

18

[This question paper contains 6 printed pages.]

12/12/19

Your Roll No.....

Sr. No. of Question Paper : 5524

H

Unique Paper Code : 216/223/589

Name of the Paper : Genetics and Genomics I (GGHT-501)

Name of the Course : B.Sc. (Hons.) Anth./Biochem./Biomed./Bot./Microbio./Zoology

Semester : V

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 5 questions in all including Question No. 1 which is compulsory.

1. (a) Define the following terms (Attempt any five) :

- (i) Codominance
- (ii) Missense Mutation
- (iii) Dosage compensation
- (iv) Allele



P.T.O.

(v) Pleiotropy

(vi) Aneuploidy

(1×5=5)

(b) Expand the following :

(i) TDF

(ii) EMS

(iii) F<sub>2</sub>

(iv) HGPRT

(v) QTL

(1×5=5)

(c) Give contributions of the following scientists in the field of genetics (Attempt any five) :

(i) Sutton and Boveri

(ii) H.J. Muller

(iii) Barbara McClintock

(iv) Bateson and Punnet

(v) Karpachenko

(vi) Mary Lyon

(1×5=5)

(d) Answer the following in one word :

- (i) Virus used for fusing somatic cells in vitro.
- (ii) Intercalating agent that cause mutation.
- (iii) Experimental organism on which Morgan worked.
- (iv) Number of Barr bodies found in human suffering from Turner syndrome.
- (v) Sex of *Drosophila* having chromosomal constitution  $2A+XXY$ . (1×5=5)

(e) Write the phenotypic ratios for the following interactions :

- (i) Recessive Epistasis
- (ii) Complementary factor
- (iii) Incomplete dominance (1×3=3)

(f) A plant with tall stem and red flowers was crossed with the plant having dwarf stem and white flowers. Write the genotype of  $F_1$  plants and predict the result of testcrossing these  $F_1$  plants. (4)

2. Differentiate between the following pairs (Attempt any **Four**) :

(a) Epistasis and Dominance

(b) Paracentric and Pericentric inversion

(c) Autopolyploid and Allopolyploid

(d) Cis and Trans heterozygote

(e) Somatic and Germinal mutation

(f) Back cross and Test cross (3×4=12)

3. Given below is the test cross data :

Phenotype			Number
+	+	+	80
+	+	c	344
+	b	c	95
a	+	+	110
a	b	+	296
a	b	c	70
+	b	+	3
a	+	c	2

- (a) What are linked genes? Are the genes a, b and c in the above data linked? Justify. (3)
- (b) Determine the sequence and distance between the three genes a, b and c. (6)
- (c) Calculate the coefficient of coincidence and interference. (3)
4. (a) Explain maternal influence with a suitable example. How is it different from cytoplasmic inheritance? (8)
- (b) What is multiple allelism? Explain with suitable examples. (4)
5. (a) Define spontaneous mutations? Discuss the molecular mechanism of spontaneous mutations. (6)
- (b) What is dosage compensation? Describe the mechanism of dosage compensation in *Drosophila*. (6)
6. (a) Give an experimental evidence to prove that crossing over occurs at four-strand (tetrad) stage. (6)
- (b) Device an experiment to demonstrate that X-rays cause mutation. (6)
7. Write short notes on any **three** of the following :
- (a) Conditional lethal mutations



- (b) Mendel's laws of inheritance
- (c) Somatic cell hybridization
- (d) Penetrance and Expressivity
- (e) Role of environmental factors in sex determination

(4×3=12)

(19)

[This question paper contains 4 printed pages.]

30/11/19  
Your Roll No.....

**Sr. No. of Question Paper : 5550**

**H**

Unique Paper Code : 249501

Name of the Paper : Membrane Biology

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

Semester : V

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. Comment on the following :

- (i) Proteins cannot move across the membrane.
- (ii) Gap junctions are regulated by cellular  $Ca^{+2}$  ion concentration.
- (iii) Digitalis is a cardiotonic drug.
- (iv) Alpha helices are more common than beta barrels in transmembrane proteins.

P.T.O.

- (v) Valinomycin kills microbial cells by dissipating transmembrane ion gradients.
  - (vi) Phosphatidyl serine is found predominantly on the cytosolic side of the bilayer.
  - (vii) Lipid rafts are insoluble in nonionic detergents.
  - (viii) Spectrin, a red cell protein controls membrane shape and movement.
  - (ix) Facilitated transport system shows saturation kinetics. (16,3)
- 2.
- (a) What are micro-domains? Give the functional significance of lipid rafts.
  - (b) Diagrammatically outline the mechanism of transport by  $\text{Na}^+\text{K}^+\text{ATPase}$ . Why is it called an electrogenic pump?
  - (c) Differentiate between primary and secondary active transport. Give one example of each. (5,5,4)
- 3.
- (a) Give the structure of  $\text{F}_0\text{-F}_1$  ATPase. How does the passage of protons through this system induce the rotation of C-ring and synthesis of ATP? Explain.
  - (b) Explain the use of following techniques to study the membrane structure :
    - (i) FRAP



(ii) Patch - clamp

(iii) Freeze fracture

(5,9)

4. (a) Draw the diagram of fluid mosaic model of membrane. Give the salient features of the same.

(b) How is membrane fluidity affected by any three of the following?

(i) Cholesterol

(ii) Temperature

(iii) Anaesthetics

(iv) Lipid composition



(c) Explain the basis of ion selectivity of Potassium Channels. (5,6,3)

5. Explain how :

(i) Bone remodeling is done by osteoclast proton pumps.

(ii) The neuronal  $\text{Na}^+$  ion channel is a voltage gated channel.

(iii) Phosphotransferase system phosphorylates sugar during transport across the membrane.

(iv) Aquaporins provide highly selective channels for rapid movement of water molecules across the plasma membranes. (3,3,4,4)

6. Write short notes on the following :

- (i) Cystic fibrosis
- (ii) Pore forming toxins
- (iii) Hydropathy plots
- (iv) CMC (4,4,3,3)

7. (a) Give the structure of nicotinic acetyl choline receptor. How does it act as a ligand gated channel ?

(b) Define the following :

- (i) Nernst equation
- (ii) Resting membrane potential
- (iii) Porins
- (iv) Antiport (6,8)

8. (a) How does SNARE protein bring about membrane fusion ? Show diagrammatically.

(b) Give the structure and mechanism of transport of  $\text{Ca}^{+2}$  by SERCA pump. How is it inhibited by vandate ?

(c) Differentiate between mediated and non mediated transport. (5,6,3)

[This question paper contains 4 printed pages.]

2017

Your Roll No.....

Sr. No. of Question Paper : 5551 H

Unique Paper Code : 249503

Name of the Paper : Hormone Biochemistry

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

Semester : V

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. Q. No. 1 is compulsory.



1. (a) Explain the following terms :
  - (i) Paracrine response
  - (ii) Organification of iodine
  - (iii) Cross phosphorylation
  - (iv) Biphasic secretory response
  - (v) Natriuresis

P.T.O.

(vi) LH surge

(vii) Polyuria

(1,2,1,2,1,2,1)

(b) Give the location and function of the following cells.

(i) Chromaffin cells

(ii) Zona reticularis

(iii) Sertoli Cells

(iv) Parafollicular cells of the thyroid

(v) Trophoblasts

(iv) SON

(1.5×6=9)

2. Comment on the following statements.

(a) Steroid hormones act as transcriptional regulators

(b) Hyperglycemia is not a confirmatory diagnosis of Diabetes Mellitus

(c) Cholecalciferol plays a dual role in bone physiology

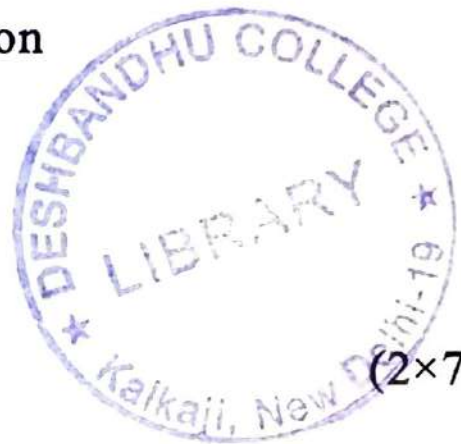
(d) Thyroxine is called a permissive hormone

(e) Vasopressin regulates blood pressure and blood volume

(f) There is crosstalk between  $\text{Ca}^{2+}$  and cAMPs

(g) Hypokalemia and alkalosis are seen in persons suffering from Conn's syndrome. (2×7=14)

3. Give the full form and their physiological significance:
- (a) BMR and thyroxine
  - (b) GHRH and feedback regulation
  - (c)  $\beta$ ARK and regulation of hormonal response
  - (d) POMC and Hyperpigmentation
  - (e) DHT and  $5\alpha$  reductase
  - (f) SH2 and adaptor proteins
  - (g) EGF and wound healing
4. (a) Compare and contrast the effect of PTH and Calcitonin on plasma  $Ca^{2+}$  levels. How does calcium itself regulate the secretion of the two hormones? (2×7=14)
- (b) Explain how G proteins mediate dual control of adenylate cyclase
- (c) Certain gasses act as primary messengers. (5,5,4)
5. Outline with the help of a neatly labelled diagram the following :
- (a) Hypothalamic Hypophysial Axis.
  - (b) The signal transduction pathway of the insulin receptor.
  - (c) Regulation of blood volume by Renin Angiotensin System



(d) The neuroendocrine integration of gastric acid secretion. (3.5×4)

6. Discuss briefly :

(a) Role of hormones in the initiation and progression of Parturition.

(b) Epinephrine regulates the flight and fight response

(c) Leptin regulates food intake. (5,5,4)

7. (a) Explain the role of the following toxins/ drugs.

(i) Pertussis toxin

(ii) Yersinia toxin

(iii) Phorbol esters

(iv) Sildenafil (2.5×3=7.5)

(b) Growth hormones show both a direct and indirect effect and excess secretion of growth hormone shows different symptoms in children and in adults. Explain. (3.5)

8. Write short notes on : (14)

(a) Scatchard analysis.

(b) Goitre.

(c) Type II diabetes Mellitus.

(d) Cushing's Disease

①

This question paper contains 4 printed pages.

2017

Your Roll No. ....

Sl. No. of Ques. Paper : 6427 HC  
Unique Paper Code : 32491502  
Name of Paper : Gene Expression and Regulation  
Name of Course : B.Sc. (H) Biochemistry  
Semester : V  
Duration : 3 hours  
Maximum Marks : 75

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



Answer five questions in all, including  
Q. No. 1 which is compulsory.

1. (a) Explain the following:

- (i) Anticodon of many tRNA molecules can interact with more than one codon.
- (ii) Cells carrying suppressor tRNA genes are less viable than wild type cells.
- (iii) Fidelity of transcription is lower than that of replication.
- (iv) Transcription in eukaryotes is more complex than in prokaryotes.
- (v) Diphtheria toxin inhibits protein synthesis in eukaryotes.

Turn over

(b) What do you understand by the following terms?

- (i) Transcriptome
- (ii) Lysogen
- (iii) Guide RNA
- (iv) Exon Shuffling
- (v) Repressor.

(c) The following sequence of a duplex DNA segment in a DNA molecule is transcribed by the enzyme RNA polymerase:

5' — ATCGCTTGTTTCGGA — 3'

5' — TAGCGAACAAGCCT — 3'

to give the RNA with the following sequence:

5' — UCCGAACAAGCGAU — 3'

Giving reason state whether the following statements about the DNA segment are True or False:

- (i) The top strand is the coding strand.
- (ii) The bottom strand is the sense strand.
- (iii) The top strand is the template strand.
- (iv) The bottom strand is the antisense strand. 10,5,4

2. (a) Differentiate between the following:

- (i) Group I and Group II self-splicing introns
- (ii) Core RNA polymerase and Holoenzyme
- (iii) Translational initiation in prokaryotes and eukaryotes.

(b) Explain how cells ensure the fidelity of protein synthesis. 9,5



3. (a) Give the experiments that were the basis for the following:
- (i) The ribosome is unable to discriminate between correctly and incorrectly charged *t*RNA.
  - (ii) Protein synthesis proceeds from N-terminal to C-terminal.
  - (iii) The codon UUU was assigned to phenyl alanine.
- (b) Give the anticodon sequence on *t*RNA molecule for the following codons:
- |     |     |      |
|-----|-----|------|
| CAA | GGU | 12,2 |
|-----|-----|------|
4. (a) Explain the significance of the following:
- (i) GTP-GDP cycle of EF-Tu
  - (ii) Shine Dalgarno sequence
  - (iii) Poly A tail of eukaryotic *m*RNA
- (b) Predict the expression of lac operon genes under the following conditions:
- (i) In the presence of glucose and absence of lactose
  - (ii) In the presence of glucose and presence of lactose
  - (iii) In the absence of glucose and absence of lactose
  - (iv) In the absence of glucose and presence of lactose
- (c) Write the sequence of -10 and -35 elements of a prokaryotic promoter. 5,4,5
5. (a) With the help of a diagram explain the conserved elements required for splicing.
- (b) Fine control of tryptophan operon is mediated by attenuation. Explain.

- (c) What is a lariat structure? What is unusual about the phosphodiester bond in a lariat structure?
- (d) Describe a technique that can be used to identify a promoter sequence. 4,4,3,3
6. (a) Write the mode of action of the following:
- (i) Tetracyclin
  - (ii) Rifampicin
  - (iii) Actinomycin D.
- (b) What are suppressor *t*RNAs? With the help of an example explain how they suppress nonsense mutations.
- (c) Describe different DNA binding motifs. 6,4,4
- 7 (a) Write the roles of the following:
- (i) Ubiquitin in protein degradation
  - (ii) Initiation factors in protein synthesis
  - (iii) *c*AMP in regulation of lac operon
- (b) What are the ways in which transcription is terminated in prokaryotes? 9,5
8. Write short notes on the following (any four):
- (a) Alternative splicing
  - (b) Features of genetic code
  - (c) Charging of *t*RNA
  - (d) RNA interference
  - (e) Lytic cycle of lambda phage. 3.5×4

This question paper contains 6 printed pages.

Your Roll No. ....

12117117

Sl. No. of Ques. Paper : 8424 HC  
Unique Paper Code : 32497903  
Name of Paper : Molecular Basis of Non-infectious Diseases  
Name of Course : Biochemistry : Discipline Specific Elective for Honours  
Semester : V  
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.

Q. No. 1 is compulsory.

Use of scientific calculators / log tables may be allowed.

1. (A) Choose the one best answer :

(i) Untreated diabetes may result in all of the following

except:

- (a) Blindness
- (b) Cardiovascular disease
- (c) Kidney disease
- (d) Tinnitus

(ii) What criterion is required for the diagnosis of Alzheimer's disease?

Turn over



- (a) Dementia  
(b) Hallucination  
(c) Agitation and anxiety  
(d) Changes in personality
- (iii) Deficiency of enzyme  $\alpha$ -keto acid decarboxylase is observed in which of the following disorders?  
(a) Phenyl ketonuria  
(b) Alkaptonuria  
(c) Hartnup's disease  
(d) Maple Syrup Urine disease
- (iv) Huntington's chorea disease results due to accumulation of:  
(a) Branched chain amino acids  
(b) Misfolded proteins  
(c) Hemoglobin in the blood  
(d) Fatty acids
- (v) All are appetite stimulating hormone except:  
(a) Leptin  
(b) Glucagon  
(c) Ghrelin  
(d) Peptide YY
- (vi) Which of the following is characteristic of a malignant rather than a benign tumor?



- (a) Undergoes metastasis  
(b) Develops blood supply  
(c) Cells divide an unlimited number of times  
(d) Grows without needing a growth signal
- (vii) A 20 year old male with hypertension has been prescribed a drug that inhibits the synthesis of catecholamines. Which of the following vitamins participates in the synthesis of catecholamines?  
(a) Vitamin C  
(b) Vitamin D  
(c) Vitamin B<sub>1</sub>  
(d) Vitamin K
- (viii) Atherosclerosis occurs due to the presence of  
(a) potassium in arteries  
(b) calcium in arteries  
(c) proteins in arteries  
(d) magnesium in arteries
- (ix) A symptom that distinguishes between Marasmus and Kwashiorkor:  
(a) Oedema  
(b) Fatigue  
(c) Bleeding in gums  
(d) Memory loss

(B) State whether the following statements are true or false.  
If false, justify.

- (i) All cancers are malignant.
- (ii) LDL is good cholesterol.
- (iii) Decreased BMI is associated with NIDDM.
- (iv) Calcium channel blockers are used to treat heart patients.
- (v) Megaloblastic anaemia is caused by folate deficiency.

(C) Expand the following:

- (i) PCOS
- (ii) ALS
- (iii) DOPA
- (iv) PEM
- (v) IBD

9,5,5

2. (A) Differentiate between the following (any five):-

- (i) Anorexia nervosa and Bulimia
- (ii) Wet beriberi and Dry beriberi
- (iii) Osteoporosis and Osteomalacia
- (iv) Oncogenes and Tumor suppressor genes
- (v) Xerophthalmia and Night-Blindness
- (vi) Marasmus and Kwashiorkor

(B) Describe Thalassemia. 10,4

3. (A) Explain the mechanism of action of following drugs

(any four):-

- (i)  $\beta$ -Blockers
- (ii) Statins

(iii) Tamoxifen

(iv) Herceptin

(v) Methotrexate

(vi) Warfarin.

(B) What dietary interventions should be done in the following diseases?

- (i) Rickets
- (ii) Night-Blindness.

12,2

4. Elaborate on the following:

- (i) Ras is an oncogene
- (ii) The 4Ds of Pellagra
- (iii) The etiology of Phenyl ketonuria
- (iv) The Black Urine disease.

4,4,3,3

5. (A) What are lifestyle disorders? Explain the causes of adult obesity.

(B) What are protein misfolding diseases? Describe the molecular basis of Alzheimer's disease. 6,8

6. Write short notes on:

- (i) Cystic Fibrosis or Prions
- (ii) Familial hypercholesterolemia or Heart Attack
- (iii) Schizophrenia or Parkinson's disease. 5,5

7. (A) Describe the relationship of diabetes mellitus with hypertension, obesity, hypothyroidism and stress.

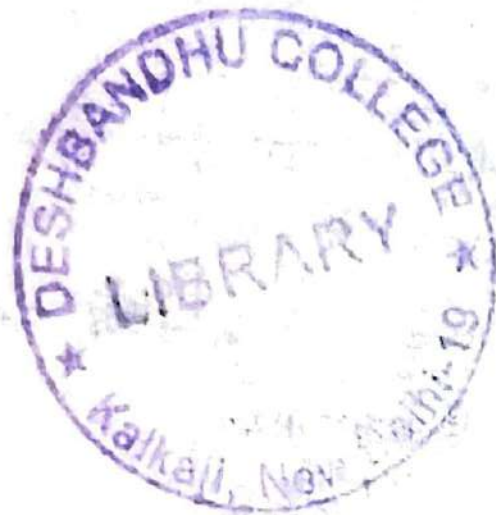
(B) What is Atherosclerosis? Elaborate the stages of development of atherosclerotic plaque. 8,6

8. (A) What is a balanced diet? What are the major and minor components of nutrients in a balanced diet?

(B) Explain:

(i) Causes and stages of cancer

(ii) Molecular approaches to cancer treatment. 5,9



(3)

**This question paper contains 4 printed pages.**

Your Roll No. ....19112117

**Sl. No. of Ques. Paper: 8428**

**HC**

**Unique Paper Code : 32497908**

**Name of Paper : Basic Microbiology**

**Name of Course : Biochemistry : Discipline  
Specific Elective for Hons.**

**Semester : V**

**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.*

**1. (A) Explain the following:**

- (a) Plaque
- (b) Viroid
- (c) Superinfection
- (d) Amoebiasis
- (e) Zoospores
- (f) Mycelium.



**1×6**

**(B) Mention contribution of the following scientists:**

- (a) Felix D'Herelle
- (b) Anton von Leeuwenhoek

**P. T. O.**

- (c) Paul Ehrlich
- (d) Fredrick Twort
- (e) Alexander Fleming 1×5

2. (a) Comment on the following:

- (i) Gram positive bacteria do not disrupt easily by sonication
- (ii) Viruses have variable genetic material
- (iii) Deuteromycetes are known as Fungi imperfecti
- (iv) Agar is preferred as a solidifying agent over gelatin. 2×4

(b) Differentiate between:

- (i) Helical capsid and Icosahedral capsid symmetry of viruses
- (ii) Rhodophycophyta and Phaeophycophyta
- (iii) Poxvirus and Poliovirus
- (iv) Rickettsia and Chlamydia. 1.5×4

3. (a) Which period is known as the golden era of microbiology and why?

(b) How was the theory of spontaneous generation disapproved?

(c) How were pure cultures first obtained and what is their significance? 5,5,4



4. Explain the following with the help of diagram:

(a) Life cycle of Basidiomycetes

(b) Ultrastructure of algal cell

(c) Structure of HIV.

5,5,4

5. (a) Explain the following:

(i) Isogamy and Anisogamy

(ii) Ectocommensalism and Endocommensalism

(iii) Classification of Protozoa (upto phylum level)

(b) Discuss the various types of reserve food material in different classes of algae. 3×3,5

6. (a) What are temperate phages? Explain the factors responsible for the decision between lytic cycle and lysogeny.

(b) Name the algae from which the following products are obtained:

(i) Carrageenan

(ii) Agar

(iii) Alginates

(iv) Iodine.

(c) Explain the habitat and structure of hyphae of ascomycetes. 5,4,5



7. Write short notes on the following

- (a) Applications of Archaeobacteria
- (b) Thallus Organization
- (c) Mycoplasma.

5,5,4,

8. (a) Name *one* disease caused by following:

- (i) Prions
- (ii) *Claviceps purpurea*
- (iii) Rickettsia.

(b) How do euglenoids and diatoms reproduce?

(c) Explain (with diagram) various modes of asexual reproduction in Fungi.

3,3,8