Total Number of Pages : 03   **B.Tech.**
                                                                                                                        PBT6D001

6th Semester Regular Examination 2017-18
PROTEIN ENGINEERING AND STRUCTURE ANALYSIS
BRANCH : BIOTECH
Time : 3 Hours
Max Marks : 100
Q.CODE : C482
Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Part – A (Answer all the questions)

Q1   **Answer the following questions: multiple type or dash fill up type :**   **(2 x 10)**

a) Protein engineering is :
   (i)   the process of developing proteins with desired function via manipulating stability and specificity
   (ii) optimized protein properties for various applications and usefulness
   (iii) DNA manipulation, heterologous expression so change of protein at genetic level
   (iv) All of the above

b) What provides the information necessary to specify the three-dimensional shape of a protein?
   (i)   The protein's interactions with other polypeptides,
   (ii) The protein's peptide bonds,
   (iii) The protein's interaction with molecular chaperones,
   (iv) The protein's amino acid sequence

c) Protein engineering improves enzyme fitness and increase industrial applications due to :
   (i)   Multiple substrates affinity,
   (ii) Increased activity on novel substrates
   (iii) Stability or activity in artificial environments- solvent vs. aqueous solutions
   (iv) All of the above

d) Layer that surrounds solute when it is dissolved in solvent is called :
   (i)   Solvent layer
   (ii) Solvation layer
   (iii) Solute layer
   (iv) Fatty layer

e) Molecular sieve chromatography best suits for :
   (i)   Separation of solutes (proteins) according to size
   (ii) Separation through electrostatic interactions between solutes (proteins) and chromatography medium
   (iii) Separation based on specific affinities in between target molecule(s), a protein and a specific ligand
   (iv) Method that separates proteins on the basis of pI.

f) For the construction of *Ramachandran* plot values of Psi and Phi are plotted. The value of Phi is the rotation angle around
   (i)   N - Cα bond
   (ii) Cα - C bond
   (iii) C - N bond
   (iv) N - H bond

g) The stability of thermophilic enzymes depends on
  (i) The numbers of charged groups
  (ii) The difference in sidechain rotameric entropy for protein folding
  (iii) Presence of high no. of aromatic sidechains
  (iv) All of the above

h) Which of the following technique is involved in radiation in a range of 0.8 – 1000 µm wavelength
  (i) Ultraviolet–visible spectroscopy
  (ii) Vibrational spectroscopy
  (iii) Fluorescence spectroscopy
  (iv) Circular dichroism spectroscopy

i) X-ray crystallography is a technique used for
  (i) Investigate the secondary structure of proteins
  (ii) Measurement of the masses of the atoms and associated vibronic coupling
  (iii) Determining the atomic and molecular structure of a compound with the crystalline atoms
  (iv) None of the above

j) Solvents used in NMR spectroscopy
  (i) CDCl3
  (ii) D2O
  (iii) DMSO-d6
  (iv) All of the above

Q2 **Answer the following questions :** *Short answer type :*   **(2 x 10)**
  a) Briefly state the structural features of proteins.
  b) Briefly explain rational protein design.
  c) Give description on module shuffling.
  d) Write down the implementations of using thermodynamics laws for protein stabilization.
  e) Explain homology modeling.
  f) Write down the importance of mono-chromator in ultraviolet-visible spectrophotometer.
  g) Briefly explain the importance of lysozyme.
  h) What are the different weak forces that stabilize proteins?
  i) Write down the applications of Fluorescence spectroscopy (any two).
  j) Define electro-paramagnetic resonance.

Part – B (Answer any four questions)

Q3 a) Describe in detail the thermodynamic laws and principles involved in protein stability and flexibility.   **(10)**
  b) What are the roles of solvent in protein stability?   **(5)**

Q4 a) Give an account on structural to functional relationship of protein.   **(10)**
  b) What are the different chemical modifications required for protein stability?   **(5)**

Q5 a) Give a detail account on computational approaches for structural analysis protein folding and interaction.   **(10)**
  b) Describe PCR mediated site directed mutagenesis.   **(5)**

Q6 a) Briefly describe protein folding, reversible folding and unfolding. **(10)**

b) Give brief note on module shuffling. **(5)**

Q7 a) Give account on mechanisms of protein stabilization in thermophiles and psychrophiles. **(10)**

b) State and explain beer-lambert's law. **(5)**

Q8 a) Describe in detail on NMR spectroscopy, its types and applications. **(10)**

b) What is the role of denaturing protein electrophoresis? **(5)**

Q9 a) Give a description on molecular sieve chromatography. **(10)**

b) Differentiate between calorimetric methods and viscometric methods of protein estimation. **(5)**