

**BIOPHYSICS OF MACROMOLECULES
(BIOT 3242)**

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) Which of the following atoms is least likely to participate in hydrogen bond?
(a) O (b) S
(c) F (d) N
 - (ii) Which of the following is a polar and uncharged amino acid?
(a) Histidine (b) Proline
(c) Alanine (d) Threonine
 - (iii) Which interaction takes place when a partially positive end of one molecule interacts with a partially negative end of another molecule?
(a) dipole-dipole interaction (b) ion-dipole interaction
(c) ion-ion interaction (d) van der Waals force
 - (iv) Which of the following statement is correct?
(a) Charged amino acid residues are never found in the core of a protein
(b) Charged amino acid residues are seldom found in the core of a protein
(c) Hydrophobic amino acid residues are always found in the core of a protein
(d) Tyrosine is always found in the core of a protein
 - (v) If no. of amino acid residues is 110, what will be the molecular weight of the protein?
(a) 15000 (b) 11000
(c) 12100 (d) 13800
 - (vi) Which one is a non-proteinogenic amino acid?
(a) Selenocysteine (b) Pyrrolysine
(c) N-formyl methionine (d) GABA.
 - (vii) In which region the wave length 600 nm belongs to?
(a) UV (b) visible
(c) near IR (d) far IR

- (viii) Under which condition Lambert-Beer law can be applied?
(a) when the solution is dilute and transparent
(b) when the solution is concentrated and transparent
(c) when the solution is in colloid form
(d) when solution is dilute and has suspended particles
- (ix) What is the use of Faraday Cup in Mass Spectrometry?
(a) Ion analyzer (b) Ion detector
(c) Ion production (d) None of the above
- (x) Virtual, erect and magnified image as that of the object is formed in
(a) Telescope (b) Photocopier
(c) Camera (d) Magnifying glass

Group – B

2. (a) Write notes on Reverse Turns.
(b) Compare A, B and Z DNA.
5 + 7 = 12
3. (a) Draw and explain the titration curve of Aspartic acid.
(b) pKa of any functional group is greatly affected by its chemical environment-
Explain with examples
6 + 6 = 12

Group – C

4. Justify the following statements. **(3 × 4) = 12**
(i) Mixing of benzene and water increases energy of a system
(ii) Melting point of an alpha helix depends on its chain length
(iii) Tertiary structure of a protein is maintained by weak forces
5. (a) Based on the two-state model, derive the equation for kinetic study of denaturation of a protein. Discuss how the kinetic constant can be determined experimentally using the equation.
(b) Explain cooperative nature for melting of an alpha helix
(4 + 4) + 4 = 12

Group – D

6. (a) State the basic principles of fluorescence spectrometry. What is the major difference between fluorescence and UV-visible spectroscopy?
(b) Draw a schematic diagram of a fluorescence spectrophotometer. State the parameters that influence the shape of the curve of fluorescence spectrum.
(4 + 2) + (4 + 2) = 12

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7. (a) What are the different types of vibrations in a molecule? Draw diagrams of different types of vibrations in a three-atomic non-linear molecule.
- (b) Discuss three applications of IR.

(3 + 3) + 6 = 12**Group – E**

8. (a) Explain with a diagram the working principle of TEM.
- (b) Write down the different areas where Mass Spectrometry is used.
9. (a) Briefly explain the production of X-rays.
- (b) What is the principle behind Mass Spectrometry?

8 + 4 = 12**8 + 4 = 12**

Department & Section	Submission Link
BT	https://classroom.google.com/c/MzAxNjYwNzg0NDEx/a/MzY1MzU3MzQ5NTM5/details