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09/5/18

Roll No.

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S. No. of Question Paper : 6432

Unique Paper Code : 32491401 HC

Name of the Paper : Human Physiology

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

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

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

Attempt five questions in all including

Q. No. 1. which is compulsory.

1. (a) Define the following :

(i) Cardiac Output

(ii) Renal Plasma Flow

(iii) Depolarisation

(iv) Enteric Reflex

(v) Total Lung Capacity.

5×1

(b) What is the physiological term for the following :

(i) The molecule used to detect the GFR.

(ii) Increase in platelets number.

P.T.O.

- (iii) A blood clot flowing through the circulation.
- (iv) Amount of blood pumped out of the heart per cycle.
- (v) The molecule responsible for decreased FSH secretion only.
- (vi) Rhythmic movements in the small intestine.
- (vii) Measurement of electrical conductivity of the brain.
- (viii) Onset of menstrual cycle in women.
- (ix) Amount of air remaining in the lungs after a normal tidal expiration. 9×1

(c) Give the full form of the following :

(i) JGA

(ii) EDV

(iii) IPSP

(iv) ECG

(v) ANF. 5×1

2. (a) Give the importance of brain stem.
- (b) How many kinds of cells are present in the central nervous system ? Describe them.
- (c) How is cerebrospinal fluid different from blood ?

3. Explain the following with the help of diagram/flow chart :

- (i) Juxtaglomerular apparatus in the kidney
- (ii) Hepatic lobule of liver
- (iii) Cardiac cycle
- (iv) Mature Graafian Follicle.

3.5×4

4. Differentiate between the following :

- (i) Bohr's effect and Haldane effect
- (ii) Hemostasis and homeostasis
- (iii) Parasympathetic and Sympathetic nervous system
- (iv) Alkalosis and Acidosis.

3.5×4

5. Explain how/why ?

- (i) There is need for acclimatization at high altitude
- (ii) EEG waves change in sleep awake cycle
- (iii) Only one sperm can fertilize an egg
- (iv) Premature infants often suffer from respiratory distress syndrome
- (v) Cardiac muscle does not undergo tetany
- (vi) Bile juice helps in fat absorption
- (vii) Edema occurs in glomerulonephritis.

2×7

P.T.O.

6. Write short notes on the following :
- (i) Kidney Failure
  - (ii) Jaundice
  - (iii) Anemia
  - (iv) Hypertension. 3.5×4
7. Give the mechanism of action of the following :
- (i) Counter current multiplication system of urine formation
  - (ii) Sliding theory of muscle contraction
  - (iii) Fibrinolytic system of blood clotting. 5,4,5
8. Give the location, function and mechanism of action of the following receptors :
- (i) Nociceptor
  - (ii) Baroreceptors
  - (iii) Thermoreceptor
  - (iv) Chemoreceptors
  - (v) Stretch receptor
  - (vi) Gustatory receptor. 7×2

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2018

Roll No.

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S. No. of Question Paper : 6433

Unique Paper Code : 32491402 HC

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

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

Answer any five questions. Question No. 1 is compulsory.

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

- (i) The polarity of DNA helicase is defined by the DNA strand that is displaced.
- (ii) The enzyme RNaseH is able to remove the entire RNA primer.
- (iii) The stability of a DNA helix increases in 1M NaCl as compared to an aqueous solution.
- (iv) A larger stretch of DNA is synthesized in *E.coli* by DNA Polymerase I than by DNA Polymerase III.

P.T.O.



(v) An *E. coli* strain that is  $dam^-$  (DNA adenine methylase minus) has a higher frequency of mutations than a  $dam^+$  host.  $5 \times 2 = 10$

(b) (i) Why does DNA have thymine instead of uracil as a natural base ? 3

(ii) SOS response is considered to be a last resort by the cell to survive DNA damage. Explain. 3

(iii) What is the significance of the sequence 5'TTAGGG3' in eukaryotic chromosomes ? 3

2. (a) What is a replisome ? Explain the role of each of its components. 5

(b) Outline and compare the steps involved in mismatch repair and nucleotide excision repair. 5

(c) Describe an experiment used to determine the length of DNA associated with nucleosomes. 4

3. (a) A relaxed, circular, double stranded DNA molecule (2000 bp) has 10 bp per turn. What is the  $L_0$  value of this molecule ? DNA gyrase introduces 16 negative supercoils in this molecule. What is its value of L now ? What is the superhelical density of this molecule ? 3

(b) What are the factors that contribute to a decreased gene density in eukaryotic cells ? 5

(c) What are the various domains of the DNA polymerase enzyme ? Discuss their roles in the functioning of the enzyme. 6

4. (a) Explain in detail the Holliday model of recombination illustrating the two sets of outcomes that arise from its resolution. 6

(b) Discuss the agents that cause inhibition of DNA replication. How are these inhibitors useful in medicine ? 5

(c) What is the replicon model ? 3

5. (a) How does the eukaryotic cell ensure that not even one of its several hundred origins of replication is activated more than once in the cell cycle ? 5

(b) What is the effect of alkylating agents on DNA ? 3

(c) Explain in detail the role of Rec BCD in choosing between recombination or destruction of DNA that enters the *E.coli* cell ? 6

6. (a) What is conservative site specific recombination ?  
Explain in detail. 6
- (b) What problem would arise in the process of replication  
in the absence of topoisomerases ? 3
- (c) Describe the Ames test and its applications. 5
7. (a) What are the different classes of transposons ? Explain  
their genetic organization. 6
- (b) How does Lambda DNA integrate into the *E.coli*  
genome ? 5
- (c) What is polymerase switching ? 3
8. Write short notes on the following :
- (a) Translesion repair
- (b) Nucleosome assembly
- (c) Factors stabilizing the DNA double helix
- (d) Rolling circle replication. 3,5,3,3



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Roll No.

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S. No. of Question Paper : 6434

Unique Paper Code : 32491403

HC

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**

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

Attempt *five* questions in all.

Question No. 1 is compulsory.

Use of scientific calculator/log tables may be allowed.

1. Explain the following :

- (i) Alanine and glutamine are present in much higher concentration in blood than any other amino acids.
- (ii) Glutathione functions as a redox buffer.
- (iii) Plants do not possess  $\delta$  amino levulinic acid synthetase activity yet porphyrins are required for the synthesis of chlorophyll.
- (iv) L-asparaginase is an effective chemotherapeutic agent.

P.T.O.

- (v) In humans, the consumption of PRPP by salvage pathway is greater than the consumption of PRPP for *de novo* purine biosynthesis.
- (vi) S-adenosyl methionine (SAM) has a higher methyl group transfer potential than N<sup>5</sup>-methyl tetra hydro folate.
- (vii) Nitrogen fixation is energetically expensive.
- (viii) Genetic defects in enzymes involved in urea cycle can be life threatening.
- (ix) Sulfonamide drugs do not interfere with mammalian purine synthesis.
- (x) Von Gierke's disease results in hyperuricemia. 9×2,1

2. Write the steps involved in the following enzymatic conversions :

- (i) IMP to Uric acid
- (ii) Carbamoyl phosphate to UMP
- (iii) Histidine to N-formimino glutamate
- (iv) dUMP to dTTP
- (v) 3-phosphoglycerate to serine *or* Glutamate to proline

3,3,3,3,2

3. (a) Draw a well labelled diagram of nitrogen cycle and name any *two* nitrogen fixing organisms.
- (b) Discuss the regulation of heme biosynthesis. Why does lead toxicity cause anemia ?
- (c) Pyridoxal phosphate is a versatile cofactor. Support your answer with suitable examples. 4,5,5

4. Give the biochemical basis and clinical symptoms associated with the following metabolic disorders (any *four*) :
- (i) SCID
  - (ii) Hartnup disease
  - (iii) Orotic aciduria
  - (iv) Maple syrup urine disease
  - (v) Lesch Nyhan Syndrome. 4×3.5
5. Diagrammatically explain the following :
- (i) Purine nucleotide cycle
  - (ii) Glucose-Alanine cycle
  - (iii) Urea cycle. 4,5,5
6. (a) Name and draw the structure of alpha keto acid resulting when each of the following amino acid undergoes transamination :
- (i) Aspartate
  - (ii) Alanine
  - (iii) Glutamate
  - (iv) Phenylalanine
  - (v) Arginine.
- (b) What are the different pathways for the breakdown and synthesis of glycine ? Explain.
- (c) Draw a purine ring and mark the origin of Carbon and Nitrogen atoms. 5,6,3

7. (a) Give *one* scientific contribution of the following scientists :

- (i) David Shemin
- (ii) Thomas Sydenham
- (iii) A. Garrod
- (iv) Jo Anne Stubbe.

(b) Write the mode of action of the following inhibitors and highlight their use in medicine :

- (i) Allopurinol
- (ii) Azaserine
- (iii) 6-mercaptopurine
- (iv) 5-fluorouracil
- (v) Methotrexate.

4,10

8. (a) Compare the following pairs :

- (i) Kwashiorkor and Marasmus
- (ii) Transamination and Oxidative Deamination
- (iii) Carbamoyl phosphate synthetase I and Carbamoyl phosphate synthetase II
- (iv) *De novo* synthesis of purines and pyrimidines.

(b) Since dUTP is not a normal component of DNA, why do you suppose ribonucleotide reductase has the capacity to convert UDP to dUDP ?

12,2