $C_s = kC_L^2$ , where  $C_s$  is the solute concentration in solid phase (mg solute/mg adsorbent) and  $C_L$  is the liquid phase concentration of solute (mg solute/mg liquid). Use the following information :  $k = 0.4$ ,  $\varepsilon = 0.3$ ,  $A = 25 \text{ cm}^2$ ,  $M = 10 \text{ g adsorbent/100 ml column}$ .  
i) For  $V = 400 \text{ ml}$  and  $X = 25 \text{ cm}$  determine the equilibrium solute concentration in liquid and solid phases.  
ii) Determine the ratio of travel distance of solute to solvent  $R_f$ .  
b) Derive an expression to calculate the band distance  $\Delta X$ .  $(6 + 4) + 5$
8. a) What do you mean by forward scatter and side scatter ?  
b) Explain with an example the application of FACS in Biotechnology research.  
c) Discuss in brief the working principle of a capillary DNA sequencer.  $5 + 5 + 5$
9. State the difference luminescence and phosphorescence. What do you mean by chemiluminescence and bioluminescence ? Discuss how chemiluminescence is used for detection of a disease.  $4 + 4 + 7$

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