

[This question paper contains 4 printed pages.]

2023-2024
Your Roll No.....

Sr. No. of Question Paper : 4337

G

Unique Paper Code : 32231501

Name of the Paper : Molecular Biology

Name of the Course : **B.Sc. (Hons) 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. Question No. 1 is compulsory.
3. Attempt **five** questions in all.
4. Draw neat, labelled diagrams wherever necessary.

1. (a) Define the following terms : (1×5=5)

(i) Tautomerism

(ii) snRNPs

(iii) Polysome

(iv) Polymerase switching

(v) Replicator

P.T.O.

(b) Differentiate between the following : (2×5=10)

- (i) EF-Tu and EF-G
- (ii) DNA pol α and DNA pol δ
- (iii) Group I and Group II Introns
- (iv) sRNA and siRNA
- (v) Replisome and Replicon

(c) State the function of the following : (1×4=4)

- (i) RRF
- (ii) TFIID
- (iii) RF-C
- (iv) *Xist*

(d) State the most important contribution of the following scientists : (0.5×4=2)

- (i) Fire and Mello
- (ii) Hargobind Singh Khorana
- (iii) Arthur Kornberg
- (iv) Zamecnik and Hoagland

(e) Explain the following : (6)

- (i) DNA polymerase is able to distinguish between deoxyribonucleotides and ribonucleotides.

- (ii) The third base of codon can be recognised by more than one base at the first position of the anticodon.
 - (iii) Prokaryotic mismatch repair system is able to differentiate between parental DNA strand and newly synthesized strand.
- 2. (a) Describe the experiment conducted by Meselson and Stahl and explain its conclusion. (6)
- (b) Describe the structure of double stranded B-DNA with suitable diagrams. (6)
- 3. (a) Illustrate the process of initiation of translation in Eukaryotes. (6)
- (b) How many energy rich molecules are used per round of peptide bond formation? Name the steps where energy is consumed. (3)
 - (c) Ribosomes cannot discriminate between correctly and incorrectly charged tRNAs. Explain. (3)
- 4. (a) Illustrate the chemical reaction which leads to the synthesis of DNA. (2)
- (b) What will be the consequence if helicase is not present during replication? (2)
 - (c) Describe the function of all the domains of DNA pol III. (4)

- (d) Explain the mechanism which ensures that eukaryotic chromosomes are replicated only once per cell cycle (with illustration). (4)
5. (a) Illustrate the steps involved in spliceosome mediated RNA splicing. (6)
- (b) Explain the regulation of gene expression by attenuation in tryptophan operon. (6)
6. (a) What will be the sequence of RNA transcribed from the following DNA template (2)
- 5' ATGTCTGGAGGCTAG 3'
- (b) Draw the chemical structure of two modified bases found in tRNA. (3)
- (c) Illustrate the process of mismatch repair of DNA in Prokaryotes. (3)
- (d) Explain the steps involved in processing of pri-miRNA into miRNA. (4)
7. Write short notes on **any three** of the following :
- (a) Pyrimidine dimerization
- (b) Alternative Splicing
- (c) Rho independent termination
- (d) Lac Operon (3×4=12)

[This question paper contains 8 printed pages.]

Your Roll No. 2023-.....

Sr. No. of Question Paper : 4391

Unique Paper Code : 32231502

Name of the Paper : Principles of Genetics – LOCF

Name of the Course : B.Sc. (Honours) Zoology

Semester : V

Duration : 3 Hours

Maximum Marks : 75

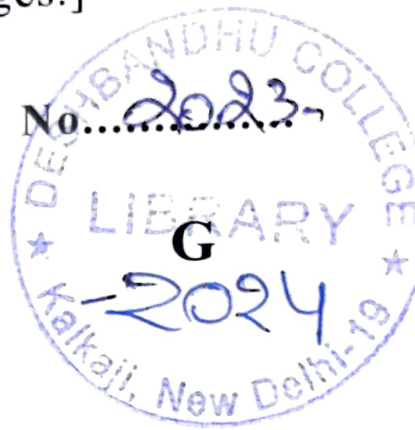
Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all, including question No. 1 which is compulsory.

1. (i) Define any **five** of the following : (5)

(a) Point mutation

(b) Hemizygous



- (c) Reciprocal Cross
- (d) Allele
- (e) Episome
- (f) Maternal effect

(ii) Differentiate between the following (**any four**) :
(8)

- (a) Test cross and Back cross
- (b) Pericentric and Paracentric inversion
- (c) Sex influenced traits and Sex-limited traits
- (d) Incomplete dominance and Codominance
- (e) Multiple alleles and Multiple genes

(iii) Justify the following statements : (4)

- (a) Only specified genes can be transduced by bacteriophage in specialized transduction.
- (b) The *Drosophila* with chromosome combination as XXY is female.
- (c) Dominant lethal genes are rare in the population.

(d) Ds sequences can only move in presence of Ac elements in the maize genome.

- (iv) What are the contributions of the following scientists : (4)
- (a) A. Sturtevant
 - (b) Joshua Lederberg
 - (c) Calvin Bridges
 - (d) Sutton and Boveri
- (v) Give one example each for syndromes associated with the following conditions in humans : (4)
- (a) Monosomy
 - (b) Trisomy
 - (c) Chromosomal Deletion
 - (d) Chromosomal translocation
- (vi) Write true or false : (2)
- (a) Mutations are always harmful.
 - (b) In humans Sry is the master gene in sex determination.

(c) An X-linked trait will be passed on from the father to all his children.

(d) LINEs are examples of retrotransposons.

2. (a) The data obtained from a three-factor test-cross is as follows : (2+5+2=9)

Genotype	Number of progenies
ABc/abc	367
abC/abc	348
ABC/abc	77
abc/abc	68
aBC/abc	58
Abc/abc	64
aBc/abc	10
AbC/abc	8

- (i) Based on the given data, determine the order of the genes.
- (ii) Draw a linkage map and calculate the map distance between the genes.

(iii) Calculate the coefficient of coincidence and interference.

(b) A panel of cell lines was created from human-mouse somatic cell fusions. Each line was examined for the presence of human chromosomes and for the production of a human protein thymine kinase. The following results were obtained :

Cell Line	thymine kinase	Human Chromosomes						
		1	5	11	13	17	18	21
K	+	-	+	+	+	+	-	-
L	+	+	+	-	+	+	+	+
M	-	+	+	+	+	-	+	-
N	-	+	-	-	+	-	-	-

Which of the human chromosome carries the gene for the thymine kinase? Explain. (3)

3. (a) Describe the characteristics of maternal inheritance. (4)

(b) Explain the molecular basis of mutations caused by base analogues, nitrous acid, and acridines. (8)

4. (a) Predict the genotypes of the offspring in a trihybrid cross between $AaBbCC \times AABbCc$. (Draw Punnet square or Forked line diagram). What proportion of progeny would be homozygous for all three genes. (5)
- (b) How do gene interactions modify the Mendelian dihybrid ratio? Explain with three suitable examples. (7)
5. (a) What are transposable elements? Describe any three types of transposable elements found in the bacteria. (7)
- (b) Briefly explain the basis of sex determination in humans. (5)
6. (a) In complementation studies of rII locus of phage T_4 , the following pairs of different mutations were tested. From the given data, determine which mutations are in the same cistron assuming mutation 1 is in A cistron and mutation 2 in B cistron. (+) indicates complementation, (-) indicates failure of complementation. (3)

Test Pair	Results
1,2	+
1,3	-
1,4	-
1,5	+
2,3	+
2,4	+
2,5	-

(b) Explain the process of transformation with suitable diagrams. How does this process help in the recombination of genes in bacteria? (4)

(c) Discuss how interrupted mating experiments help in gene mapping in bacteria. (5)

7. Write short notes on the following (**any three**) :
(3×4=12)

(i) Polygenic inheritance

(ii) Extra chromosome inheritance in Paramecium

- (iii) Environmental sex determination
- (iv) F factor
- (v) Lethal alleles

[This question paper contains 4 printed pages.]

2023-

Your Roll No.

Sr. No. of Question Paper : 4495

Unique Paper Code : 32237901

Name of the Paper : DSE – Animal Behaviour and Chronobiology

Name of the Course : B.Sc. (H) Zoology (LOCF)

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 including Question No. 1 which is compulsory.

1. (a) Define the following :

- (i) Sign stimulus
- (ii) Polymorphism
- (iii) Siblicide
- (iv) Actograms
- (v) Zeitgeber

(2×5=10)

P.T.O.

(b) Differentiate between the following :

- (i) Intersexual and Intrasexual selection
 - (ii) Master clock and Slave clock
 - (iii) Daily rhythms and Free-running rhythms
 - (iv) Focal sampling and scan sampling
- (2×4=8)

(c) Match the following :

- | | |
|-----------------------|----------------------|
| (i) R. A. Fisher | Imprinting |
| (ii) Oscar Heinroth | Sexual selection |
| (iii) E. L. Thorndike | Reciprocal altruism |
| (iv) Robert Trivers | Circadian rhythm |
| (v) Franz Halberg | Operant conditioning |
- (1×5=5)

(d) Fill in the blanks/ True-False : (1×4=4)

- (i) Infanticide is caused by Intra-sexual selection.

- (ii) Species exhibiting altruism are relatively more likely to discriminate against outsiders (non relatives).
 - (iii) Melatonin secretion is often used as a marker of the body clock.
 - (iv) In Orthokinesis, relationship exists between the rate of change of direction (turning) and intensity of stimulus.
 - (v) King Solomon's Ring (book) was written by Konrad Lorenz.
2. (a) Describe foraging in honey bee and comment upon the advantages of waggle dance. (6)
- (b) Discuss various methods of studying and recording animal behaviour. (6)
3. (a) What is associative learning? Explain Pavlov's classical experiments with dogs involving conditioned reflex. (6)
- (b) Explain the correlation between sign stimulus, innate releasing mechanism and fixed action pattern. (6)

4. (a) Classify and explain various form of orientation with suitable example. (6)
- (b) What is filial imprinting? Discuss the role of imprinting in social development of mammals. (6)
5. (a) Give a detailed account of photoperiodic regulation of seasonal reproduction in vertebrates. (6)
- (b) With the help of suitable diagram, discuss the various components of biological oscillators. (6)
6. (a) Explain the adaptive significance of biological clock. (6)
- (b) What are the basic characteristics of biological rhythm? Also state the various types of biological rhythms with suitable examples. (6)
7. Write short notes on any **three** of the following :
- (a) Chronotherapy
- (b) Male-male rivalry
- (c) Fisher's runaway theory
- (d) Supernormal stimuli (4×3=12)

[This question paper contains 4 printed pages.]

2023-2024
Your Roll No.....

Sr. No. of Question Paper : 4503

Unique Paper Code : 32237909

Name of the Paper : Immunology

Name of the Course : B.Sc. (H) 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 **Five** questions in all. Question No. 1 is compulsory.
3. Attempt all the parts of a question together.

1. (a) Define :

- (i) Avidity
- (ii) Extravasation
- (iii) Atopy
- (iv) Cross reactivity

P.T.O.

(v) Opsonization

(1×5)

(b) Write the contribution/s of the following scientists :

(i) Karl Landsteiner

(ii) Rosalyn R. Yalow

(iii) G.M. Edelman and Rodney Porter

(iv) Edward Jenner

(1/2×4)

(c) Differentiate between the following :

(i) Apoptosis and Necrosis

(ii) T helper (T_H) and T cytotoxic (T_C) cells

(iii) Antigen and Immunogen

(iv) Polyclonal and Monoclonal sera

(v) Sabin and Salk vaccine

(2×5)

(d) Expand the following :

(i) CD

(ii) TAP

(iii) MALT

(iv) HLA

(v) SCID

(vi) TLR

(1/2×6)

(e) Write the immunological significance of the following :

- (i) Nude (Athymic) Mice
- (ii) Immune privileged organs
- (iii) Lymph nodes
- (iv) Mononuclear phagocytes (1×4)

(f) Justify the following statements :

- (i) IgM is the first immunoglobulin class produced in a primary response to an antigen
- (ii) Passive immunization is transient
- (iii) Dendritic cells are called versatile (1×3)

2. (a) Differentiate between primary and secondary lymphoid organs. Write a note on structure and function of spleen.

(b) Discuss the properties of T cell epitopes. (8,4)

3. (a) Describe how monoclonal antibodies are produced with the help of hybridoma technology. Write down the applications of monoclonal antibodies.

(b) Discuss the basic attributes of adaptive immunity. (8,4)

4. (a) Illustrate the basic structure of an antibody with the help of suitable diagram(s). Explain how was the structure of antibody deduced with the help of chemical and enzymatic methods?
- (b) Differentiate between the primary and secondary immune response to an antigen. (8,4)
5. (a) Give a detailed account of Gell and Coomb's classification of hypersensitivity with suitable examples.
- (b) Write a note on cytokines. (8,4)
6. (a) Illustrate and discuss the exogenous pathway of antigen processing.
- (b) Give a detailed account of Recombinant Vector vaccines. (6,6)
7. Write short notes : **(Any Three)**
- (i) Hematopoiesis
 - (ii) ELISA
 - (iii) AIDS
 - (iv) Clonal selection theory (4×3)