

BITS PILANI,INTERNATIONAL ACADEMIC CITY ,DUBAI
III YEAR BIOTECH FIRST SEMESTER,2009-2010
COMPREHENSIVE EXAMINATION

Course Title :Biophysical Chemistry

Course No:BIOT C339

Date:29.12.09

Total Marks:40

Time: 3 Hours

Weightage:40%

1. Answer Part-A and Part-B separately
2. Answer all questions sequentially
3. Useful data : 1 a.m.u = 1.6605×10^{-27} Kg

PART-A

- 1.(i) What is isoelectric point ? Write the structure for the dipeptide gly + ala .
(ii) Write the therapeutic use of the chiral drug methyldopa.
(iii) Suppose the C=O group in a peptide bond can be regarded as isolated from the rest of the molecule. Given the force constant of the bond in a carbonyl group is 908 Nm^{-1} . Calculate the vibrational frequency of $^{13}\text{C}=\text{}^{16}\text{O}$. [2+1+2M]

2. (i) Write any two hydrogen bond donors and acceptors frequently observed in biomolecules.
(ii) What is meant by hydrophobic attractions? Give its importance in biological processes.
(iii) Mention the factors that stabilize the Quaternary structure of proteins.
(iv) Give the significance of cubic symmetry in protein structures. [2+2+2+1M]

3. (i) Explain how chirality arises at all levels of protein structural hierarchy .
(ii) Write the expression for Lennard Jones potential.
(iii) What is meant by Levinthal's paradox ?
(iv) Explain homopolymer collapse theory of protein folding. [2+1+1+2M]

4. (i) Calculate R_{rms} and R_G for a linear polymeric chain containing 250 monomeric units each being 45 \AA long.
(ii) How will you determine the conformation of a polymer chain ?
(iii) Mention any two denaturation methods used to disrupt the ionic linkages.
(iv) Write any two characteristics of conformational transitions in proteins. [3+1+1+2M]

PART-B

- 1.(i) Explain the terms:
(a) Hypotonicity (b) Bremsstrahlung, (c) osmotic pressure.
(ii) Give the salient features of the biological semi-permeable membranes. **[3+2M]**
- 2.(i) What are X-rays? How are they created? **[3+2M]**
(ii) What are elastic scattering? Explain the two major forms. **[3+3M]**
- 3.(i) Aqueous protein solutions exhibit dielectric relaxations. Justify. **[2+2M]**
(ii) The mononucleotides of DNA have two ionizable protons. Justify. **[2+2M]**

BITS PILANI, INTERNATIONAL ACADEMIC CITY, DUBAI
III YEAR BIOTECH FIRST SEMESTER, 2009-2010

TEST- 2 (Open book)

Course Title : Biophysical Chemistry

Course No: BIOT C339

Date: 16.12.09

Total Marks: 20

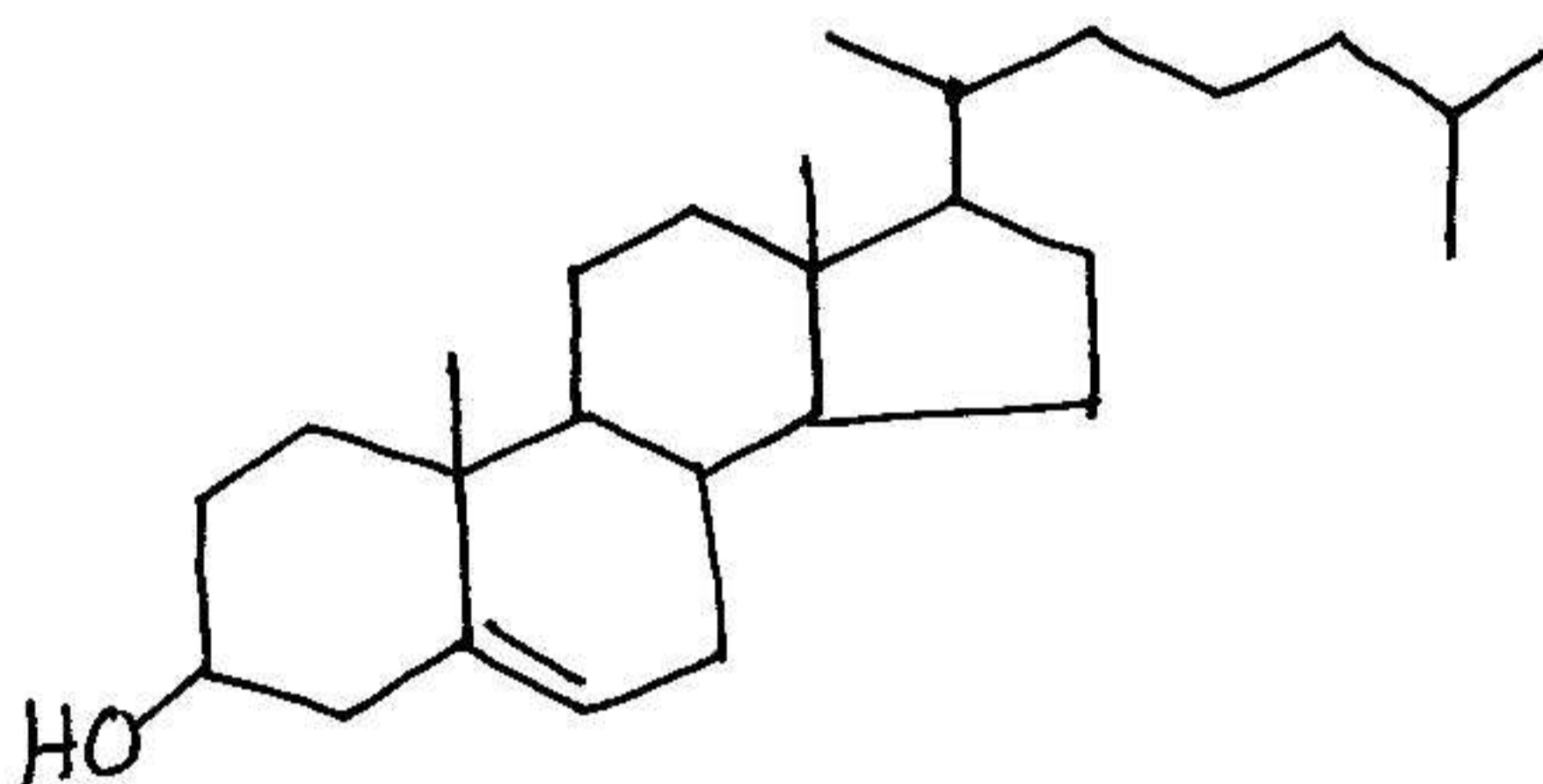
Time: 50 min

Weightage: 20%

1. Answer all questions sequentially

2. Only prescribed Text book and original hand written Notes are allowed.

1. Mention any two techniques used to study the chirality of biomolecules. [1M]
2. Give the use of (R) and (S) enantiomer of limonene. [1M]
3. Indicate the number of stereocentres and the number of possible stereoisomers possible for the cholesterol molecule given below. [2M]



4. What are chaperones? Give one example. [2M]
5. Denaturation occurs at different levels of protein structure. [6M]
 - (a) Write any two denaturation processes that occurs in the tertiary structure of proteins.
 - (b) Mention the methods used to carry out the denaturation in the above case.
 - (c) Write any two changes observed in the properties (physical or chemical) of proteins upon denaturation processes generally.
6. What is the structure factor? Give its correlation with the scatter factor. [3M]
7. How are the dielectric relaxations used in characterizing compounds? [3M]
8. What is the bimodality of δ -relaxation? [2M]

BITS PILANI,INTERNATIONAL ACADEMIC CITY ,DUBAI
III YEAR BIOTECH FIRST SEMESTER,2009-2010

TEST- 1 (Closed book)

Course Title :Biophysical Chemistry

Course No:BIOT C339

Date:1.11.09

Total Marks:25

Time: 50 min

Weightage:25%

Answer all questions sequentially

1. Write the number of hydrogen bond donors and acceptors in HF and water molecule. [2M]
2. The solvation of an amino acid in water and octanol do not make drastic differences in energetics. Why? [2M]
3. Explain the α -helix structure (secondary structure) of the proteins. [4M]
4. Schematically represent all the major interactions involved in the tertiary structure formation of proteins. [4M]
5. Calculate the number of modes of vibration for a protein molecule of 3000 atoms. [2M]
6. Give the significance of cyclic group symmetry in protein structures .Give an example of protein for C_2 and C_3 point group symmetry. [3M]
7. Define the following: [3M]
(a) phosphodiester bond (b) attractive force (c) micelles
8. List the important interactions present in the nucleic acids. [2M]
9. Give the equation for the free energy associated with transfer of protein from aqueous solution to lipid membranes. [1M]
10. Describe the various phases in a monolayer pressure-area isotherm. [2M]

BITS, PILANI – DUBAI
FIRST SEMESTER 2009 – 2010

Course Code: BIOT C339 THIRD YEAR Quiz-2
Course Title: Biophysical Chemistry
Duration: 20 minutes

Date: 9.12.2009
Max Marks: 14
Weightage: 7%

Name: ID No: Sec / Prog: ...
.....

Instructions: (if any) Over writing will be taken as wrong answer
Useful Data : $1 \text{ D} = 3.335 \times 10^{-30} \text{ C.m}$, $c = 3 \times 10^8 \text{ m/sec}$

1. Mention the origin of all intermolecular interactions? (1M)
2. Calculate the dipole moment of HF molecule. Express your answer in Coulomb metres (2M)
 $\chi(\text{H}) = 2.1$, $\chi(\text{F}) = 4.0$
3. Give the importance of dipolar interactions in biological molecules. (1M)
4. Write the expression for the free energy of coulombic interaction between two charges (2M)
 Q_1 and Q_2 separated by a distance r .

5. For ${}^1\text{H}{}^{35}\text{Cl}$ molecule the force constant is 516 Nm^{-1} . Calculate the vibrational frequency (in cm^{-1}) of the molecule. Reduced mass of ${}^1\text{H}{}^{35}\text{Cl} = 1.626 \times 10^{-27} \text{ Kg}$. **(3M)**

6. Write the expression for the frequency of oscillation in the case of a harmonic oscillator. **(1M)**

7. Define Donnan equilibrium. **(1M)**

8. What are aquaporins?

(1M)

9. What is Rayleigh scatter?

(1M)

10. Give two examples of inelastic light scatterings.

(1M)



BITS, PILANI – DUBAI
FIRST SEMESTER 2009 – 2010

Course Code: BIOT C339
Course Title: Biophysical Chemistry
Duration : 20 minutes

THIRD YEAR

Date: 14.10.2009
Max Marks: 16
Weightage: 8%

Name: ID No: Sec / Prog:

Instructions: (if any) Over writing will be taken as wrong answer

1. Hemoglobin which carries oxygen to the cell is an example of which type of proteins? **(1M)**

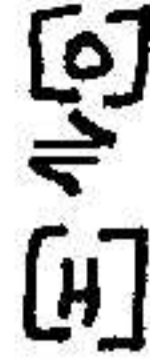
2. Among Valine and alanine which is more non polar? Why? **(2M)**

3. Write any two features of strong hydrogen bonds. **(2M)**

4. If a solution has a pH of 6.75 at 25° C calculate its $[OH^-]$. **(2M)**

5. Binding force constants of hydrogen bonds are _____ times smaller than the covalent bonds. **(1M)**

6. Complete the following: 2 cystein residues



?

(2M)

7. Write the appropriate H-bond acceptors for the donors given below:

(2M)

S-H

O-H

8. The discriminant function of external and internal proteins is given by

(2M)

Z =

9. Write the structure for the dipeptide : Phe + Ser → ?

(2M)
