This question paper contains 3 printed pages

Your Roll No

7648

M. Tech. / II Sem.

CHEMICAL SYNTHESIS AND PROCESS TECHNOLOGIES

Paper – 204 – Chemistry of Life Process and Naturally Occurring Bioactive Compounds

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Time 3 hours

Maximum Marks 70

(Write your Roll No on the top immediately on receipt of this question paper)
Use separate answer script for Section A & B

SECTION A
(Attempt all questions)

Q 1 (a) What was the contribution of Rosalind Franklin in DNA research (1)

(b) What forces are responsible for the stability of DNA double helical structure and physiological conditions? (2)

(c) Write main reactions and key intermediates of urea biosynthesis Write the role of carbamoyl phosphate synthase I in urea cycle ? (3)

(d) Write a short overview on β-oxidation of fatty acids (2)

(e) Acetyl CoA plays a central role in metabolism Justify the statement (2)

(f) Justify that oxygen evolved in photosynthesis comes form water and not from carbon dioxide (1)

Q 2 (a) Which component of DNA absorbs UV-radiation? What are the possible structures formed by the DNA sequence 5'-AGATCTTTTAGATCT-3' ? Draw a typical thermal denaturation profile of DNA double helix (3)

(b) DNA is polymorphic Justify the statement (2)

(c) What are the crucial steps regulating the ketogenesis ? (1)

(d) What is the role of plastoquinone and cytochrome bf in photosynthesis ? (2)

Q 3 (a) Write short notes on any three of the following (2+2+2)

(i) G-C base-pair

(ii) Structure and function of t-RNA

(iii) Glutathione peroxidase protects erythrocytes against hemolysis

(iv) Structure and function of TPP and Biotin

(v) Calvin cycle

(b) Give salient features of α-helix of proteins (2)

Q (4) (a) Write key steps in the biosynthesis of long-chain fatty acid (2)

(b) What is the difference between transamination and oxidative deamination? How is amino acid catabolism initiated by transamination? Give examples (2)

(c) What do you understand by 1° 2° and 3° structures of protein? (1)

(d) Explain the role of transaldolase and transketolase in pentose phosphate pathways (2)

(e) The conversion of pyruvate into phosphoenolpyruvate begins with the formation of oxaloacetate Comment (1)

SECTION B
(Attempt any three questions)

1(a) Give the synthesis of vitamin A_1, using β-ionone and ethyl γ-bromocrotonate as starting materials.

(b) (i) Write down the structure of (±) β-tocopherol. How many chiral centres are there in it and what is its configuration ?

(ii) Vitamin E , a phenol , is the major compound in the blood responsible for preventing oxidative damage by free radicals. Explain.

(c) Ergosterol $\xrightarrow{h\nu}$ A $\xrightarrow{[1,7]\text{H shift}}$ B

Write down the structures of A & B.

(d) What are reductones ?Explain with the help of an example.

(3,4,3,2)

2.(a) Using bases (B:) and acids ($^+$BH) , provide a pyridoxal phosphate-catalysed mechanism for decarboxylation of an α− amino acid. How this transformation is utilized ?

(b) Thiamine is decomposed quantitatively into two compounds, when treated with a sodium sulphite solution saturated with sulphur dioxide :

$$C_{12}H_{18}Cl_2N_4OS + Na_2SO_3 \longrightarrow \underset{(A)}{C_6H_9NOS} + \underset{(B)}{C_6H_9N_3O_3S} + 2NaCl$$

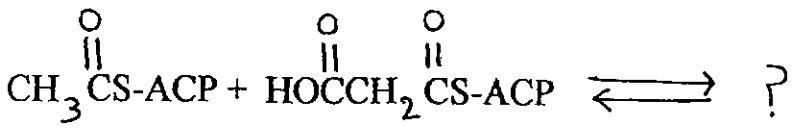
Establish the structures of A and B

(c) (i) Write down the important features regarding the structure of bimolecule vitamin B_{12}

(ii) Give the name and structure of the two biological active geometrical isomers of vitamin A_1

(d) What is the importance of natural products in drug discovery ? Explain with suitable examples. (3,3,3,2)

3(a) (i) Complete the following reaction ·



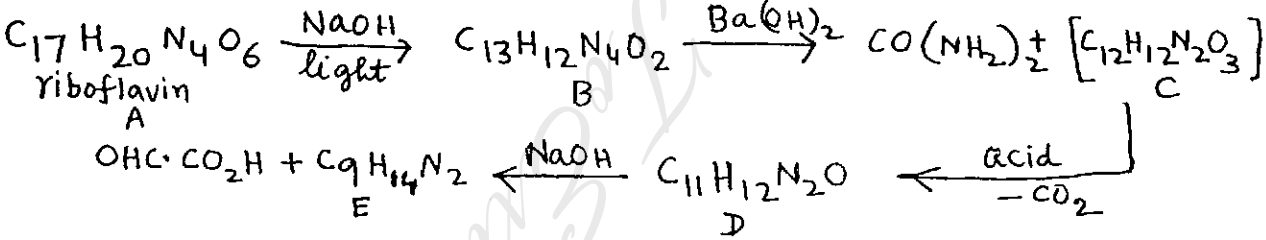
(ii) Write the overall equation for the biosynthesis of palmitic acid.

(b) Propose a mechanistic pathway for the biosynthesis of:
(i) ∝ -terpineol (ii) squalene

(c) Write down the names and structures of principal starting materials for secondary metabolism and the nature of products obtained from them.

(d) Write down the biosynthesis of:
(i) Hygrine (ii) Cuscohygrine. (3,3,2,3)

4.(a) Given below are the reactions of riboflavin:



Write down the structures of A,B,C,D &E.

(b) (i) With ATP, glucose undergoes an energetically favourable reaction to yield glucose-6-phosphate plus ADP. Explain.
(ii) Give two reactions that have been postulated for the biosynthestic conversion of amino acids into alkaloids.

(c) The vitamin thiamine is used as a coenzyme for the metabolic decarboxylation of pyruvate to acetyl-coenzyme-A. Give the mechanism of the reaction.

(d) Write a note on any ***two*** of the following:
(i) Down-stream processes in case of isolation of bioactive molecules.
(ii)Herbal preparations
(iii) Classification of water & fat soluble vitamins
(3,3,3,3)