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 :

$10 \times 1 = 10$

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.

a) Flow cytometry

b) Capillary electrophoresis

c) Isotacophoresis

d) Electrosmosis.

x) ..... works on identification of combination of scattered and fluorescent light.

a) Flow cytometry

b) Capillary electrophoresis

c) FACs

d) All of these.

xi) Isotachophoresis is based on separation of

a) leading and terminating electrolytes

b) intermediate electrolytes

c) moving oil droplets in buffer

d) analytes in organic solvent.

xii) Electrokinetic chromatography involves

a) electrosmosis b) electrophoresis

c) chromatography d) all of these.

GROUP – B

(Short Answer Type Questions)

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

2. Give a brief description of the Capillary Zone Electrophoresis technique.
3. What is HPLC ? Write the working principle of HPLC.
4. Derive an expression for measuring R_f in HPLC and mention its significance.
5. 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 × 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 : $k = 0 \cdot 4,\ \varepsilon = 0 \cdot 3, A = 25\,\text{cm}^2$, M = 10 g adsorbent/100 ml column.
      i) For V = 400 ml and X = 25 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 ΔX. (6 + 4) + 5

8. a) What do you mean by forward scatter and side scatter ?
   b) Explain which 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 chemiluminescene and bioluminescence ? Discuss how chemiluminescence is used for detection of a disease. 4 + 4 + 7

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