

Total No. of Questions : 5]

SEAT No. :

PD-3279

[Total No. of Pages : 2

**[6479]-101**

**M.Sc.**

**ZOOLOGY**

**ZOO-501-MJ: Advanced Biochemistry  
(2023 Pattern) (Semester - I) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1) Solve any five of the following :**

**[5]**

- a) Define enzyme.
- b) Write any two biological functions of vitamin K.
- c) Write any two functions of Heparin.
- d) Write the full form of SGOT and SGPT.
- e) Write any two functions of silk fibroin.
- f) Write any two applications of Alkaline phosphatase enzyme in diagnostics.

**Q2) Answer the following questions:**

- a) Explain the biochemistry of Blood Group substances. **[6]**
- b) Discuss the biological function of lecithin. **[4]**

**P.T.O.**

**Q3)** Answer the following questions:

- a) Write the disorders of maple syrup urine disease. [6]
- b) Explain the role of immobilized enzymes in Industry. [4]

**Q4)** Answer the following questions:

- a) Explain in detail the process of urea cycle. [6]
- b) Write about the physical properties of amino acids. [4]

**Q5)** Write short notes on any two of the following: [10]

- a) Glycoproteins
- b) Enzyme therapy (streptokinase)
- c) Methylmalonic Acidemia (MMA)



Total No. of Questions : 5]

SEAT No. :

PD-3280

[Total No. of Pages : 2

[6479]-102

M.Sc. (Part - I)

ZOOLOGY

**ZOO - 502 MJ : Advanced Cell Biology  
(2023 Pattern) (Semester - I) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) What is endocytosis?
- b) Define Prokaryotic cell?
- c) What are membrane receptor?
- d) F1 particles
- e) Active transport
- f) Membrane potential

**Q2)** a) What is the mechanism of protein sorting & transport in Endoplasmic reticulum & Mitochondria **[6]**

b) Describe structure & functions of Mitochondria. **[4]**

**Q3)** a) Explain channels & pumps in the cell membrane. **[6]**

b) Describe Phagocytosis process in cell. **[4]**

*P.T.O.*

**Q4)** a) What is cell signalling & add note on their signaling molecules & their receptors. [6]

b) Explain fluid Mosaic model of plasma membrane. [4]

**Q5)** Write short notes on any two of the following : [10]

a) Regulation of cell cycle

b) Cytoskeleton associated proteins & their roles

c) Stem cells, their types & add note on their significance



Total No. of Questions : 5]

SEAT No. :

PD-3281

[Total No. of Pages : 2

[6479]-103

M.Sc.(Part - I)

ZOOLOGY

**ZOO 503 MJ : Comparative Embryology  
(2023 Pattern) (Semester - I) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q.no. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to 5 carry equal marks.*

**Q1) Solve any Five of the following :** [5]

- a) Delamination.
- b) Posterior marginal zone.
- c) Primary hypoblast.
- d) Resact.
- e) Geum cell.
- f) Involution.

**Q2) a) Describe gastrulation in frog.** [6]

- b) Describe the concept of induction and competence giving suitable example. [4]

**Q3) a) Describe the organizer in Hen.** [6]

- b) Describe Oogenesis in mammals. [4]

**Q4) a) Explain regeneration in Hydra.** [6]

- b) Describe the structure of mammalian sperm with labeled diagram. [4]

**P.T.O.**

**Q5) Write short notes on any Two of the following :**

**[10]**

- a) Egg activation in sea urchin.
- b) Blastulation in Drosophila.
- c) Regulation of sperm motility.



Total No. of Questions : 5]

SEAT No. :

PD-3282

[Total No. of Pages : 2

**[6479]-104**  
**M.Sc. (Part - I)**  
**ZOOLOGY**  
**ZOO - 504 MJ : Medical Entomology**  
**(2023 Pattern) (Semester - I) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any Three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

**Q1) Solve any five of the following :**

**[5]**

- a) Name the vector of Japanese encephalitis.
- b) Define Integrated Vector Management.
- c) Define Veterinary Entomology
- d) Define vector incrimination
- e) Define endoparasite
- f) Name any two insect vectors of order hemiptera

**Q2) a) Describe the pathogenicity, mode of transmission & control measures of Filariasis.**

**[6]**

b) Describe the medical importance & control measures of public louse**[4]**

**Q3) a) Explain the life cycle, medical importance & control measures of Bed bug.**

**[6]**

b) Describe the life cycle & medical importance of soft ticks. **[4]**

**P.T.O.**

- Q4)** a) Explain the morphology, life cycle & medical importance of cat flea. [6]  
b) Importance of Flesh Flies & rove beetle in forensic investigations. [4]

**Q5) Write short notes on any two of the following :** [10]

- a) Mechanical method of Vector control  
b) Mode of transmission, prophylaxis & control measures of dengue Fever.  
c) Annoyance





Total No. of Questions : 5]

SEAT No. :

PD-3283

[Total No. of Pages : 2

[6479]-105

M.Sc. (Part - I)

ZOOLOGY

ZOO-505MJ : Biosystematics & Biodiversity

(2023 Pattern) (Semester - I) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q.1 is compulsory.
- 2) Solve any Three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

**Q1) Solve any Five of the following :**

**[5]**

- a) Cladistics
- b) Holotype
- c) Point count
- d) Taxonomic checklists.
- e) State any two roles of "State Biodiversity Board".
- f) Enlist any three endemic species of India.

**Q2) a) Give an account of Simpson's diversity Index.**

**[6]**

b) Write an essay on "Description of new species".

**[4]**

**Q3) a) Discuss the procedure and Applications of DNA barcoding.**

**[6]**

b) Write an essay on "Wildlife Protection Act, 1972".

**[4]**

P.T.O.

**Q4) a)** Give an account of Biodiversity and its importance. **[6]**

b) Write a note on:

i) Point counts

ii) Radio-tracking. **[4]**

**Q5) Solve any two of the following :** **[10]**

a) Taxanomic surveys and checklists.

b) Pielou's Evenness Index.

c) Bioinformatics and its applications in Systematics.



Total No. of Questions : 5]

SEAT No. :

PD-3284

[Total No. of Pages : 2

[6479]-106

M.Sc. (Part - I)

ZOOLOGY

ZOO-508MJ : Biostatistical Applications

(2023 Pattern) (Semester - I) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q.1 is compulsory.
- 2) Solve any Three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.
- 4) Figures to the right indicate full marks.
- 5) Use of calculator and statistical table is allowed.

Q1) Solve any Five of the following :

[5]

Choose correct alternative from the following:

- i) Which one of the following is not a measure of central tendency?
  - a) Mean
  - b) Median
  - c) Mode
  - d) Variance
- ii) A set of values with mean 20 and its coefficient of variation is 15 percent, then variance of the data \_\_\_\_
  - a) 3
  - b) 9
  - c) 30
  - d) 300
- iii) If  $x$  and  $y$  are independent variables then  $\text{corr}(x,y)$  is \_\_\_\_\_.
  - a)  $-1$
  - b)  $1$
  - c)  $0$
  - d) Can not be determined
- iv) If two regression coefficients  $b_{yx}$  and  $b_{xy}$  are equal then which of the following is true.
  - a)  $r = \text{corr}(x,y) = 0$
  - b)  $r = -1$
  - c)  $r = +1$
  - d)  $\text{S.D.}(x) = \text{S.D.}(y)$
- v) A null hypothesis is a \_\_\_\_\_.
  - a) Hypothesis of no interest
  - b) Hypothesis which assign value 0 to the parameter
  - c) Hypothesis of 'no difference'
  - d) Hypothesis which is simple

P.T.O.

- vi) Rejecting null hypothesis H<sub>0</sub> when it is true leads to \_\_\_\_\_
- a) Type - I error                                      b) Type - II error  
c) both type - I & type - II error   d) none of the type of error
- Q2)**
- a) The range, arithmetic mean and standard-deviation of 10 observations are 12, 50 and 6 respectively. If each observation is increased by 10, what will be the range, arithmetic mean, standard deviation and coefficient of variation of new data? [6]
- b) Define : Scatter diagram, explain how it is used to measure correlation.[4]
- Q3)**
- a) From the following data on variable x (rain fall in inches) and y (yield per acre) of a particular place:  $\bar{x} = 27$ ,  $\bar{y} = 40$ , S.D (x) = 3, S.D. (y) = 6,  
 $r = \text{Corr}(x,y) = 0.8$  obtain the equation of line of regression of y on x. Estimate the yield of a crop when rain fall  $x = 30$  at that place? [6]
- b) Define : Type-I error and Type-II error in testing of hypothesis. [4]
- Q4)**
- a) Define : Null hypothesis, Alternative hypothesis, critical region, Acceptance Region Level of significance, p-value. [6]
- b) Describe one way ANOVA table. [4]
- Q5)** Solve any two of the following : [10]
- a) Describe chi-square test of goodness of fit.  
b) Describe two way ANOVA table.  
c) Describe paired t-test.

Total No. of Questions : 5]

SEAT No. :

PD-3285

[Total No. of Pages : 2

[6479]-107

M.Sc. (Part - I)

ZOOLOGY

ZOO-510MJ : FreshWater Zoology

(2023 Pattern) (Semester - I) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q.No.1 is compulsory.
- 2) Solve any Three questions from QNo.2 to QNo.5.
- 3) Questions 2 to 5 carry equal marks.

**Q1) Solve any Five of the following :**

**[5]**

- a) Biotic homogenization.
- b) Hardness of water.
- c) Lotic water Habitat.
- d) Water pollution.
- e) Dissolved oxygen.
- f) Wetlands

**Q2) a) What is eutrophication? Explain its causes and consequences.**

**[6]**

b) Describe the importance of freshwater habitats.

**[4]**

**Q3) a) Write the distinguishing features of Rotifera.**

**[6]**

b) Explain the implications of physical conditions of water on Freshwater fauna.

**[4]**

P.T.O.

- Q4)** a) Describe in detail ecological and economical importance of catfishes. **[6]**  
b) Explain the need and importance of conservation. **[4]**

**Q5)** Solve any two of the following : **[10]**

- a) Impact of climate change on fresh water habitats.
- b) Lentic freshwater body.
- c) Diagnostic features of fairy shrimp.



Total No. of Questions : 5]

SEAT No. :

PD-3286

[Total No. of Pages : 2

**[6479]-108**

**M.Sc. (Part-I)**

**ZOOLOGY**

**ZOO-MJ 514: Research Methodology - Theory**

**(2023 Pattern) (Semester - I) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions No. 2 to 5 carry equal marks.*

**Q1) Solve any five of the following :**

**[5]**

- a) H – Index
- b) Appendix
- c) Genebank
- d) UGC care list Journal
- e) Citation
- f) Qualitative data

**Q2) a) What is the meaning of Research. Add a note on types of research. [6]**

b) Explain the steps involved in scientific research process. **[4]**

**P.T.O.**

**Q3) a)** What do you mean by Ethics? Explain the basic principles of human research Ethics. **[6]**

b) Describe scaling technique. **[4]**

**Q4) a)** Describe the structure of dissertation. **[6]**

b) Add a note on biodiversity act 2008. **[4]**

**Q5)** Solve any two of the following: **[10]**

a) Epidemiological studies

b) Publication Ethics

c) Data collection





Total No. of Questions : 5]

SEAT No. :

PD-3287

[Total No. of Pages : 2

**[6479]-201**  
**M.Sc. - I**  
**ZOOLOGY**  
**ZOO 551 MJ: Molecular Biology**  
**(2023 Pattern) (Semester - II) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) Name different types of RNA polymerases.
- b) Differentiate between leading and lagging strands.
- c) What are TATA building proteins
- d) Define mutarotation.
- e) Define Replication.
- f) What is linking number.

**Q2)** Answer the following questions.

- a) Explain the structure of tRNA (Cloverleaf model)
- b) Describe cot 1/2 kinetic and sequence complexity

**[6]**

**[4]**

**P.T.O.**

**Q3)** Answer the following questions.

- a) Describe the mechanism of transcription in Eukaryotes. [6]
- b) Write about the nucleosome model of chromatin [4]

**Q4)** Answer the following questions.

- a) Describe the characteristics of Genetic Code. [6]
- b) Write about Ribonucleoproteins (SnRNPs and ScRNPs) [4]

**Q5)** Write short notes on any two of the following: [10]

- a) Watson crick model of DNA
- b) Physical properties of DNA
- c) Translation in prokaryotes.



Total No. of Questions : 5]

SEAT No. :

PD-3288

[Total No. of Pages : 2

[6479]-202

M.Sc. - I

ZOOLOGY

**ZOO 552 MJ : Comparative Endocrinology**

**(2023 Pattern) (Semester -II) (2 Credits )**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instruction to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Solve any Five of the following:

**[5]**

- a) Hormone receptor
- b) Name disorder of Thyroid gland
- c) Cortisol
- d) Name two hormones responsible for fat metabolism.
- e) Homeostasis
- f) Acromegaly

**Q2)** a) Describe Renin-Angiotensin systems in nonmammalian tetrapods? **[6]**

b) Why the calcium homeostasis is important in Animals? **[4]**

**Q3)** a) Compare the structure and functions of the pituitary gland in fish, amphibian and mammals? **[6]**

b) Describe effects of Insulin on carbohydrate metabolism? **[4]**

*P.T.O.*

**Q4)** a) Define chemical signals in vertebrates and explain the main types involved in bioregulation. [6]

b) Write a role of Parathyroid hormones? [4]

**Q5)** Write short notes on any Two of the following. [10]

a) Amino acid derived Hormones.

b) Describe role of thyroid hormone in thermogenesis?

c) Hormonal regulation of Mineral metabolism.



Total No. of Questions : 5]

SEAT No. :

PD-3289

[Total No. of Pages : 2

[6479]-203

M.Sc. - I

ZOOLOGY

**ZOO-553-MJ : Comparative Animal Physiology  
(2023 Pattern) (Semester - II) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*

**Q1) Solve any Five of the following :**

**[5]**

- a) Define gills and mention its importance.
- b) Define osmoregulators with examples.
- c) Define hypo-osmotic regulation.
- d) What are gustatory organs? Give examples.
- e) Define Bowman's capsule.
- f) Define the thermoregulation term-convection.

**Q2) a) Describe the internal structure of mammalian heart with diagram.**

**[6]**

b) Give general outline of a ruminant digestive system.

**[4]**

**Q3) a) Describe the proteins of myofilaments with their functions.**

**[6]**

b) Give the structure and function of haemocyanin.

**[4]**

**P.T.O.**

**Q4) a)** Describe the process of osmoregulation in birds. **[6]**

b) Describe renal regulation in the process of excretion. **[4]**

**Q5)** Write short notes on any Two of the following. **[10]**

a) Homeotherms

b) Cone cells

c) Uricotelism



Total No. of Questions : 5]

SEAT No. :

PD-3290

[Total No. of Pages : 2

[6479]-204

M.Sc.-I

ZOOLOGY

**ZOO-554-MJ: Biochemical Techniques  
(NEP 2023 Pattern) (Semester - II) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) What is PAGE?
- b) Define stationary phase.
- c) What is mean by spectroscopy?
- d) Define NMR.
- e) Enlist the types of Light Microscope lenses.
- f) What is SEM & TEM?

**Q2) a)** Explain the principle & working of Affinity Chromatography.

**[6]**

b) Write a note on agarose gel electrophoresis.

**[4]**

**P.T.O.**

**Q3) a)** Describe the principle and working of Inverted microscope. **[6]**

b) Explain density gradient centrifugation with its applications. **[4]**

**Q4) a)** Explain chain/dye terminator sequencing methods. **[6]**

b) Describe the principle and components of spectrophotometer. **[4]**

**Q5) Solve any two of the following:** **[10]**

a) Explain the types of Electrophoresis units & mention the use of supporting media.

b) Write a note on Protein Sequencing Methods.

c) Describe X-ray diffraction.





Total No. of Questions : 5]

SEAT No. :

PD-3291

[Total No. of Pages : 2

[6479]-205

M.Sc. (Part - I)

ZOOLOGY

**ZOO-555 MJ : Integrated Pest Management**

**(2023 Pattern) (Semester - II) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry eqaul marks.*

**Q1) Solve any five of the following :**

**[5]**

- a) Mention any ethics in IPM.
- b) Write names of any two entomopathogenic viruses in insect pest control.
- c) Define pheromones.
- d) What is genetic manipulation?
- e) Define pesticide resistance.
- f) What is sterile insect release?

**Q2) a) Describe the biological control in integrated pest management.**

**[6]**

b) Explain damage caused by insect pests and their symptoms.

**[4]**

**Q3) a) Describe genetic manipulation of pest population.**

**[6]**

b) Explain safety protocols for pesticide use.

**[4]**

*P.T.O.*

- Q4)** a) Describe bioherbicide approach to weed control by using plant pathogens. [6]
- b) Explain the use of fluorescence image sensing. [4]

**Q5) Write short notes on any Two of the following :** [10]

- a) Low power cameras and sensors
- b) Herbicides
- c) Significance of IPM



Total No. of Questions : 5]

SEAT No. :

PD-3292

[Total No. of Pages : 2

[6479]-206

M.Sc. - I

ZOOLOGY

**ZOO 560 MJ : Medical Parasitology  
(2023 Pattern) (Semester - II) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to 5 carry equal marks.*

**Q1) Solve any Five of the following :** [5]

- a) Define the term parasite.
- b) Define immune response.
- c) Give any two examples of class Cestoda.
- d) Give scientific name of Black fly and Sand fly.
- e) Define tissue biopsy.
- f) Give any two uses of chloroquine.

**Q2) a)** Write a note on adaptation to parasitism. Explain its morphological adaptations with examples. [6]

b) What are vectors? Describe their types with example. [4]

**Q3) a)** Describe the life cycle, mode of transmission, symptoms and prophylaxis of *Entamoeba histolytica*. [6]

b) Explain drug resistance in *Leishmania*. [4]

**Q4) a)** Give general features, control measure and significance of the vector-mites. [6]

b) Explain the term Zoonotic disease. Give preventive and control measures of Toxoplasmosis. [4]

**P.T.O.**

**Q5) Write short on notes any Two of the following :**

**[10]**

- a) Urinogenital specimen culture method.
- b) Status of drug resistance in India.
- c) Clinical features and disease management of Trypanosoma sp.



Total No. of Questions : 5]

SEAT No. :

PD-3293

[Total No. of Pages : 2

[6479]-207

M.Sc. - I

ZOOLOGY

ZOO-562-MJ: Economic Zoology

(2023 Pattern) (Semester - II) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q. 2 to Q. 5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following :

[5]

- a) Define pisciculture
- b) Write the names of any two parasitic protozoans harmful to domestic animals.
- c) Mention the names of microbes used in biofloc system.
- d) Define fishery.
- e) What is apiculture?
- f) Write the names of any two ornamental fishes.

Q2) a) Describe pen and cage type of aquaculture system.

[6]

b) Explain value added products from fisheries.

[4]

P.T.O.

- Q3)** a) Describe preparation of farm for prawn culture. [6]  
b) Explain pearl culture in India. [4]
- Q4)** a) Describe disease management nutrition and feeding management in biofloc fish farming. [6]  
b) Explain parasitic helminths harmful to humans domestic animals and livestock. [4]
- Q5)** Write short notes on any two of the following: [10]  
a) Present status of aquaculture in India  
b) Biofloc technology for water quality management.  
c) Applications of Sponge culture.



Total No. of Questions : 7]

SEAT No. :

PD-3294

[Total No. of Pages : 2

[6479]-301

M.Sc. (Part - II)

ZOOLOGY

ZOO 601 MJ : Animal Physiology - I

(2023 Pattern) (Semester - III) (4 Credits)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q. 1 is compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

**Q1) Solve any Five of the following :**

**[10]**

- a) Define Photoperiodism.
- b) What is Synapsis.
- c) What are refracting errors of eyes.
- d) What is neuropeptide?
- e) Write about motion sickness.
- f) Write about Epilepsy.

**Q2) Answer the following questions :**

- a) Explain in detail the molecular basis of skeletal muscle contraction. **[7]**
- b) Draw neat and well labelled diagrams of internal structure of ear. **[5]**

**Q3) Answer the following questions :**

- a) Explain in detail the physiology of eyesight. **[7]**
- b) Write about different determinants of metabolic rate. **[5]**

**Q4) Answer the following questions :**

- a) What is haemato poiesis. Explain the molecular mechanisms of blood clotting. **[7]**
- b) Explain the structure and fucntions of luminiscent organs. **[5]**

**P.T.O.**

**Q5) Answer the following questions :**

- a) Describe the neuroanatomy of spinal cord. [7]
- b) Describe the different disorders of eyes. [5]

**Q6) Answer the following questions :**

- a) Explain the regulation of any two biological clocks. [7]
- d) Explain the local control of motor neurons. [5]

**Q7) Write short notes on any Two of the following : [12]**

- a) Origin and saltatory conduction of nerve impulse.
- b) Electrical conduction of Heart.
- c) Structure and functions of Electro-receptors.





Total No. of Questions : 7]

SEAT No. :

PD-3295

[Total No. of Pages : 2

**[6479]-302**

**M.Sc. - II**

**ZOOLOGY**

**ZOO-601-MJ: Entomology- I (Special)  
(2023 Pattern) (Semester - III) (4 Credits)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*

**Q1) Solve any five of the following :**

**[10]**

- a) Define Exopterygota.
- b) Write the structure and example of moniliform antenna.
- c) Explain tegmina.
- d) Explain natatorial leg with example.
- e) Explain polypneustic tracheal system.
- f) Explain photocytes.

**Q2) a) Describe morphology of head of a typical insect.**

**[7]**

b) Explain the characters of Isoptera with two examples.

**[5]**

**P.T.O.**

- Q3)** a) Explain in brief different theories regarding origin of insects. [7]  
b) Explain in brief structure and functions of integument in insects. [5]
- Q4)** a) Explain circulatory system in insects. [7]  
b) Explain the characters of Orthoptera with two examples. [5]
- Q5)** a) Give the distinguishing characters of order Collembola with two examples. [7]  
b) Explain polytrophic ovariole. [5]
- Q6)** a) Mention the distinguishing characters of Coleoptera with two examples. [7]  
b) Explain central nervous system of a generalized insect. [5]
- Q7)** Write short notes on any two of the following: [12]  
a) Chewing and lapping type of mouthparts.  
b) Exocrine glands in insects.  
c) Nephrocytes and Labial glands.



Total No. of Questions : 7]

SEAT No. :

PD-3296

[Total No. of Pages : 2

[6479]-303

M.Sc. (Part - II)

ZOOLOGY

ZOO - 601 - MJ : Genetics - I (Special)

(2023 Pattern) (Semester - III) (4 Credits)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.no. 1 is compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

**Q1) Solve any Five of the following :**

**[10]**

- a) Define Mendelism & extension of mendelism.
- b) Mention the types of selection.
- c) What are DNA binding motifs? Mention their types.
- d) What is Genetic coadaptation?
- e) Define YAC & BAC.
- f) Enlist the characters of Autosomal Inheritance.

**Q2) a)** What is polygenic inheritance? Explain concept of continuous variation, phenotypic variance and its partitioning into subcomponents. **[7]**

b) Explain Gene mapping by specialized transduction. **[5]**

**Q3) a)** Explain methods of gene transfer in bacteria. **[7]**

b) Describe Hardy Weinberg Genetic equilibrium and its applications. **[5]**

**Q4) a)** Describe molecular evolution with respect to change in nucleotide, amino acid sequences and molecular clock theory. **[7]**

b) Explain regulation of tryptophan operon by attenuation. **[5]**

**P.T.O.**

- Q5)** a) Explain in brief positive and negative regulation of Lac operon. Describe enhancers and promotor elements in operon system. [7]  
b) Describe the procedure for construction of phylogenetic tree. [5]
- Q6)** a) Describe the mechanism of sex determination in human and dosage compensation. [7]  
d) Explain mode of action and application of restriction enzymes. [5]
- Q7) Write short notes on any Two of the following :** [12]  
a) Chloroplast variegation in 4 O' clock plant  
b) Genetic drift  
c) Genomic imprinting



Total No. of Questions : 5]

SEAT No. :

PD-3297

[Total No. of Pages : 2

[6479]-304

M.Sc. - II

ZOOLOGY

**ZOO - 602 MJ : Physiology of Reproduction**

**(2023 Pattern) (Semester - III) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) Fertilization
- b) Capacitation
- c) Testosterone Derivative
- d) Spermatogenesis
- e) Endometrium
- f) ZIPT

**Q2)** a) Describe types and functions of Placenta.

**[6]**

b) Describe Hormonal regulation of menstrual cycle.

**[4]**

**Q3)** a) Explain Hormonal control of lactation and add a note on sucking reflex.

**[6]**

b) Describe ultrastructure of sperm with neat labelled diagram.

**[4]**

*P.T.O.*

**Q4)** a) Explain oogenesis process with hormonal regulations. [6]

b) Describe in detail Invitro fertilization (IVF)? [4]

**Q5)** Write a short note on any two of the following : [10]

a) Write a short note on Reproductive dysfunctions.

b) What is prostaglandin and explain their role in reproduction?

c) Describe the events that the fertilized eggs will undergoes upto implantation of blastocyst in the uterus?



Total No. of Questions : 5]

SEAT No. :

PD-3298

[Total No. of Pages : 2

[6479]-305

M.Sc. (Part - II)

ZOOLOGY

ZOO - 603 MJ : Developmental Biology

(2023 Pattern) (Semester - III) (2 Credits)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) Define model organism.
- b) Define developmental biology.
- c) Define polyphenism.
- d) What is heterochrony?
- e) What is Duffy blood group substance?
- f) What is autoimmune disease?

**Q2)** a) Describe the process of neural tube formation in Chick.

**[6]**

b) Explain Free radical theory of aging.

**[4]**

**Q3)** a) Explain proximal-distal axis specification in vertebrate limb.

**[6]**

b) Give the significance of environmental cues in development.

**[4]**

**P.T.O.**

- Q4)** a) Describe in brief the events involved in process of apoptosis adding a note on significance of casepases. [6]
- b) Describe morphogenetic constrains on evolution. [4]

**Q5)** Write short notes on any two of the following : [10]

- a) *Xenopus laevis* as a model organism.
- b) Folic acid antagonist and teratogenesis.
- c) Temperature induced polyphenism.





Total No. of Questions : 5]

SEAT No. :

PD-3300

[Total No. of Pages : 2

**[6479]-307**  
**M.Sc. (Part - II)**  
**ZOOLOGY**  
**ZOO-610MJ : Applied Genetics**  
**(2023 Pattern) (Semester - III) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any Three quations from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1) Solve any Five of the following :**

**[5]**

- a) Molecular marker
- b) Genetic counselling
- c) Genomics
- d) BAC
- e) Pedigree
- f) Genetic disease

**Q2) a) Describe various DNA modifying enzymes used in genetic engineering.[6]**

b) Explain stem cell therapy. **[4]**

**Q3) a) Discuss Autosomal Dominance inheritance pattern. Add a note on their complications. [6]**

b) Discuss E.coli genome project. **[4]**

**P.T.O.**

**Q4) a)** Write a note on DNA fingerprinting and its application **[6]**

b) Explain the Blue-white selection screening. **[4]**

**Q5)** Solve any two of the following : **[10]**

a) Explain bacterial transduction.

b) Describe in detail the process of genetic counseling.

c) Discuss use of somatic cell genetics in production of monoclonal antibodies.



Total No. of Questions : 5]

SEAT No. :

PD-3301

[Total No. of Pages : 2

[6479]-308

M.Sc. (Part - II)

ZOOLOGY

ZOO 612 MJ : Animal Behaviour

(2023 Pattern) (Semester - III) (2 Credits)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates :*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) What is innate behaviour?
- b) What is sperm competition?
- c) What is herding in mammals?
- d) What is dispersal?
- e) Define mimicry.
- f) What is homing in birds?

**Q2)** a) Describe in detail habitat selection.

**[6]**

- b) Write a note on learning behaviour in animals.

**[4]**

**P.T.O.**

- Q3)** a) Describe schooling in fishes. [6]
- b) Write a note on camouflage. [4]
- Q4)** a) Describe in detail courtship. [6]
- b) Explain parental care with suitable example. [4]
- Q5)** Write short notes on any two of the following : [10]
- a) Evolution of sexes
- b) Auditory and tactile communication
- c) Social organization in insects



Total No. of Questions : 7]

SEAT No. :

PD-3302

[Total No. of Pages : 2

**[6479]-401**  
**M.Sc. (Part-II)**  
**ZOOLOGY**  
**ZOO-651-MJ: Animal Physiology - II**  
**(2023 Pattern) (Semester - IV) (4 Credits)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*

**Q1)** Solve any five of the following :

**[10]**

- a) In what two organs does major glycogen storage occur?
- b) Define Respiratory Quotient.
- c) Write the functions of three small bones present in middle ear
- d) What three hormones do the kidneys secrete?
- e) Name the mood disorders.
- f) What is chronic obstructive pulmonary disease.

**Q2)** Answer the following questions.

- a) Describe the major metabolic pathways of the absorptive state. **[7]**
- b) Write about the neural basis of learning. **[5]**

**P.T.O.**

**Q3)** Answer the following questions.

- a) Explain the phenomenon of transport of oxygen in Blood. [7]
- b) Describe the glucose sparing (Fat utilization) [5]

**Q4)** Answer the following questions.

- a) Describe the functional organization of chromatophore system. [7]
- b) Describe the mechanism of inspiration and expiration in the alveoli of lungs. [5]

**Q5)** Answer the following questions.

- a) Describe the role of different neural substrates involved in the states of awake and sleep. [7]
- b) Describe the role of mechanoreceptors and their response. [5]

**Q6)** Answer the following questions.

- a) With the help of diagram explain the relationship between the middle ear bones and cochlea [7]
- b) Draw neat and labelled diagram of Nephron [5]

**Q7)** Write short notes on any two of the following: [12]

- a) Coma
- b) Eye movement
- c) Ultrafiltration



Total No. of Questions : 5]

SEAT No. :

PD-3303

[Total No. of Pages : 2

**[6479]-402**  
**M.Sc. (Part-II)**  
**ZOOLOGY**  
**ZOO-651-MJ: Entomology-II**  
**(2023 Pattern) (Semester - IV) (4 Credits) (Special)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*

**Q1)** Answer any five of the following :

**[10]**

- a) Explain oviposition habits in insects laying eggs in aquatic habitat.
- b) Explain paurometabolous development.
- c) Explain aging in insects.
- d) Explain campodeiform larva with suitable example.
- e) Explain emergence from the cocoon.
- f) Explain polypod phase of insect embryo.

**Q2) a)** Describe the process of spermatogenesis in insects.

**[7]**

b) Explain the process of vitellogenesis in insects.

**[5]**

**P.T.O.**

- Q3)** a) Describe development of insects up to germ band formation. [7]  
b) Describe embryonic development of alimentary canal in insects. [5]
- Q4)** a) What is gastrulation? Explain the general process of gastrulation in insects. [7]  
b) Describe exarate pupa with suitable examples. [5]
- Q5)** a) What is metamorphosis? Explain complete metamorphosis in insects. [7]  
b) What is diapause? Describe its occurrence and initiation. [5]
- Q6)** a) Explain regeneration in insects. [7]  
b) Describe embryonic development of reproductive system in insects. [5]
- Q5)** Write short notes on any two of the following: [12]  
a) Polyembryony  
b) Apodous larva  
c) Segmentation and appendages formation





Total No. of Questions : 7]

SEAT No. :

PD-3304

[Total No. of Pages : 2

**[6479]-403**  
**M.Sc. (Part-II)**  
**ZOOLOGY**  
**ZOO-651-MJ: Genetics - II**  
**(2023 Pattern) (Semester - IV) (4 Credits) (Special)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*

**Q1)** Answer any five of the following :

**[10]**

- a) What is significance of yeast as a model organism?
- b) Define apoptosis
- c) What are triplet repeat disorders?
- d) State the role of HOX genes in development.
- e) What is the genetic basis of Antibody diversity?
- f) Define Parkinson's disease & its genetic components.

**Q2) a)** Discuss the genetic mechanism behind sickle cell Anemia & Thalassemia.

**[7]**

- b) Explain the role of inbred strains in mouse genetics.

**[5]**

**P.T.O.**

- Q3)** a) Explain integration of genetic, cytogenetic and physical maps in genome study. [7]
- b) Describe the process of mutagenesis and its impact on DNA repair. [5]
- Q4)** a) Describe the functional role of Oncogene products in cancer progression. [7]
- b) Explain the concept of gene synteny & orthology. [5]
- Q5)** a) Explain the role of whole-genome sequencing in disease gene identification. [7]
- b) Discuss the role of tumor suppressor genes in multistep cancer development. [5]
- Q6)** a) Discuss the role of genetic & environmental factors in schizophrenia.[7]
- b) Explain the function and diversity of TCR generation. [5]
- Q7)** Write notes on any two of the following: [12]
- a) Sleep-wake cycle in mammals
- b) Phage RNA.
- c) Twin and adoption studies



Total No. of Questions : 5]

SEAT No. :

PD-3305

[Total No. of Pages : 2

[6479]-404

M.Sc. (Part - II)

ZOOLOGY

ZOO-652-MJ : Ecology and Evolution

(2023 Pattern) (Semester - IV) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

**Q1) Solve any five of the following :**

**[5]**

- a) Define the term 'Ecology'.
- b) What is mass extinction. Give one example of it.
- c) Define the term 'Natural selection'.
- d) What do you mean by 'Neo-Darwinism'?
- e) Give two examples of abiotic components of Ecosystem.
- f) Define 'Biosphere.'

**Q2) a) What is stratification? Write a note on types of stratification and its ecological importance.**

**[6]**

b) Discuss briefly Evolution of Kenyapithecus and its role in Human Evolution.

**[4]**

**Q3) a) Describe the structure and types of food chains in an Ecosystem.**

**[6]**

b) Explain the concept of Analogy in Evolution Add a note on how it supports Convergent Evolution.

**[4]**

**P.T.O.**

- Q4)** a) Explain the 'Origin and Evolution of Universe' with the help of 'Big Bang Theory'. [6]
- b) Define food web. Describe structure and significance of food web. [4]

**Q5) Write short notes on any Two of the following :** [10]

- a) Genetic drift and its Evolutionary Significance.
- b) Origin of Prokaryotic Cells.
- c) Embryological Evidences of Evolution.



Total No. of Questions : 5]

SEAT No. :

PD-3306

[Total No. of Pages : 2

[6479]-405

M.Sc. (Part - II)

ZOOLOGY

ZOO-653 MJ : Environmental Biology

(2023 Pattern) (Semester - IV) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

**Q1) Solve any five of the following :**

**[5]**

- a) Define 'Keystone Species'.
- b) What is 'Biome'?
- c) What do you mean by 'Biotransformation'.
- d) How will you define the term 'Natural Resource'?
- e) What is carrying capacity?
- f) What do you mean by 'Acid Rain'?

**Q2) a) Write an essay on : Tropical rainforests, their significance and threats. [6]**

b) Write short note on : Global warming and its consequences. **[4]**

**Q3) a) Discuss the types of Natural resources and their exploitation. [6]**

b) Explain briefly : Types of Speciation. **[4]**

*P.T.O.*

- Q4)** a) Write a descriptive explanation of : Green Roofs and Green chemistry. [6]
- b) Explain briefly Shelford's law of Tolerance. [4]

**Q5) Write short notes on any Two of the following : [10]**

- a) Population Dispersion
- b) Major water-borne diseases of Humans
- c) Rain water Harvesting



Total No. of Questions : 5]

SEAT No. :

PD-3307

[Total No. of Pages : 2

**[6479]-406**  
**M.Sc.(Part-II)**  
**ZOOLOGY**  
**ZOO-660-MJ: Applied Entomology**  
**(2023 Pattern) (Semester - IV) (2 Credits)**

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidate:*

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

**Q1)** Solve any five of the following :

**[5]**

- a) Explain Agricultural entomology
- b) Define Apiculture.
- c) Write examples of non-Insect Pest.
- d) What is Livestock entomology?
- e) Write biological name of pulse beetle.
- f) Explain nature of damage of snail?

**Q2)** a) Describe the morphology, nature of damage and control measures of pest of maize. **[6]**

b) Write nature of damage and control measures of crab. **[4]**

**P.T.O.**

- Q3)** a) Describe the life cycle of the honey bee and explain the various bee products. [6]
- b) Describe the major pest of livestock and their control measures. [4]
- Q4)** a) Describe the morphology, nature of damage and control measures of Rice weevil. [6]
- b) Explain different types of silk moth. [4]
- Q5)** Write short notes on any two of the following: [10]
- a) Scope of Industrial and nutritional entomology.
- b) Control measures of pomegranate fruit borer.
- c) Nature of damage and control measures of sugarcane shoot borer.





Total No. of Questions : 5]

SEAT No. :

PD-3308

[Total No. of Pages : 2

[6479]-407

M.Sc. (Part - II)

ZOOLOGY

ZOO-662-MJ : Immunology

(2023 Pattern) (Semester - IV) (2 Credits)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q.1 is compulsory.
- 2) Solve any three equations from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

**Q1) Solve any Five of the following :**

**[5]**

- a) What is humoral immunity?
- b) What is natural killer cells?
- c) Define MHC.
- d) Enlist examples of vaccines.
- e) Define Monoclonal antibody.
- f) Define Autoimmunity.

**Q2) a) Explain the process of antigen-antibody reaction.**

**[6]**

b) Describe the iso, allo and ido types of receptors.

**[4]**

**Q3) a) Describe different types of primary lymphoid organs.**

**[6]**

b) Explain the concept of Immunological memory.

**[4]**

**Q4) a) What is complement fixation? Explain complement fixation test.**

**[6]**

b) Explain the mechanism of antibody synthesis and its diversity.

**[4]**

P.T.O.

**Q5)** Solve any two of the followings :

**[10]**

- a) Explain the types of hypersensitivity.
- b) Describe cell-mediated immunity.
- c) Write a note on Immunodeficiencies and disorders.

