

This question paper contains 3 printed pages]

90

May 2025 R

Roll No.

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S. No. of Question Paper : 5522

Unique Paper Code : 2492012401

Name of the Paper : Metabolism of Amino Acids and Nucleotides

Name of the Course : B.Sc. (Hons.) Biochemistry (NEP)

Semester : IV

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

There are six questions.

Attempt any four questions.

All questions carry equal marks.

Question No. 1 is compulsory.

1. (A) Justify the following statements :

- (a) Alanine and glutamine are present in much higher concentrations than any other amino acids.
- (b) Nitrogen fixation is energetically expensive.
- (c) S-adenosyl methionine (SAM) has a higher methyl group transfer potential than N⁵-methyl tetrahydrofolate.

P.T.O.

(d) Branched chain amino acid metabolism is affected by Vitamin B12 deficiency.

(e) dATP is toxic to mammalian cells.

(f) Von Gierke's disease results in hyperuricemia.

(B) Give one significant contribution of the following scientists :

(i) P. Reicherd

(ii) A. Folling

(iii) John Buchanan. (12,3)

2. (A) Write down the role of pyridoxal phosphate in amino acid metabolism.

(B) Differentiate between the following :

(i) Transamination and oxidative deamination

(ii) Positive and negative nitrogen balance

(iii) Carbamyl phosphate synthetase I and II. (6,9)

3. (A) Explain the defective enzyme, biochemical basis and any *two* symptoms of the following metabolic disorders :

(a) Maple syrup urine disease

(b) Alkaptonuria

(c) Lesch Nyhan syndrome

(d) Gout.

(B) Elaborate on the mechanism of nitrogen fixation. (3×4,3)

4. (A) Discuss *four* major biosynthetic reactions which utilize PRPP.
- (B) Write the steps to accomplish the following conversion :
- (i) Methionine to cysteine
 - (ii) Tyrosine to norepinephrine
 - (iii) Glutamate to proline
 - (iv) dUMP to dTTP.
- (C) Explain Purine nucleotide cycle and its significance. (4,8,3)
5. (A) Give the reaction catalyzed by enzyme glutamine synthetase. Explain the regulation of glutamine synthetase by covalent modification.
- (B) List the mode of action of the following inhibitors :
- (a) Allopurinol
 - (b) 5-fluorouracil
 - (c) 6-mercaptopurine
 - (d) Trimethoprim. (7,8)
6. Write short notes on the following :
- (a) Liver as a 'metabolic hub' of our body
 - (b) Inherited defects of urea cycle
 - (c) Salvage pathway of nucleotide biosynthesis. (4,5,6)

This question paper contains 4 printed pages|

29/5/25

Roll No.

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S. No. of Question Paper : **5582**

Unique Paper Code : **2492012402**

Name of the Paper : **Hormones : Biochemistry and Function**

Name of the Course : **B.Sc. (Hons.) Biochemistry**

Semester : **IV**

Duration : **2 Hours**

Maximum Marks : **60**

(Write your Roll No. on the top immediately on receipt of this question paper.)

There are **6** questions.

Attempt any *four* questions.

All questions carry equal marks.

Question No. **1** is compulsory.

1. (A) Mention the location and function of the following cells :

(a) Leydig cells

(b) Zona reticularis cells

(c) Alpha cells of Islet of Langerhans

(d) Trophoblastic cells

(e) PVN.

P.T.O.

- (B) Comment on the following :
- (a) Urine of patients with diabetes insipidus contains no sugar.
 - (b) Women have relatively higher chances of fractures after menopause.
 - (c) Stress can lead to hyperglycemia
 - (d) Vitamin D is actually a hormone
 - (e) Hyperpigmentation is seen during pregnancy. (5,10)
2. (A) Differentiate between :
- (a) Diabetes mellitus Type I and Diabetes mellitus Type II
 - (b) Hyperthyroidism and Hypothyroidism
 - (c) Adrenal cortex and Adrenal medulla.
- (B) Explain the physiologic basis for administering a posterior pituitary extract to induce or facilitate labour. (12,3)
3. (A) Discuss the regulation of PTH in maintaining calcium homeostasis.
- (B) What is Parturition ? Explain the *four* stages of parturition. Explain why Progesterone causes low uterine contraction ? How does increasing Estrogen levels initiate parturition ? Explain the feed forward mechanism that increases strength of uterine contractions.
- (C) Draw and explain the action of the Hypothalamic-pituitary axis.
- (D) Elaborate upon the type of sexual dysfunction that might arise in men taking drugs that inhibit sympathetic nervous system activity as part of the treatment for high blood pressure ? Explain the biochemical mechanism. (4,4,4,3)

4. (A) List the cause and characteristic symptoms of the following diseases :

(a) Cushing's syndrome

(b) Acromegaly

(c) Conn's syndrome

(d) Cretinism

(e) Dwarfism

(f) Graves's disease.

(B) Tapping the facial nerve at the angle of the jaw in a patient with moderate hyposecretion of a particular hormone elicits a characteristic grimace on that side of the face. What endocrine abnormality could give rise to this so-called Chovstek's sign ? (12,3)

5. Write short notes on :

(a) Hormone based contraceptives

(b) Fight or Flight response

(c) RAAS

(d) Lactation

(e) Regulation of insulin secretion.

(3×5=15)

P.T.O.

(B) Comment on the following :

- (a) Urine of patients with diabetes insipidus contains no sugar.
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- (c) Stress can lead to hyperglycemia
- (d) Vitamin D is actually a hormone
- (e) Hyperpigmentation is seen during pregnancy. (5,10)

2. (A) Differentiate between :

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- (b) Hyperthyroidism and Hypothyroidism
- (c) Adrenal cortex and Adrenal medulla.

(B) Explain the physiologic basis for administering a posterior pituitary extract to induce or facilitate labour. (12,3)

3. (A) Discuss the regulation of PTH in maintaining calcium homeostasis.

(B) What is Parturition ? Explain the *four* stages of parturition. Explain why Progesterone causes low uterine contraction ? How does increasing Estrogen levels initiate parturition ? Explain the feed forward mechanism that increases strength of uterine contractions.

(C) Draw and explain the action of the Hypothalamic-pituitary axis.

(D) Elaborate upon the type of sexual dysfunction that might arise in men taking drugs that inhibit sympathetic nervous system activity as part of the treatment for high blood pressure ? Explain the biochemical mechanism. (4,4,4,3)

6. (A) Diagrammatically discuss the biosynthesis of thyroid hormone.
- (B) Show the hormonal changes occurring in ovarian and uterine phase during menstruation in a graphical format.
- (C) What actions of growth hormone would induce a full-grown athlete to take supplemental doses of this hormone ? What are the potential detrimental side effects ? (5,6,4)

This question paper contains 4 printed pages]

03/6/25

Roll No.

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S. No. of Question Paper : 5661

Unique Paper Code : 2492012403

Name of the Paper : Gene Organization, Replication and Repair

Name of the Course : B.Sc. (Hons.) Biochemistry (NEP)

Semester : IV

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

There are six questions in this question paper.

Attempt four questions in all.

All questions carry equal marks.

Question No. 1 is compulsory.

1. (a) Comment on the following :

- (i) Prokaryotes have a special type-II topoisomerase that introduces, rather than removes, negative supercoils.
- (ii) Methylated cytosines are hotspots for mutations.
- (iii) There is an inverse relationship between organism complexity and gene density.
- (iv) RNase H plays a critical role in DNA replication.
- (v) DNA polymerase I is not suitable for replication of *E. coli* genome.

P.T.O.

(b) Name the following :

- (i) Decondensed/relaxed form of genome
- (ii) Enzyme that replicates the ends of eukaryotic chromosomes.
- (iii) Two ends of the broken DNA are joined to each other by misalignment between single strands protruding from the broken ends.
- (iv) Sequences that are hotspots for recombination in *E. coli*.
- (v) Replication inhibitor used as an antiviral agent. 10,5

2. (a) (i) What do you understand by superhelical density ? Discuss with respect to positive and negative supercoiling of DNA.

- (ii) Discuss the Trombone model for coordinating replication.
- (iii) Elucidate a biological role of site-specific recombination.

(b) Discuss the role of the following proteins in DNA replication (any two) :

- (i) Topoisomerase
- (ii) Helicase
- (iii) Primase

(c) Elaborate on the mode of action of these drugs :

- (a) Cisplatin
- (b) Cytosine Arabinoside
- (c) 5-FU
- (d) Azidothymidine. 9,2,4

3. (a) What is the replicon model of Replication Initiation ? Discuss the key features of initiator sequences of Prokaryotes.
- (b) Predict whether the loss of the following *E. coli* genes would lead to lethality. Justify your answer :
- (i) dnaB
 - (ii) recBCB
 - (iii) ruvC.
- (c) A relaxed circular double stranded DNA molecule of 1600 bp is in solution where it has 10 bp per turn. Calculate the linking number (L_0) of this DNA. A DNA topoisomerase introduces 12 negative supercoils in this DNA. What are the values of L, W and T ?
- (d) What are split genes ? What are the advantages of split genes in the eukaryotic genome ? 4,4,3,4
4. (a) Explain the following :
- (i) Direct reversal of DNA damage
 - (ii) The proper structure of the double helix depends on an aqueous environment, but DNA undergoes spontaneous damage from the hydrolytic action of water.
- (b) It is likely that the linear genomes might get shorter after every round of replication. How is this problem overcome in eukaryotes ?
- (c) What are transposable elements ? Comment on different classes of transposable elements. 6,5,4

5. (a) Differentiate between the following :
- (i) Type-I and Type-II topoisomerases
 - (ii) B-DNA and Z-DNA.
- (b) Elaborate the key steps in homologous recombination, elaborating the functions of different participating proteins in a prokaryote.
- (c) Explain how the mismatch repair system operates in prokaryotes.

6,5,4

6. (a) Write short notes on the following :
- (i) Chi sites
 - (ii) SOS response
 - (iii) Ames Test
- (b) What is a replication fork ? Draw a well labelled diagram of the same, highlighting the function of the major proteins.

9,6

This question paper contains 4 printed pages|

04/6/25

Roll No.

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S. No. of Question Paper : 5685

Unique Paper Code : 2493012005

Name of the Paper : Nutritional Biochemistry

Name of the Course : B.Sc. (Hons.) Biochemistry (NEP)

Semester : IV

Duration : 2 Hours

Maximum Marks : 60

(Write your Roll No. on the top immediately on receipt of this question paper.)

There are six questions.

Attempt any four questions.

All questions carry equal marks.

Question No. 1 is compulsory.

1. (A) Explain the following terms (any five) :

(i) Amino acid imbalance

(ii) RDA

(iii) UL of nutrients

(iv) Calorific value of food

(v) Lipotropic factors

(vi) Artificial sweeteners.

P.T.O.

(B) Give reasons for the following (any *five*) :

- (i) Alcohol isn't a nutrient
- (ii) Vitamin B12 deficiency leads to folic acid deficiency
- (iii) Vitamin E has anti-atherosclerotic properties.
- (iv) It is always advised to take rice along with pulses.
- (v) During convalescence from illness the body has positive nitrogen balance.
- (vi) Respiratory quotient falls in diabetes mellitus.

5,10

2. (A) What is the role of dietary fiber in the following :

- (i) Colon function
- (ii) Gastric emptying
- (iii) Gut microbiota.

(B) Mention *four* important indices that can be used to assess the quality of protein. Which one is better and why ?

(C) Why is consumption of hydrogenated and reheated oils considered harmful ? What are the recommended proportions of different fatty acids in the diet ?

6,5,4

3. Differentiate the following (any *five*) :

- (A) Lactose intolerance and gluten intolerance
- (B) Positive nitrogen balance and negative nitrogen balance
- (C) Wet Beri-beri and Dry Beri-beri
- (D) Macrocytic anemia and Megaloblastic anemia
- (E) Essential fatty acid and Non-essential fatty acid
- (F) Prebiotics and Probiotics.

3×5=15

4. (A) Discuss the factors affecting the bio-availability and absorption of calcium in the gastrointestinal tract. What would be the effects of having excess calcium in the diet ?
- (B) A chocolate has a glycemic index of 62 and the carbohydrate content is 40 gm whereas watermelon has a glycemic index of 80 and contains about 7 gm carbohydrate. Calculate and compare the glycemic load of the two food items. Also discuss the utility of GI and GL in dietary management of diabetics.
- (C) Discuss the consequences of the following :
- (i) Low protein diet
 - (ii) High protein diet
 - (iii) Vegan diet.

6,3,6

P.T.O.

5. (A) Define BMR. Discuss the various factors affecting the BMR.
- (B) Discuss the deficiency and clinical signs in the following cases :
- (i) Marasmus
 - (ii) Pellagra
 - (iii) Wilson's diseases
 - (iv) Rickets
 - (v) Keshan disease. 5,10
6. (A) Mention the significance of the following reactions inside the body :
- (i) Gamma-carboxylation by Vitamin K
 - (ii) Post-translation modification of proteins by vitamin C
 - (iii) One-carbon metabolism by folic acid.
- (B) Discuss the Muscosal Block theory for regulation of iron absorption.
- (C) What do you mean by thermogenic effect of food (TEF) ? How does the meal composition influence the TEF ? 6,6,3