SPECIAL SUPPLE B.TECH/BT/7TH SEM/BIOT 4164/2018

PROTEOMICS & PROTEIN ENGINEERING
(BIOT 4164)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) The route of any drug delivery/administration is addressed in the
(a) clinical trial phase of drug development
(b) pre-clinical phase of drug development
(c) during toxicological studies
(d) in the discovery phase of drug development.

(ii) Trypsin cleaves the peptide bond containing aminoacid
(a) Arg or Lys (b) Glu or Asp
(c) Met, Trp (d) none of these.

(iii) The 2D-Gel Electrophoresis provides which informations about the proteins?
(a) MW, pI and quantity (b) MW and pI
(c) pI and quantity (d) none of these.

(iv) A permeation enhancer used to increase bioavailability of an orallly administered drug typically uses a detergent based substance at concentration
(a) 0.01% (b) 1% (c) 10% (d) 20%.

(v) Protein splicing is a
(a) post transnational processing
(b) post transcriptional processing
(c) post replication processing
(d) signal processing.

(vi) Tunicamycin inhibits
(a) all N-glycosylation of proteins
(b) all O-glycosylation of proteins
(c) both (a) and (b)
(d) none of these.

(vii) Protein visualization sensitivity by Coomassie Briliant Blue R-250 Staining per spot is
(a) 1 ng to 1 µg (b) 100 ng to 10 µg
(c) 1 ng and up (d) 1 mg.

(viii) Which ionization method will be the best to study peptides, proteins and DNA upto 500 kD by mass spectrometry?
(a) Electron impact ionization (b) ESI
(c) MALDI (d) FAB.

(ix) Which of these is NOT a reverse genetics technique?
(a) chemical mutagenesis (b) gene silencing
(c) homologous recombination (d) sialylation.

(x) Formation of disulfide bond takes place in
(a) smooth ER (b) rough ER
(c) golgi body (d) none of these.

Group – B

2. (a) Define protein and proteome.

(b) Describe the life cycle of protein with a diagram.

(c) What are the basic differences between proteomics and protein chemistry?

(d) Write the basic principles, steps with labeled diagram and application about Yeast two hybrid.

2 + 3 + 3 + 4 = 12

3. (a) Write the principle of 2D-Gel electrophoresis.

(b) How do you prepare a protein sample for 2-D gel electrophoresis?

(c) What are the advantages and disadvantages of 2-D Gel electrophoresis?

4 + 4 + 4 = 12

Group – C

4. (a) What is protein engineering? What are the purposes of protein engineering?

   (b) Describe a strategy for increasing the stability of a protein that has (i) no cystein residues (ii) an odd number of residues.

   (c) How would you engineer streptokinase so that it will become less sensitive to protease?

4 + 4 + 4 = 12

5. (a) From a medical perspective, what are the important categories of biomarkers and what functions do they measure? What characteristics of proteins make them suitable as disease biomarkers? Explain the parameter of bioavailability in the context of protein based drugs. Wherever applicable use suitable examples to explain your answer.

   (b) Use a flowchart to depict the stages of drug development. What are the technologies that have contributed to reduction of the attrition rate in drug discovery? What is the value of proteomics in (i) target identification and (ii) identification of potential protein therapeutics and targets in the pathogen proteome.

(2 + 2 + 2) + (1 + 1 + 2 + 2) = 12

Group – D

6. (a) What is the role of proteomics in the detergents industry? Which category (ies) of protein engineering principles do such applications fall in?

   (b) How can site directed mutagenesis be applied for protein stability measurements? How is measurement of protein stability typically done? Name two globular proteins that served as models for protein stability measurements.

   (c) How has protein stability measurements been applied to the food processing and environmental biotechnology industries. Cite two examples in each industry category.

3 + (2 + 1 + 1) + (2 + 2 + 1) = 12

7. (a) How have principles of rational design been applied to the purification of proteins and design of hybrid enzymes? Use examples to highlight the commercial applications of such rational design experiments.

   (b) Name 4 expression systems for the generation of recombinant proteins. What are the disadvantages associated with the most common of them?

   (c) Draw a labelled flowchart for a general solid phase peptide synthesis cycle. Give a simple definition of selective deprotection.

(2 + 2) + (2 + 2) + (3 + 1) = 12

Group – E

8. (a) Describe the mechanism of protein folding?

   (b) Discuss the forces that help in self-assembly of protein molecules.

   (c) Discuss protein folding by the GroES/GroEL system. Name two diseases that are caused by misfolded proteins.

4 + 3 + (3 + 2) = 12

9. (a) What are non-ribosomal peptides? Discuss their uses. Name the cellular machinery that is used for their synthesis.

   (b) Discuss the mechanism of cystic fibrosis in relation to defect in protein folding.

(2 + 2 + 2) + 6 = 12