

- (d) A protein folding reaction has the following thermodynamic parameters – $\Delta H = -40$ kJ/mol and $\Delta S = -100$ J/mol K. Calculate the Gibbs free energy change (ΔG) at 27°C (300 K). Is the folding process spontaneous? (4,4,4,3)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1723

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Unique Paper Code : 3182013601

Name of the Paper : BIOPHYSICS

Name of the Course : **B.Sc. (Hons.) Biomedical Science**

Semester : VI

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. 1 is compulsory.
4. Give illustrations and examples wherever required.

(Subparts of the questions should be attempted together).

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1. (a) Abbreviate the following terms: (5×1=5)

(i) MRI

(ii) HOMO

(iii) RCF

(iv) FACS

(v) ΔG°

(b) Match the following : (5×1=5)

- | | |
|------------------------|-----------------------------|
| (i) Ramachandran plot | a. Cell Size |
| (ii) Stokes shift | b. ϕ and ψ angles |
| (iii) FSC | c. Cell Granularity |
| (iv) SSC | d. Fluorescence |
| (v) Tetramethyl silane | e. Chemical Shift |

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5. (a) Explain the underlying principle of MALDI-TOF mass spectrometry.

(b) Discuss how you will determine the percentage of early apoptotic, late apoptotic and necrotic cells by flow cytometry.

(c) State Fick's first and second law of diffusion? How do they apply to biological systems?

(5,5,5)

6. (a) Explain the concept of resonance condition in NMR spectroscopy.

(b) Explain the principle of IR spectroscopy and the types of molecular vibrations involved.

(c) The flow time for a solution, X and water in an Ostwald viscometer is 100 and 250 seconds, respectively. If the density of water is 2g/cm³ and the density of the liquid is 2.5 g/cm³, calculate the viscosity of X relative to water.

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(iii) Temperature affects crystal nucleation and growth.

(iv) Protein folding is thermodynamically favorable despite loss of conformational entropy.

(v) Active transport is required to maintain ion gradients.

4. Briefly explain the following: (5×3=15)

(i) Effect of Solvent and pH on Proteins on Absorption Behavior of Proteins.

(ii) FRET

(iii) Supercoiling of DNA: Linking number, twist and writhe

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(c) Explain the following terms: (10×2=20)

(i) Wavelength

(ii) Chromophore

(iii) ORD

(iv) n+1 rule

(v) Viscoelasticity

(vi) Centrifugal Force

(vii) Enthalpy

(viii) Passive Diffusion

(ix) Conformation

(x) Levinthal's Paradox

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2. (a) Give two points of difference between the following : (5×2=10)

- (i) Static and Dynamic Quenching
- (ii) Shielding and Deshielding
- (iii) Iso-pycnic and Rate-zonal density gradient centrifugation
- (iv) Newtonian and Non-Newtonian Fluid
- (v) Carrier Ionophores & Channel-Forming Ionophores

(b) Answer the following questions in one word only (1×5=5)

- (i) What is the parameter that indicates efficiency of fluorescence emission?
- (ii) Which interaction is the major contributor to DNA duplex stability?

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(iii) What is the crystallographic measure of agreement between observed and calculated data?

(iv) What is the IR region for C=O stretching (cm^{-1})?

(v) What is the term for increase in negativity of membrane potential?

3. (a) Draw a well-labelled diagram of the instrumentation of a Circular Dichroism spectrometer. (5)

(b) Justify the following statements: (2×5=10)

- (i) Viscosity affects sedimentation rate.
- (ii) Absorbance of single-stranded DNA is higher than that of double-stranded DNA.

P.T.O.