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30/11/17

10-I

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5832 H

Unique Paper Code : 223501

Name of the Paper : Immunology – ZOHT 507

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.
3. Question No. 1 is Compulsory.

1. (a) Define :

- (i) Haplotype
- (ii) Prozone effect
- (iii) Adjuvant
- (iv) Colostrum
- (v) Opsonisation



(5)

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- (b) Differentiate between the following : (10)
- Cytokine redundancy and cytokine synergism
  - Humoral and Cell mediated Immune response
  - Papain digestion and pepsin digestion of Antibody
  - Attenuated and Killed Vaccine
  - Type I and Type II Hypersensitivity
- (c) Write the contribution/s of the following scientists : (2)
- E. V. Behring and S. Kitasato
  - M. Chase
- (d) Expand the following : (3)
- HEV
  - HLA
  - GALT
  - TLR
  - HAT
  - DTH
- (e) Fill in the blanks : (4)
- After infection, the lymph leaving a lymph node is much richer in \_\_\_\_\_ and \_\_\_\_\_, as compared to lymph entering the lymph node.



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- (ii) The smaller fragments, C3a and C5a, resulting from complement cleavage are called \_\_\_\_\_.
- (iii) Certain microbial cell wall component can activate, \_\_\_\_\_ triggering opsonization and damage to the microbe's plasma membrane.
- (f) Justify the following statements : (3)
- All immunogens are antigens but all antigens are not immunogens.
  - Innate responses are the same in all members of a species.
  - Sperms injected into the animal from which they originated will function as immunogens.
2. (i) What is antigen processing and presentation? Explain with the suitable diagram the exogenous pathway of antigen processing and presentation. (2,7)
- (ii) Explain with suitable example subunit vaccine. (3)
3. What is an antibody? Give the generalized structure of antibody, describe various classes of antibodies, their structural differences and functions. (Give suitable Diagram). (12)

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4. (i) Macrophages play central role in immunity, Justify. (8)
- (ii) Describe Agglutination reaction and its applications. (4)
5. (i) Briefly describe the various antigenic barriers of the immune system and how are they breached. (4)
- (ii) Enumerate the cardinal signs of Inflammation. (4)
- (iii) What are NK cells? Compare the function of NK-cells with respect to CTLs. (4)
6. (i) Define epitope. What are the properties of T cell and B cell epitopes. (2+6)
- (ii) Draw a well labeled diagram of a transverse section of Spleen, illustrating functional histology. (4)
7. Write short notes : (Any Three) : (4,4,4)
- (i) Antigenic determinants on Immunoglobulins
- (ii) Prausnitz-Küstner test
- (iii) MHC I
- (iv) Functions of Cytokines



(2)

[This question paper contains 4 printed pages.]

Your Roll No.....  
512119

Sr. No. of Question Paper : 5833

H

Unique Paper Code : 223503

Name of the Paper : Ecology

Name of the Course : B.Sc. (Hon) 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.
3. Question No. 1 is Compulsory.



1. (a) Define the following :
  - (i) Biosphere
  - (ii) Fecundity
  - (iii) Cyclomorphosis
  - (iv) Allopatric speciation
  - (v) Eutrophication

(5)

P.T.O.



(b) Distinguish between the following :

- (i) Autecology and synecology
- (ii) Realized and fundamental niche
- (iii) Autotrophic and heterotrophic succession
- (iv) Horizontal and vertical life tables
- (v) Commensalism and amensalism (5)

(c) Fill in the blanks :

- (i) Birds exhibit \_\_\_\_\_ type of survivorship curve.
- (ii) Industrial nitrogen fixation is done by \_\_\_\_\_ process.
- (iii) Permanently frozen deeper soil in tundra is called as \_\_\_\_\_ .
- (iv) Assimilation efficiency in carnivores is \_\_\_\_\_ than in herbivores.
- (v) \_\_\_\_\_ are organisms that derive their nutrients from dead and decaying organisms. (5)

(d) Explain the following :

- (i) Energy pyramids can never be inverted.
- (ii) Forest ecosystems have higher species diversity than the grasslands. (4)

(e) Illustrate following with the help of diagrams (no description required) :

- (i) Functional responses of predator
- (ii) Patterns of dispersion (4)

(f) Give contribution of the following scientists :

- (i) A.G. Tansley
- (ii) Charles Elton
- (iii) Joseph Grinnell
- (iv) Ernst Haeckel (4)



- 2. (a) Explain the phenomenon of ecological succession with the help of suitable examples.
- (b) Discuss the various density-dependent factors regulating the population. (6,6)
- 3. (a) Explain with suitable diagrams and equations the exponential and logistic growth forms of population.
- (b) Differentiate between r-selected and k-selected species. (9,3)

4. (a) Describe the universal energy flow model with the help of diagrams. Give equation for Lindeman's efficiency.
- (b) Briefly describe Liebig's law of minimum with the help of suitable examples. (8,4)
5. (a) Diagrammatically represent nitrogen cycle in nature. Add a note on role of microbes in nitrogen cycle.
- (b) Describe the various types of age pyramids. (8,4)
6. Write short notes on **any three** of the following :
- (a) Raunkaier's life forms
- (b) Application of ecology in wildlife conservation
- (c) Competitive Exclusion Principle
- (d) Temperature as a limiting factor
- (e) Types of population interactions (4,4,4)



[This question paper contains 6 printed pages.]

Your Roll No.....  
2117117

Sr. No. of Question Paper : 5834 H

Unique Paper Code : 223505

Name of the Paper : Developmental 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. Attempt five questions in all including Question No. 1 which is compulsory.
3. Draw suitable well labelled diagrams wherever necessary.

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

(i) Epiboly

(ii) Egg Polarity



P.T.O.

(iii) Capacitation

(iv) Life expectancy

(v) Trophoblast

(b) Distinguish between the following : (6)

(i) Animal pole and Vegetal pole

(ii) Area pellucida and Area opaca

(iii) Deciduous placenta and Non-deciduous placenta

(c) Expand the following : (4)

(i) PTHH

(ii) PCBs

(iii) ART

(iv) TGF



(d) Match the following : (3)

(i) Ethel Browne            a) Fertilization

(ii) J.F.Gudernatsch        b) Teratogenesis

(iii) Gregg

(iv) Oscar Hertwig

(v) C. Bonnet

(vi) Waddington

c) Regeneration in Hydra

d) Preformation theory

e) Induction

f) Metamorphosis

(e) State whether the following statements are true or false. (3)

(i) Sertoli cells are located in the ovary.

(ii) In human secondary oocyte undergoes ovulation.

(iii) Three germ layers formation takes place in blastula stage.

(f) Name the germ layers from which the following are derived : (3)

(i) Adrenal cortex

(ii) Enamel

(iii) Duodenum

(iv) Urinary bladder



5834

4



(v) Retina

(vi) Muscle

(g) Answer the following in **one** sentence : (3)

(i) Name the extra-embryonic membrane that appears first in chick embryo.

(ii) Give the reason for the formation of polar bodies in Oogenesis.

(iii) Which animal does undergo stem cell mediated regeneration?

2. (a) Define morphogenetic movements and mention different types of morphogenetic movements that occur during gastrulation. (7)

(b) Describe the process of Spermiogenesis with the help of suitable diagrams. (5)

3. (a) Elaborate hormonal regulation of insect metamorphosis. (8)

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5



(b) Write on Gray crescent formation in frog embryo. (4)

4. (a) Outline the difference between Primary neurulation and Secondary neurulation in vertebrates. Elaborate the process of neural tube formation in vertebrates. (7)

(b) Explain the process of Amniocentesis and its utilities. (5)

5. (a) Define teratogenesis. Why is embryonic period between 3 weeks and 8 weeks vulnerable to teratogens. Explain Fetal alcohol syndrome. (6)

(b) Discuss the role of cortical reaction as blocking mechanism for polyspermy. (6)

6. (a) Enumerate any two theories with regard to senescence. (4)

(b) Describe the structure, development and functions of extraembryonic membranes in chicks. (8)

7. Write short notes on any **three** of the following :

(a) Vitellogenesis

(b) Primary organizer

(c) Epimorphosis

(d) Cleavage

(e) Fate maps



(4×3=12)

①

This question paper contains 4 printed pages]

30/11/17

Roll No.

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S. No. of Question Paper : 6736

Unique Paper Code : 32231501

HC

Name of the Paper : Molecular Biology

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

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, including Q. No. 1 which is compulsory.

Illustrate answers with appropriate well-labelled diagrams wherever necessary.

1. (a) Define the following terms (any five) : 5

- (i) Processivity (ii) Chromatin  
(iii) Consensus sequence (iv) Operon  
(v) Polysome (vi) Tautomerism  
(vii) RNA Interference.

(b) Write down the generalized sequence of the following : 4

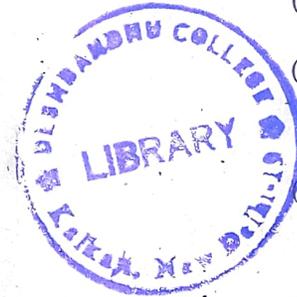
- (i) Kozak sequence  
(ii) Pribnow box



P.T.O.

- (iii) Shine-Dalgarno sequence
- (iv) Downstream promotor element.
- (c) Expand the following : 4
- (i) IRES (ii) MTE
- (iii) SSRP (iv) SAGA
- (d) Diagrammatically represent the structure of the following : 6
- (i) Prokaryotic RNA polymerase
- (ii) tRNA
- (iii) Replisome.
- (e) Answer the following : 8
- (i) How is protein synthesis accuracy ensured without a proof reading enzyme ?
- (ii) Attenuation is an important process to regulate gene expression. Comment.
- (iii) Sigma factor plays an important role in prokaryotic initiation of transcription.
- (iv) In prokaryotes, transcription and translation are coupled processes.
2. (i) Write down the composition of 70S and 80S ribosome subunits. 3
- (ii) Compare and contrast theta mode of replication with the rolling circle mode of replication in prokaryotes. Give appropriate illustrations. 9

3. Elaborate the structure of DNA as proposed by Watson and Crick. Give the distinguishing features of A-DNA with that of B-DNA. 12
4. (i) Based on your knowledge of Lac operon, predict what would happen to the expression of the lac genes under the following conditions :
- (a) A mutation in Lac I gene
- (b) Abnormally high concentration of cAMP available in the cell at all the times
- (c) High concentration of Glucose and Lactose in cell
- (d) Mutation in the lactose-binding site of Lac repressor 8
- (ii) What do you understand by alternate splicing ? Explain with suitable examples. 4
5. (i) Briefly describe the mechanism of transcription termination of prokaryotes. 6
- (ii) Describe function of various enzymes in DNA replication. 6
6. (i) With the help of suitable diagram, explain the formation of pre-initiation complex for transcription in eukaryotes. 5



- (ii) Explain the chemistry of charging of tRNA. 4
- (iii) Protein translation initiation requires more factors in eukaryotes than prokaryotes. Comment. 3

7. Write short notes on any *three* of the following :

3 × 4 = 12

- (i) Riboswitches
- (ii) Mismatch repair of DNA
- (iii) RNA editing
- (iv) Salient features of genetic code
- (v) Wobble hypothesis
- (vi) Role of telomerase in DNA replication.



(2)

1.6

5/12/17

[This question paper contains 8 printed pages]

**Your Roll No.** : .....

**Sl. No. of Q. Paper** : **6737** **HC**

**Unique Paper Code** : 32231502

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

**Name of the Paper** : **Principles of Genetics**

**Semester** : V

**Time : 3 Hours** **Maximum Marks : 75**

**Instructions for Candidates :**

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt any **FIVE** questions including question no. 1, which is compulsory.
- (c) Simple non-programmable calculators are allowed.

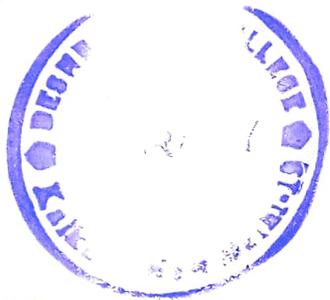
1. (a) Define the following terms (Any **five**) :

5

- (i) Heteroplasmy
- (ii) Non-disjunction
- (iii) Merozygotes



- (iv) Consanguinity
- (v) Idiogram
- (vi) Base analogs
- (b) Differentiate between the following (Any **four**) : 8
- (i) Coupling and Repulsion
- (ii) Transition and Transversion
- (iii) Episome and Plasmid
- (iv) Incomplete dominance and Co-dominance
- (v) Monosomy and Trisomy
- (c) Mention the contribution of following Geneticists (Any **five**) : 5
- (i) Karl Landsteiner
- (ii) Reginald Punnett
- (iii) Calvin B. Bridges
- (iv) Boris Ephrussi
- (v) Thomas Hunt Morgan
- (vi) Theodor Sutton and Walter Boveri



- (d) Give reason for the following (Any **two**) : 3
- (i) A normal mammalian female (XX) and a Turner syndrome female (XO), both have only one active X chromosome still Turner female is sexually abnormal.
- (ii) It is easier to identify spontaneous mutation in bacteria than in most eukaryotes.
- (iii) Genotype of the mother *Limnaea* determines the pattern of shell coiling in progeny. Justify the statement.
- (e) (i) A cross between Red and White coloured flowers of a hypothetical plant results in 256 progenies in F<sub>2</sub> generation. Out of these 256, a total of 4 plants have white flowers. If flower colour in this plant shows polygenic inheritance, calculate the number of genes that are involved in deciding the flower colour. 2



(ii) How many chromosomes would be found in somatic cells of an allotetraploid derived from two plants, one with  $N=5$  and the other with  $N=8$  ? 2

(f) Expand the following abbreviations : 2

(i) TDF

(ii) HAT

(iii) DCO

(iv) 2 AP

2. (i) State the principles of inheritance. What characteristics of an organism would make it suitable for studies of the principles of inheritance ? 4

(ii) What type of inheritance does ABO blood group in humans exhibit ? What are the genotypes of the phenotypes observed in the human populations ? Add a note on 'universal donor' and 'universal recipient'. 6



(iii) What are 'lethal alleles'. Explain with suitable example. 2

3. (i) Explain cell fusion in relation to gene mapping in eukaryotes. 5

(ii) In *Drosophila*, three genes are linked in one chromosome. Assume one parent is dominant and the other one is recessive. In a test cross, the following results were obtained :

ABC	450
abc	490
aBC	28
Abc	32
aBc	196
AbC	204
ABc	288
abC	312
<b>Total</b>	<b>2000</b>

- (a) How do you say that these genes are linked ?
- (b) What is the order of genes ?
- (c) Determine the map distance and construct the chromosomal map ?
- (d) Calculate the coefficient of co-incidence and interference.  $1+2+2+2=7$

4. (i) Briefly discuss the various types of chromosome number aberrations.

8

(ii) Explain the molecular basis of mutations caused by base analogs.

4

5. (i) Enumerate the methods used for gene mapping in bacteria. Explain generalized and specialized transduction with diagrams.

8

6



- (ii) A series of Hfr strains that have genotype  $m^+n^+o^+p^+q^+r^+$  are mixed with F-strain that has genotype  $m^-n^-o^-p^-q^-r^-$ . When the interrupted mating techniques was used with four different strains of Hfr bacteria, the following orders of gene entry and recombination were observed. On the basis of these data, draw a map of the bacterial chromosome :

4

Hfr strain	Order of gene
1	$m^+q^+p^+n^+r^+o^+$
2	$n^+r^+o^+m^+q^+p^+$
3	$o^+m^+q^+p^+n^+r^+$
4	$q^+m^+o^+r^+n^+p^+$

7

P.T.O.



6. (i) Write a note on Sex-influenced traits with suitable examples. 4
- (ii) LINES and SINES and their role in human evolution. 4
- (iii) Discuss 'Bombay phenotype' as an example of epistatic gene interaction. 4

7. Write short notes on (Any **three**) :

4+4+4

- (i) Attached-X method for detection of mutations in *Drosophila*
- (ii) Mitochondrial mutations in *Saccharomyces*
- (iii) Genic Balance Theory in *Drosophila*
- (iv) Ac-Ds elements in Maize



3

[This question paper contains 4 printed pages]

Your Roll No. : .....2017.....

Sl. No. of Q. Paper : 8405 HC

Unique Paper Code : 32237905

Name of the Course : Zoology : OSE for  
Honours

Name of the Paper : Computational Biology

Semester : V

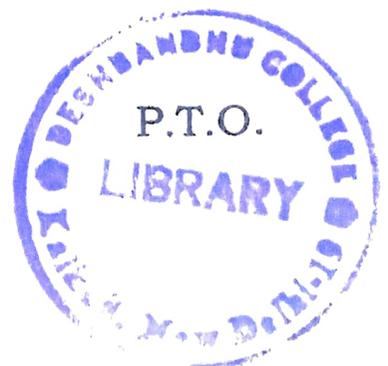
**Time : 3 Hours**                      **Maximum Marks : 75**

**Instructions for Candidates :**

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Question **NO.1** is compulsory.
- (c) Attempt **all** question.

1. (a) Define the following : 1×5=5

- (i) Microarray
- (ii) Curated database
- (iii) Matagenomics
- (iv) Annotation
- (v) Codon



(b) Expand the following :  $0.5 \times 6 = 3$

- (i) BLAST
- (ii) PAMI20
- (iii) QSAR
- (iv) DDBJ
- (v) ZINC
- (vi) ORF



(c) Differentiate between the following :  $2 \times 5 = 10$

- (i) Functional & Structural genomics
- (ii) Homology & Similarity
- (iii) e- value & lod score
- (iv) Paired and unpaired t-test
- (v) PAM and BLOSUM

(d) Write the major contribution of the following scientists.  $1 \times 4 = 4$

- (i) Needleman- Wunsch
- (ii) Smith- Waterman
- (iii) Ronald Aylmer Fisher
- (iv) Margaret Oakley Dayhoff

(e) Match the following :  $1 \times 5 = 5$

- (i) A data base that deals with structure classification. BLAST



- (ii) A database of chemical molecules and their activities against biological assays. Clustal
- (iii) A tool to find regions of similarity between biological sequences . Pubchem
- (iv) A series of widely used computer programs used in Bioinformatics for multiple sequence alignment SAGEmap
- (v) Gene Expression database. SCOP

2. Write Short Notes on the following (Any **three**) :  $5 \times 3 = 15$

- (a) z-test
- (b) Scoring Matrices
- (c) Swiss-Port
- (d) Metabolic pathway database

3. Describe the methods of DNA and Protein sequencing . 8

**OR**

Sequence similarity and sequence identity are synonymous for nucleotide sequences. But, for protein sequences, however, the two concepts are very different. Explain how ? 08

4. Explain the methods used for prediction of tertiary structures of proteins. 08



8405

5. Explain the heuristic methods FASTA and BLAST for sequence alignment. What are the disadvantages of heuristic methods over other dynamic programming methods ? 08

OR

Explain the importance of high-throughput techniques such as microarray and next genome sequencing in functional genomics.

6. (a) Compute the sample Standard Deviation of the following data. 03

24 23 25 23 30 29 28 26 33 29  
24 37 25 23 22 27 28 25 31 29

- (b) The types of raw materials used to construct stone tools found at the archaeological site Casa del Rito are shown below. A random sample of 1486 stone tools was obtained from a current excavation site. 06

Raw Material	Regional Percent of Stone Tools	Observed Number of percent Tools at Current Excavation Site
Basalt	61.3%	906
Obsidian	10.6%	162
Welded tuff	11.4%	168
Pedernal chert	13.1%	197
other	3.6%	53

Use a 1% level of significance to test the claim that the regional distribution of raw materials fits the distribution at the current excavation site.



- (c) Expand the following : 5
- MBL
  - BALT
  - PAMP
  - CLIP
  - CDR
- (d) Give reasons for the following : 2
- Polymers of D-amino acids are poor immunogens.
  - Passive immunization is transient.
- (e) Distinguish between :  $2 \times 5 = 10$
- Innate Immunity and Adaptive Immunity
  - Sabin and Salk vaccines
  - Indirect and Sandwich ELISA
  - IgA and IgE.
  - Macrophage and Dendritic Cell.
- (f) Give the functions of the following : 3
- Adjuvant
  - NK Cell
  - Calnexin.
2. (a) Diagrammatically represent the structure of a monomeric antibody. 6
- (b) Explain the role of T cells in eliciting an immune response. 6



3. (a) What are the different biological properties of cytokines ? 4
- (b) Give a detailed description of the processing and presentation of the endogenous antigen. 8
4. (a) What are the factors influencing the immunogenicity ? 4
- (b) Discuss the initiation and activation of the classical pathway of complement system. 8
5. (a) Define hypersensitivity. Give the Gell & Coomb's classification for hypersensitivity. 8
- (b) With the help of a flow chart explain haematopoiesis. 4
6. (a) Discuss in detail DNA vaccine and its mechanism of immune response. 6
- (b) Discuss the hybridoma technology for production of monoclonal antibodies. 6
7. Write short notes on any *three* of the following:  $3 \times 4 = 12$
- Radioimmunoassay
  - Clonal Selection Theory
  - Primary Lymphoid Organs
  - Immunoelectrophoresis.

