

B.TECH/ BT/6TH SEM/ BIOT 3242/2018
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) Examples of weak forces are
(a) hydrogen bond, disulfide linkage, ionic interaction
(b) hydrogen bond, covalent crosslinking, ion-dipole interaction
(c) van der Waals force, hydrogen bond, ionic interaction
(d) hydrophobic interaction, hydrogen bond, disulfide linkage.
- (ii) Which amino acid is known as Helix Breaker?
(a) Histidine (b) Proline (c) Glycine (d) Glutamic acid.
- (iii) If no. of amino acid residues is 15, molecular weight of protein is
(a) 1500 (b) 1100 (c) 1650 (d) 1380.
- (iv) Which statement is NOT true for phosphorescence?
(a) Phosphorescence is a delayed process compared to fluorescence
(b) Phosphorescence occurs when the light source is taken away
(c) Phosphorescence occurs due to emission of energy
(d) Phosphorescence occurs due to absorption of energy in the IR Region.
- (v) X-ray diffraction can be used to know the
(a) structure of a crystal
(b) amino acid composition of a protein
(c) functional groups of an organic compound
(d) secondary structure of DNA
- (vi) Non-proteinogenic amino acid is
(a) Selenocysteine (b) Pyrrolysine
(c) N-formyl methionine (d) GABA.

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- (vii) Number of residues per turn in a α -helix is
(a) 2.2 (b) 3 (c) 3.6 (d) 4.5.
- (viii) Fluorescence spectroscopy is based on
(a) absorption of energy (b) emission of energy
(c) vibration of bonds (d) effect of magnetic field on a molecule.
- (ix) Faraday Cup is used in a Mass Spectroscopy as
(a) ion source (b) detector
(c) mass analyser (d) signal processor.
- (x) UV region covers the wavelength range of
(a) 10-400 nm (b) 400-800 nm
(c) 100-500 nm (d) 800-1500 nm.

Group - B

2. (a) Explain why 3_{10} Helix and π Helix are rarely found in body? pKa of any functional group is greatly affected by its chemical environment. Justify the statement.
(b) Explain why amino acids are known as Ampholytes? **(4 + 4) + 4 = 12**
3. (a) Explain the titration curve of Aspartic acid.
(b) Describe any two supersecondary structure of protein. **6 + 6 = 12**

Group - C

4. (a) Discuss the major stabilizing forces responsible for maintaining the structure of DNA double helix.
(b) Draw and explain the graph for melting of DNA. State the parameters which influences melting point of a DNA molecule. **6 + (3 + 3) = 12**
5. (a) Discuss the role of Proline and Lysine residues in maintaining the structure of collagen.
(b) Explain why a protein gets denatured in presence of
i) an organic solvent
ii) detergent. **(3 + 3) + (3 + 3) = 12**

Group - D

6. (a) With a schematic diagram, describe the basic arrangement of a spectrophotometer.
- (b) Following data have been obtained from a spectrophotometric analysis of a compound with 450 nm wavelength and 1 cm pathlength.

Concentration ($\mu\text{g/ml}$)	1	2	3	4	5
Absorbance	0.099	0.197	0.298	0.380	0.475

Taking the average of the above data calculate the molar absorption coefficient. What will be the concentration if the absorbance is 0.42 at the same wavelength?

$$7 + (3 + 2) = 12$$

7. (a) Define quenching and quantum yield.
- (b) Discuss the applications of quenching in real time PCR.

$$(2 + 2) + 8 = 12$$

Group - E

8. (a) Explain with a diagram the working principle of Surface Plasmon Resonance.
- (b) Describe the sample preparation in SEM.

$$8 + 4 = 12$$

9. (a) Describe the different processes of ion detection in Mass Spectrometer.
- (b) Write down the strengths and limitations of Single crystal X-ray diffraction.

$$6 + 6 = 12$$