

**E 287**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2003.

Third Semester

Industrial Biotechnology

IB 231 — BIOCHEMISTRY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Indicate whether each of the following pairs of sugars consists of anomers, epimers, or aldose — ketose pair.
  - (a) D-glyceraldehyde and D-dihydroxy acetone
  - (b) D-glucose and D-mannose
  - (c)  $\alpha$ -D-glucose and  $\beta$ -D-glucose
  - (d) D-galactose and D-glucose.
2. Write the structure of phosphatidyl choline and indicate hydrophobic and hydrophilic components.
3. Give an example and structure of the following amino acids :
  - (a) aromatic
  - (b) acidic.
4. Write a note on allosteric regulation of enzymes.
5. What are glycogenic and ketogenic amino acids? Give an example for each.
6. Write a note on the physiological significance of gluconeogenesis. List the primary precursors of gluconeogenesis.
7. The composition (in mole fraction) of one of the strands of a double helical DNA is  $[G] = 0.35$  and  $[A] = 0.15$ .  
What can you say about the  $[C]$  and  $[T]$  for the same strand? What can you say about  $[A]$ ,  $[C]$ ,  $[G]$  and  $[T]$  of the complementary strand?

8. Describe the additivity of  $\Delta G$  values for coupled reactions and the ability of thermodynamically favorable reaction to drive an unfavorable one.
9. Write about substrate level phosphorylation with an example.
10. Describe the tertiary structure of proteins and its significance.

PART B — (5 × 16 = 80 marks)

11. Describe the following :

- (i) Components of electron transport chain and its arrangement
- (ii) Inhibitors and uncouplers of electron transport chain
- (iii) Chemiosmotic hypothesis of oxidative phosphorylation
- (iv) Analysis of electron transport pathway in a pathogenic bacterium reveals the presence of five electron transport molecule with the redox potential listed below :

Oxidant	Reductant	$E_o$ (v)
NAD <sup>+</sup>	NADH	-0.32
Flavoprotein <i>b</i> (oxidized)	Flavoprotein <i>b</i> (reduced)	-0.36
Cytochrome <i>c</i> (+3)	Cytochrome <i>c</i> (+2)	+0.22
Ferroprotein (oxidized)	Ferroprotein (reduced)	+0.85
Flavoprotein <i>a</i> (oxidized)	Flavoprotein <i>a</i> (reduced)	+0.77

- (1) Predict the sequence of carriers in this electron transport chain.
- (2) Why it is unlikely that oxygen is terminal electron acceptor in this case?
12. (a) (i) Describe the Krebs's cycle and its importance.
- (ii) Calculate net ATP production for conversion of glucose to  $\text{CO}_2 + \text{H}_2\text{O}$ .

Or

- (b) (i) Schematically show hexose monophosphate shunt with structures.
- (ii) Explain the significance of pentose pathway.

13. (a) Compare and contrast between each of the following pair with suitable examples :
- (i) Glycerolipid and sphincolipid
  - (ii)  $\alpha$  helical and  $\beta$  pleated structure of proteins.
  - (iii) Low energy phosphate compounds and high energy phosphate compounds.

Or

- (b) (i) Give the structure of AT and GC pairs with hydrogen bonding.  
(ii) Explain the salient features of DNA double helix.

14. (a) Describe the following :

- (i) Amino acid deamination
- (ii) Urea cycle
- (iii) Grouping of amino acid biosynthetic families based on metabolic precursors.

Or

- (b) Describe the following :

- (i) De novo synthesis of pyrimidine nucleotide
- (ii) Purine nucleotide degradation to uric acid.

15. (a) Outline the biosynthesis of cholesterol.

Or

- (b) (i) Explain fatty acid oxidation.  
(ii) What are the additional steps and enzymes involved oxidation of unsaturated fatty acids?