

2/H-64 (ii) (Syllabus-2015)

2 0 1 6

(April)

BIOCHEMISTRY

**(Thermodynamics, Membrane Biophysics
and Biostatistics)**

Marks : 56

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

**Answer four questions, selecting two from Part—A
and two from Part—B**

PART—A

(Thermodynamics and Membrane Biophysics)

1. (a) How do the natural spontaneous processes follow the second law of thermodynamics? Explain with example. 8
- (b) Define the terms, Gibbs' free energy, enthalpy and entropy. How are these thermodynamic quantities related to each other? 2+2+2=6
2. (a) Show that $\Delta G'^{\circ} = -RT \ln K'_{eq}$.
Illustrate the significance of the above equation. 4

(2)

- (b) Explain how a thermodynamically unfavourable reaction can drive to a favourable reaction. Explain with example. 6
- (c) Why is ATP called a high-energy molecule? 4
3. (a) Write a generalized equation for a redox reaction. 3
- (b) Define reductant, oxidant and standard reduction potential. 2+2+3=7
- (c) Calculate the standard free-energy change of the following reaction catalyzed by the enzyme phosphoglucumutase :
Glucose-1-phosphate \rightleftharpoons Glucose-6-phosphate
- Given that, starting with 20 mM glucose-1-phosphate and no glucose-6-phosphate, the final equilibrium mixture at 25 °C and pH 7.0 contains 1.0 mM glucose-1-phosphate and 19 mM glucose-6-phosphate. 4
4. (a) The standard reduction potential, E'° , of any redox pair is defined for the following half-cell reaction :
Oxidizing agent + n electron \rightarrow Reducing agent

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(Continued)

(3)

The E'° values for NAD^+/NADH and pyruvate/lactate conjugate redox pairs are -0.32 V and -0.19 V respectively.

- (i) Which redox pair has the greater tendency to lose electron? Explain.
- (ii) Which pair is the stronger oxidizing agent? Explain. 3+3=6
- (b) Write notes on any *two* of the following : 4×2=8
- (i) Fluid mosaic model
- (ii) Uniport, symport and antiport
- (iii) Active and passive transports

PART—B

(Biostatistics)

5. (a) Distinguish between primary data and secondary data. Discuss the various methods of collecting the primary data. Indicate the situations in which each of these methods should be used. 2+5=7
- (b) Distinguish between classification and tabulation. Explain the purpose and methods of classification of data giving suitable examples. 2+5=7

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(Turn Over)

(4)

6. (a) What is meant by measures of central tendency? Define mean, median and mode. $2+3=5$

(b) What do you understand by dispersion? 3

(c) Find the mean and standard deviation of the following frequency distribution : 6

Class interval (Marks)	Frequency No. of Students
0-10	2
10-20	4
20-30	15
30-40	18
40-50	22
50-60	18
60-70	15
70-80	4
80-90	2
90-100	0

7. (a) What is simple random sampling? Write its merits and demerits. 6

(b) Write short notes on the following : $4 \times 2 = 8$

(i) Stratified random sampling

(ii) Systematic sampling

(5)

8. (a) Define Karl Pearson's coefficient of correlation. Write the regression equation of Y on X. Write the assumptions, properties and limits of the correlation coefficient. $2+5=7$

(b) Define binomial, Poisson and normal distributions (their probability mass functions, density function and applications). Write the properties of normal distribution. $6+1=7$
