[This question paper contains 6 printed pages.]

(21) Your Roll No. 2023

Sr. No. of Question Paper : 4519

Unique Paper Code : 32491401

Name of the Paper : Human Physiology

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

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question No. 1 is compulsory.

1. (a) Define the following :

(i) EPSP

P.T.O.

(ii) Vital Capacity

(iii) Receptor desensitization

(iv) Cortical reaction

(v) Regurgitation

(b) Comment on the following statements :

(i) The chloride content of the venous red blood cells is greater than that of arterial cells.

(ii) Cardiac muscles are resistant to tetany.

(iii) The ovum has a longer lifespan as compared to the sperm.

(iv) Juxtaglomerular cells act as intra-renal baroreceptors.

(v) Gastric mucosa is resistant to autodigestion.

(5,10)

2. Differentiate between :

(a) Temporal and Spatial Summation

(b) Conducting Zone and Respiratory Zone

(c) Intrinsic and Extrinsic regulation of Cardiac output

(d) Gastric and Intestinal phase of gastrointestinal regulation

(e) Parturition and Placentation (3×5)

3. Answer in brief :

(a) What is Lung compliance? Describe various factors which determine lung compliance.

(b) What is Micturition? Describe its neural control mechanism

(c) What is sperm capacitation? Explain its importance in fertilization?

(d) What is fibrinolysis? How is this process regulated? (5,4,3,3)

4. Explain with the help of diagram/flow chart :

(a) Different layers of GI tract

(b) The counter-current multiplier system

(c) Excitation Contraction coupling in cardiac muscles.

(d) EEG pattern of a person from awake state to different stages of sleep. (4,4,3,4)

5. Give the physiological basis and symptoms of following :

(a) Myocardial Infarction

(b) Asthma

(c) Jaundice

(d) Hemophilia

(e) Nutritional Anemia

(f) Peptic ulcer (2.5×6)

6. (a) Explain the following :

(i) Movement of Diaphragm during respiration

(ii) Importance of gastric motility during digestion

(iii) The 2 types of Dialysis.

(b) Two individuals have a systolic pressure of 130mmHg and 110 mmHg. Their corresponding Diastolic pressures are 90 mmHg and 85 mmHg. Calculate and compare their MAP. (12,3)

7. Provide reasons for the following :

(a) Blood does not clot in circulation.

(b) Acetylcholine shows different responses in cardiac versus skeletal muscles.

(c) A person cannot voluntarily hold his/her breath for more than few minutes.

(d) Measurement of inulin clearance is the gold standard for assessing GFR.

(e) Blood-Testis barrier creates an immunological barrier.

(f) Action potential is all or none phenomena.

(2.5×6)

8. Write short notes on the following :

(a) Enterohepatic circulation

(b) Regulation of blood pH

(c) Blood Brain Barrier

(d) Atherosclerosis

(e) Serum Protein Electrophoresis (5×3)

[This question paper contains 6 printed pages.]

(22) **Your Roll No.** 2023

Sr. No. of Question Paper : 4675 **E**

Unique Paper Code : 32491402

Name of the Paper : Gene Organization, Replication and Repair

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

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **8** questions.
3. Attempt any **5** questions.
4. **All** questions carry equal marks.
5. Question No. **1** is compulsory.

1. (a) Justify the following statements :

(i) Cot curve analysis reflects the complexity of the genome.

P.T.O.

(ii) DNA intercalators like ethidium bromide decrease the stability of DNA.

(iii) Bacterial transposable elements transpose by cut and paste mechanisms.

(iv) Ames's test is useful for the identification of carcinogens.

(v) DNA synthesis is coupled to the hydrolysis of pyrophosphate.

(b) Define the following terms :

(i) Retrotransposons

(ii) Microsatellite

(iii) Processivity of DNA Polymerase

(iv) Linking Number

(v) Chi sites (10,5)

2. Differentiate between the following :

(i) Topoisomerase I and Topoisomerase II

(ii) Serine recombinase and Tyrosine recombinase

(iii) Transitions and Transversions

(iv) Euchromatin and heterochromatin

(v) Centromere and Telomere (3×5)

3. (a) Discuss the structural organization of chromatin in terms of nucleosome model.

(b) Sequencing of human genome revealed that 3% of the genome codes for the genes and proteins, so what about the rest 97%?

(c) What are thymine dimers? How are they formed and why do they need to be removed?

(5,5,5)

4. (a) Replication of linear chromosome requires the action of telomerase while the circular chromosome do not require telomerase. Explain why?

(b) Defect in DNA repair system can lead to diseases. Comment on the statement.

(c) Explain in detail the process of homologous recombination in *E. coli* highlighting the role of different proteins/enzymes.

(d) Elucidate the mechanism of mismatch repair system in prokaryotes. (3,4,5,3)

5. (a) What is the biological effect of positive and negative supercoiling?

(b) Diagrammatically explain the structure of replication fork and its components.

(c) Give the mechanism of action of following chemical compounds and their use in medicine **(any four)**.

(i) Novabiocin

(ii) Cisplatin

(iii) Azidothymidine

(iv) 6 mercaptopurine

(v) Acyclovir (3,4,8)

6. (a) Give the scientific contribution of following scientist :

(i) Barbara McClintock

(ii) Meselson and Stahl

(iii) Elizabeth blackburn

(iv) Arthur Kornberg

(b) Explain what is "polymerase switching" during eukaryotic replication

(c) What is Tm? What are the factors that affect the Tm of a DNA sample? (6,4,5)

7. (a) What is the effect of following compounds on the structure of DNA?

(i) 5-bromouracil

(ii) Nitrous acid

(b) What are transposable elements? Mention the different classes of transposable elements?

(c) DNA polymerase that would synthesize the DNA in 3'-5' direction would have a selective disadvantage even if they had a 5'-3' proofreading activity. Explain why? (4,6,5)

8. Write short notes on the following :

(i) Rolling circle mode of replication

(ii) DNA glycosylases

(iii) Telomerase

(iv) Different forms of DNA (3,3,3,6)

[This question paper contains 8 printed pages.]

(23) Your Roll No. 2023

Sr. No. of Question Paper : 4799

Unique Paper Code : 32491403

Name of the Paper : Metabolism of Amino Acids and Nucleotides

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

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **eight** questions.
3. Attempt any **five** questions.
4. **All** questions carry equal marks.
5. Question No. **1** is compulsory.

1. (a) Explain the following statements **(Any Five)** :

   (i) Glutamine metabolism in the kidney tend to counteract metabolic acidosis.

P.T.O.

(ii) Damage to CNS is seen in patients with Lesch-Nyhan syndrome

(iii) Serine is synthesized from glycolytic intermediates

(iv) Children suffering from PKU have light colored skin and hair.

(v) Lysine is purely ketogenic acid.

(vi) Folate deficiency increases the levels of N- formiminoglutamate in urine.

(b) Write the metabolic reactions inhibited by the following inhibitors :

(i) Methotrexate

(ii) 6-Mercaptopurine

(iii) Hydroxyurea

(c) Write the scientific contributions of the following **(any two)** :

(i) John Buchanan

(ii) P. Reicherd

(iii) Archibald Garrod (10,3,2)

2. (a) What are the different pathways for the breakdown and synthesis of glycine? Explain the reaction catalyzed by each protein of glycine cleavage system.

(b) Explain the role of glutamate synthase in the assimilation of fixed nitrogen in plant. Write the reactions catalyzed at three active sites of glutamate synthase.

(c) Explain why :

(i) S-adenosylmethionine (SAM) has a higher methyl group transfer potential than N^5-methyl tetrahydrofolate.

(ii) Isoleucine and valine metabolism is affected by Vitamin B12 deficiency.

(7,4,4)

3. (a) Write the steps involved in the degradation of heme.

(b) Explain the gamma-glutamyl cycle with all the metabolic reactions involved and state its physiological significance.

(c) Explain the regulation of biosynthesis of deoxyribonucleotide. Explain why dATP at low concentration is an activator of ribonucleotide reductase whereas at higher concentration it inhibits its activity. (5,4,6)

4. (a) Differentiate between the following :

(i) Carbamoyl phosphate synthetase I and II

(ii) Transamination and Oxidative deamination

(iii) Positive and negative nitrogen balance.

(b) Explain the mechanism of amino acid transamination reaction with the help of one example.

(c) L-asparaginase is an effective chemotherapeutic agent. Justify. (9,4,2)

5. (a) Explain the biochemical basis and symptoms of the following metabolic disorders :

(i) Acute erythropoietic porphyria

(ii) Lesch-nyhan syndrome

(iii) Homocystinuria

(iv) Hartnup's disease

(b) Explain the urea cycle and state its physiological significance.

(c) The activity of alanine transaminase is usually measured by including an excess of purified LDH and NADH in the reaction system. The rate of alanine disappearance is equal to the rate of NADH disappearance measured by spectroscopic methods. Explain how this assay works.

(8,5,2)

6. (a) Explain the detailed structure of nitrogenase complex and discuss the mechanism of nitrogen fixation in *Rhizobium*. What is the contribution of anammox bacteria in Nitrogen cycle?

(b) Write the reactions for the synthesis of the following :

(i) FAD

(ii) Spermidine

(iii) Histamine

(c) The purine ring is assembled de novo from several simple precursors. Draw the purine ring and name the various precursors which are origin of C and N atoms. (7,6,2)

7. (a) Write down the steps to accomplish the following metabolic conversions :

(i) Tyrosine to epinephrine

(ii) Phenylalanine to homogentisate

(iii) Arginine to Glutamate

(iv) IMP to GMP

(b) Consider the regulation of *E. coli* glutamine synthetase and explain the metabolic rationale for each of the following effects :

(i) Inhibition of glutamine synthetase by carbamoyl phosphate

(ii) Activation of uridylylation of PII by ATP.

(c) Write down the common reactions and enzymes associated with the breakdown of branched chain amino acids. What is the biochemical basis of maple syrup urine disease? (8,4,3)

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

(i) Glucose- alanine cycle

(ii) Purine nucleotide cycle

(iii) Activated methyl cycle

(b) Compare and contrast *de novo* and salvage pathway of nucleotide biosynthesis.

(c) Why do patients with Alkaptonuria excrete black colored urine? (8,5,2)