[This question paper contains 4 printed pages.]

Your Roll No 2022

Sr. No. of Question Paper : 1139 A

Unique Paper Code : 32491401

Name of the Paper : Human Physiology

Name of the Course : **B.Sc. (H) 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. Attempt **five** questions in all including Q. No. **1** which is compulsory.

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

(i) Neurons cannot divide but can regenerate

(ii) Inappropriate clot formation does not occur in blood vessels of healthy individuals

(iii) Action potentials are all-or-none events

(iv) Mullerian Inhibiting Substance influences the development of gonads

P.T.O.

(v) Surfactants increase the lung compliance

(vi) Stomach wall is not digested by its secretions

(b) Explain : **(Any two)**

(i) Stroke volume

(ii) Synapse

(iii) Sperm capacitation (10,5)

2. (a) Describe the structure and functions of the placenta.

(b) Describe the sequence of events leading to the formation of sperms from spermatogonia.

(c) What are the functions of Sertoli cells? (5,5,5)

3. (a) With the help of a flow diagram show how arterial baroreceptor reflex compensates for blood loss during hemorrhage?

(b) What is the role of thrombin and tissue thromboplastin in blood clotting?

(c) Explain how an action potential is generated in SA node and why the SA node does not show a steady state resting potential? (5,5,5)

4. (a) Explain the sequence of events in the left atrium, left ventricle, and aorta during the cardiaccycle.

(b) What do the P wave, QRS complex and T wave represent in ECG? Explain.

(c) What causes the heart murmurs in diastole? In systole? (7,4,4)

5. (a) Discusscountercurrent multiplier system in control of urine volume.

(b) What do you understand by renal clearance? How is it determined?

(c) Explain how the kidneys reabsorb bicarbonate, and how the kidneys contribute to the regulation of acid-base balance. (6,4,5)

6. (a) Give the characteristic features and significance of submucosal and myenteric plexus.

(b) Explain how the secretion of HCl in stomach is controlled? Why is the stomach wall normally not digested by the acid present in the lumen?

(c) Describe the effect of secretin and CCK on the bile ducts and gall bladder. (4,6,5)

7. (a) The chemical composition of the CNS extracellular fluid is different from that of blood. Explain how this difference is achieved? What is the significance of this difference?

(b) Differentiate between excitatory and inhibitory postsynaptic potentials.

(c) Explain the role of ionic channels in initiating action potential in nerve fiber and muscle fiber. Discuss the various factors which could alter this action potential. (4,4,7)

8. (a) Discuss the regulation of respiration through chemoreceptors.

(b) The Haldane effect approximately doubles the amount of carbon dioxide released from the blood in the lungs

(c) What is Bohr effect? How it effects the transport of oxygen in blood? (6,4,5)

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[This question paper contains 6 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1366 **A**

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. Attempt **five** questions in all.
3. Question No. **1** is compulsory.

1. (a) State True or False and justify your answer :

   (i) The melting temperature (Tm) of DNA increases with the increase in its GC content.

   (ii) H1 histone is half as abundant as the other histones.

P.T.O.

(iii) Tautomerization is believed to contribute to mutation.

(iv) There is inverse correlation between organism complexity and gene density.

(b) Fill in the blanks :

(i) Linking number is the sum of two geometric components called _____ and _____ .

(ii) Decondensed/relaxed form of genome is known as _____ .

(iii) _____ enzyme replicates the ends of the eukaryotic chromosome.

(iv) _____ sequences are the hotspots for recombination in *E coli*.

(c) Give contributions of the following **(any five)** :

(i) Frederick Meischer

(ii) E. Chargaff

(iii) Charles Yanofsky

(iv) Barbara McClintok

(v) Arthur Kornberg

(vi) Elizabeth Blackburn (6,4,5)

2. (a) What is gene density? Why is it higher in prokaryotes in comparison to eukaryotes?

(b) What are transposons? What are the various classes of transposable elements? Explain the cut and paste mechanism of DNA transposition.

(c) What is a replisome? State the function of the following proteins during replication :

(i) Primase

(ii) Tau protein (4,6,5)

3. (a) Describe the salient features of the Watson and Crick model of DNA.

(b) Describe the structural organization of chromatin according to the nucleosome model.

(c) Describe the key steps of homologous recombination. (5,5,5)

4. (a) Write the steps involved in mismatch repair in *E.coli*.

(b) What are base analoges and intercalating agents? Explain with the help of examples how they cause mutations.

(c) How do Etoposide and Novobiocin affect DNA replication? Write down their clinical applications. (5,5,5)

5. Differentiate between the following :

(a) Euchromatin and Heterochromatin

(b) DNA Polymerase I and DNA Polymerase III

(c) NER and BER

(d) Frameshift mutation and point mutation

(e) A and B-forms of DNA. (3×5)

6. Write short notes on the following :

(a) Different modes of replication

(b) Ames Test

(c) Virus like Retrotransposon (5×3)

7. (a) What are topoisomerases? Differentiate between the two types of topoisomerases.

(b) What do you understand by the SOS response? Elaborate.

(c) What is site specific recombination.? Distinguish between serine and tyrosine recombinases.

(5,5,5)

8. (a) How does the action and mutagenic effect of 5-bromouracil differ from that of nitrous acid?

(b) Explain the molecular mechanism underlying the symptoms of Xeroderma pigmentosum.

(c) A drug inhibits the activity of the enzymatic inorganic pyrophosphatase. What effect would the drug have on DNA synthesis?

(d) Predict whether the loss of the following *E. coli* genes would lead to lethality. Justify your answer :

(i) dnaB

(ii) Pol I

(iii) recA (4,4,2.5,4.5)

(20)

[This question paper contains 6 printed pages.]

Your Roll No. 2022

Sr. No. of Question Paper : 1384 **A**

Unique Paper Code : 32491403

Name of the Paper : Metabolism of Amino Acids and Nucleotides

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

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. Answer only **five** questions.
3. Question No. **1** is compulsory.

1. (a) Explain the following **(any 6)** :

(i) dUTP is not a normal component of DNA, despite that ribonucleotide reductase has the capacity to convert UDP to dUDP

(ii) Glutathione functions as redox buffer

P.T.O.

(iii) N-acetyl glutamate is a positive allosteric regulator of Urea cycle

(iv) Purine biosynthesis is impaired in vitamin B12 deficiency

(v) Isoleucine is both glucogenic and ketogenic

(vi) Glutamate plays a pivotal role in the metabolism of amino acids

(vii) Serine is synthesized by glycolytic intermediates

(viii) SGPT has an important diagnostic value

(b) Give scientific contributions of the following scientists **(Any 3)** :

(i) John Buchanan

(ii) Hans Krebs and Henseleit

(iii) David Shemin

(iv) P. Reichard

(v) Joanne Stubbe (12,3)

2. Differentiate between the following **(any 5)** :

(a) Transamination & oxidative deamination

(b) Carbamoyl phosphate synthetase I & II

(c) Positive and Negative Nitrogen balance

(d) Kwashiorkor and Marasmus

(e) Glucogenic and Ketogenic Amino Acids

(f) Denovo and Salvage pathway for Nucleotide Biosynthesis (3×5)

3. Give the reactions for the following conversions **(any 5)** :

(a) Tryptophan to NAD^+

(b) Succinyl CoA to Protoporphyrin

(c) Homocysteine to Methionine

(d) Ornithine to spermine

(e) Phenylalanine to Homogentisate

(f) Serine to Glycine (3×5)

4. Describe the process and the biochemical reaction where these drugs are effective **(any 5)** :

(a) Hydroxyurea

(b) Trimethoprim

(c) Allopurinol

(d) 6-mercaptopurine

(e) Methotrexate

(f) Azaserine (3×5)

5. (a) Inhibition of ornithine transcarbamoylase leads to orotic aciduria. Explain the metabolic basis for this.

(b) Birds are uricotelic in nature.

(c) Write the degradation pathway of Proline.

(d) Write various reactions that utilize PRPP (at least three).

(e) How does the deficiency of HGPRT affect the rate of pyrimidine nucleotide synthesis?

(2,2,3,3,5)

6. Discuss the following :

(i) Urea Cycle

(ii) Nitrogen Cycle and Nitrogen fixation

(iii) Regulation of Ribonucleotide Reductase

(5×3)

7. Describe the defective process, enzyme and symptoms of the following disorders **(any 5)** :

(a) Gout

(b) Maple syrup urine Disease

(c) Intermittent acute porphyria

(d) Hartnup disease

(e) SCID

(f) Alkaptonuria (3×5)

8. Write short notes on the following **(any 5)** :

(a) Glucose alanine cycle

(b) Krebs bicycle

(c) Glycine cleavage system

(d) Purine nucleotide cycle

(e) Gamma Glutamyl Cycle

(f) Leg Hemoglobin (3×5)