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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

- (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 ?

5,5,4

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. 5×2=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 δ 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 N⁵-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

P.T.O.

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

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Your Roll No.....

Sr. No. of Question Paper : 2180

IC

2019

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. Attempt **five** questions in all including Q. No. 1 which is compulsory.

1. (a) Define the following :

- (i) Homeostasis
- (ii) End diastolic Volume
- (iii) Transpulmonary Pressure



P.T.O.

(iv) Regurgitation

(v) Receptor desensitization

(vi) Osteoclast

(vii) Implantation

(1×7)

(b) Justify/Give Reasons :

(i) Hemoglobin functions as “tissue oxygen buffer”

(ii) The left ventricle of the heart shows physiological hypertrophy

(iii) Osteoblasts help to build up the bone.

(iv) Gastric mucosa is resistant to autodigestion

(v) RBC count is less in females

(vi) Action potentials are all-or-none events.

(2×6)

2. Differentiate between the following :

(a) REM and NREM

- (b) Heterometric and homometric regulation of cardiac output
 - (c) Gastric and Intestinal phase of gastrointestinal regulation
 - (d) Peripheral and Central chemoreceptors (3.5×4)
3. (a) What is CSF? Explain how the chemical composition of the CSF is different from that of blood.
- (b) What will happen if :
- (i) PCT of tubular segment is removed
 - (ii) Thin segment of loop of Henle is removed
- (c) Describe sequence of events that occur during swallowing. (3,6,5)
4. (a) Give the physiological basis of following : **(any 4)**
- (i) Anemia
 - (ii) Peptic ulcer

(iii) Renal alkalosis

(iv) Emphysema

(v) Atherosclerosis

(3×4)

(b) Explain how plasticity of neurons helps in learning?

(2)

5. (a) Give one word for the following :

(i) Receptors for the pain stimulus

(ii) Supporting cells of peripheral nervous system

(iii) Sensation from the skin, muscles, bone, tendons and joints

(iv) The ability to recall past events at the conscious or unconscious level

(b) A person's cardiac output (CO) is 7 litre/minute and Mean Arterial Pressure (MAP) is 140 mmHg. What is person's total peripheral resistance?

(c) What are the various components of Countercurrent multiplier system? Why it is called so?

- (d) Why a testis is considered to be immunologically privileged site? (4,3,5,2)

6. Explain the following with the help of diagram and flow chart :

(a) Tracheo-bronchial tree

(b) Different layers of GI tract

(c) Ovarian and uterine changes during menstrual cycle (4,5,5)

7. Write short notes on the following :

(a) Role of vitamin K in coagulation

(b) Blood flow into the liver

(c) Regulation of arterial pressure

(d) Transport of carbon-dioxide in the blood

(3,3,4,4)

8. Explain the following mechanisms :

(a) Voluntary control of micturition

(b) Capacitation and transport of sperm

(c) Ionic channels and their role in initiating action potential in skeletal muscle

(5,5,4)

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[This question paper contains 6 printed pages.]

Your Roll No.....

2019

Sr. No. of Question Paper : 2181

IC

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) Comment on the following :

(i) Transposition causes rearrangement of segments of DNA.

- (b) Explain the key steps of homologous recombination.
- (c) Differentiate between base excision repair and nucleotide excision repair. (6,4,4)
4. (a) Explain the mechanism of translesion synthesis during DNA damage.
- (b) Write down the steps of DNA processing by Rec BCD enzymes.
- (c) Compare and contrast serine recombinases with tyrosine recombinases with their mechanism. (4,5,5)
5. (a) How does λ integrase promote integration and excision of a viral genome into host chromosome?
- (b) Explain the mechanism of mismatch repair in prokaryotes.
- (c) Explain the role of methyl transferases and acetyl transferases in nucleosome assembly and disassembly. (5,4,5)

6. (a) Name the various classes of transposition and explain cut and paste transposition.

(b) Eukaryotic DNA has higher Cot value than prokaryotic DNA. Explain.

(c) Discuss the roles of various types of topoisomerases. (6,4,4)

7. (a) Justify the following statements :

(i) The sliding DNA clamp makes DNA polymerase more processive.

(ii) D loop mode of replication is different from rolling circle model of replication.

(iii) Ethidium bromide affects the topology of closed circular DNA

(iv) The fidelity of replication is ensured.

(b) How does DNA renature? Briefly explain its correlation with DNA complexity.

(2.5×4,4)

8. Write short notes on the following :

(a) Replicon model of two components for replication initiation

(b) Telomerase enzyme in eukaryotes

(c) Replicative transposition

(4,5,5)