2/H–64 (ii) (Syllabus–2015)

2017

(April)

BIOCHEMISTRY

(Honours)

SECOND PAPER

(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

Write the answers in separate books for each Part

PART—A

(Thermodynamics and Membrane Biophysics)

1. *(a)* Derive the Gibbs-Helmholtz equation for free energy and discuss its relevance to biological systems. 7

(b) Does the second law of thermodynamics apply to living systems? Explain your answer. 7

2. (a) What are redox reactions? In the context of redox reactions, explain the concept of conjugate redox couple. Give an example of a redox reaction occurring in biological systems, clearly showing the various components of the reaction. 3+2+2=7

(b) What are high-energy molecules? Using phosphoric acid anhydrides, explain why such compounds are considered 'high-energy'. 3+4=7

3. (a) What are coupled reactions? Using a suitable example, explain why cells need coupled reactions. 2+3=5

(b) What are standard electrode potentials? How is standard electrode potential determined? 2+3=5

(Continued)

(c) Given below is a list of pairs of redox couples and their standard reduction potential ($E°$). In each case, identify which redox couple will behave as the reducing agent and which will behave as the oxidizing agent. Justify your answer : 2×2=4

(i) $NAD^+/NADH$ (–320 mV) and Fumarate/Succinate (+30 mV)

(ii) Fumarate/Succinate (+30 mV) and $\frac{1}{2} O_2/H_2O$ (+820 mV)

4. (a) Describe the various mechanisms available to the cell for the transport of solutes across membranes. 8

(b) Write brief accounts of any *two* of the following : 3×2=6

(i) Active transport

(ii) Heat of formation

(iii) Measurement of ΔG

(Turn Over)

PART—B

(Biostatistics)

5. *(a)* What do you mean by data? Explain the method of collection of biostatistical data. 2+5=7

(b) Write short notes on the following : 3½+3½=7

(i) Primary and secondary data

(ii) Classification and tabulation of data

6. What is meant by measures of central tendency? What are the characteristics of a good measure of central tendency? Write a note on different measures of central tendency and their merits and demerits. 14

7. *(a)* Write short notes on the following : 8

(i) Use of Measures of Dispersion

(ii) Mean Deviation

(iii) Quartile Deviation

(iv) Standard Deviation

(Continued)

(b) The following is the distribution of S. chloride (m mol/l) of a group of persons :

Class Interval of S. chloride	*No. of Persons (f)*
98–100	12
100–102	20
102–104	11
104–106	5
106–108	2

Calculate mean amount (Arithmetic Mean) of S. chloride per person. Also calculate its variance and coefficient of variation. 6

8. *(a)* What is normal distribution? What are the properties of normal distribution? 6

(b) Write short notes on the following : 8

(i) *t*-test for single mean

(ii) *t*-test for difference of means

(iii) χ^2-test for goodness of fit

(iv) *F*-test

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