

This question paper contains 5 printed pages.]

Your Roll No.

1374

A

B.Sc. (Hons.)/II

BIOCHEMISTRY — Paper X

(Metabolism of Amino Acids, Nucleotides and Porphyrins)

(Admissions of 2000 and onwards)

Time : 3 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately:

on receipt of this question paper.)

Attempt five questions in all,

including Question No. 1 which is compulsory.

1. (a) Explain the following :

- (i) The role of α glutamyl cycle in the uptake of amino acids.
- (ii) 5-methyl tetrahydrofolate transfers a methyl group in methionine synthesis, but all other biological methyl transfers involve 5-adenosyl methionine.
- (iii) Liver damage causes jaundice.
- (iv) The synthesis of urea is irreversible with large negative ΔG .

[P.T.O.]

(v) Sulfonamide drugs do not interfere with human purine synthesis.

(vi) Cysteine is an essential amino acid in individuals consuming a diet devoid of methionine. $2 \times 6 = 12$

(b) Give the scientific contribution of the following scientists :-

(i) Jo Anne Stubbe

(ii) John Buchanan

(iii) A. Garrod

(iv) Thomas Sydenham $1 \times 4 = 4$

2. (a) The enzyme nitrogenase is inactivated by exposure to oxygen. What are the different strategies involved for protecting the enzyme from oxygen in the following :

(i) Cyanobacteria

(ii) Free living obligatory aerobes

(iii) Legume root nodules $2 \times 3 = 6$

(b) In bacteria, pyrimidine biosynthesis is regulated at Apease step, while in humans, regulation is at the carbomoyl phosphate synthetase II step. 5

3. (a) (i) Glutamate dehydrogenase catalyzes a reversible reaction. Show how different allosteric regulators determine the direction of the reaction.

- (ii) The mitochondrial form of carbamoyl phosphate synthetase is allosterically regulated by N-acetyl glutamate. What is the rationale for this effect. $3 \times 2 = 6$
- (b) Give a brief account of regulation of the activity of bacterial glutamine synthetase. 5
4. (a) Give the biochemical basis and symptoms of the following :
- (i) Congenital erythropoietic porphyria.
- (ii) Lesch - Nyhan Syndrome
- (iii) Phenyl ketonuria
- (iv) Orotic Aciduria $2 \times 4 = 8$
- (b) PLP is a versatile coenzyme. Support your answer with suitable example. 3
5. (a) Explain: $2 \times 4 = 8$
- (i) Mature RBCs are unable to synthesize heme.
- (ii) Hydroxyurea which destroys tyrosyl radicals, is useful as an antitumor agent.
- (iii) Individuals who are undergoing chemotherapy with FdUMP or methotrexate temporarily go bald.
- (iv) Nitrogen fixation is energetically consuming process.
- (b) What are the different pathways for breakdown and synthesis of glycine? 3

6. (a) (i) Why does Von Gierke's glycogen storage disease cause symptoms of Gout ?
- (ii) By what pathway(s) does the ribose released from nucleotide degradation enter intermediary metabolism and become converted to cellular energy ? $2\frac{1}{2} \times 2 = 5$
- (b) Write down the steps involved in the conversion of any two :
- (i) Tyrosine to epinephrin
- (ii) Succinyl CoA to Protoporphyrin
- (iii) Tryptophan to NAD 6
7. (a) (i) Since dUTP is not a normal component of DNA, why do you suppose ribonucleotide reductase has the capacity to convert UDP to dUTP ?
- (ii) Discuss the major biosynthetic reactions that utilize PRPP.
- (iii) What histidine metabolite would you expect to accumulate in a folate or B₁₂ deficient patient and why ? $2 \times 3 = 6$
- (b) What is the lateral pathway for purine biosynthesis and why it is named so ? 5
8. (a) How are the following secondary metabolites synthesized :
- (i) Creatinine.
- (ii) Spermine $1\frac{1}{2} \times 2 = 3$

- (b) ATP is synthesized primarily by energy metabolism, whereas other nucleoside triphosphates are formed by the action of nucleoside diphosphate kinase. What additional pathways exist for GTP synthesis. 3
- (c) Draw a purine ring showing the source of different 'C' & 'N' atoms. 3
- (d) Write down the degradation pathway of proline. 2