

Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**PE4556**

**[6513]-1**

**M.Sc.- I**

**ZOOLOGY**

**ZOO-501MJ : Advanced Biochemistry**

**(2023 & 2024 Credit 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 Q.2 to Q.5 carry equal marks.*

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

**[5]**

- a) Define polysaccharide
- b) Define saponification.
- c) Write clinical significance of SGOT
- d) Write biological function of collagen.
- e) Enlist water soluble vitamins.
- f) Define ion Exchange chromatography.

**Q2) a) Explain tricarboxylic acid cycle also write the total no. of ATP's generated**

**[6]**

b) Write about the biological functions of fat soluble vitamins.

**[4]**

**Q3) a) Explain Separation of amino acids by paper chromatography.**

**[6]**

b) Write about synthesis of deoxyribonucleotides .

**[4]**

**P.T.O.**

- Q4)** a) Explain urea cycle and inherited defects of urea cycle. [6]  
b) Explain role of immobilized enzymes in industry [4]

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

- a) Blood Group Substances.
- b) Phenylketonuria
- c) Gout



Total No. of Questions : 5]

SEAT No. :

**PE4557**

[Total No. of Pages : 1

**[6513]-2**

**M.Sc. - I**

**ZOOLOGY**

**ZOO-502 MJ : Advanced Cell Biology**

**(2023 & 2024 Credit Pattern) (Semester - I) (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 equal marks.

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

- a) What is endocytosis?
- b) Active transport.
- c) Why Mitochondria is called powerhouse?
- d) Define Prokaryote cell.
- e) What is cytoskeleton?
- f) What is unit membrane?

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

b) Write a short note on phagocytosis? **[4]**

**Q3) a) Describe Channels & Pumps in the cell membrane?** **[6]**

b) Explain Nuclear transport of Protein? **[4]**

**Q4) a) What is Endomembrane system? Describe in detail?** **[6]**

b) What is significance of cell signaling? **[4]**

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

- a) Cell culture & its applications.
- b) Cytoskeleton associated protein & their role.
- c) Regulation of cell cycle.

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Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**PE4558**

**[6513]-3**

**M.Sc.- I**

**ZOOLOGY**

**ZOO-503-MJ : Comparative Embryology  
(2023 & 2024 Credit 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 Q.2 to Q.5 carry equal marks.*

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

**[5]**

- a) Define Involution.
- b) What is delamination?
- c) Give any one function of organizer.
- d) Define Blastulation.
- e) What is Regeneration?
- f) Define fertilization.

**Q2) a) Describe gastrulation in Frog.**

**[6]**

b) Describe species specific sperm attraction in sea urchin.

**[4]**

**Q3) a) Describe the role of Hensen's node in Hen.**

**[6]**

b) Describe the fusion of genetic material in mammals.

**[4]**

**P.T.O.**

- Q4)** a) Describe different types of eggs based on distribution and size of yolk granules. [6]
- b) Describe the structure of mammalian sperm with neat and labelled diagram. [4]

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

- a) Regeneration in Hydra.
- b) Types of stem cells.
- c) Germ cell migration in Drosophila.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PE4559**

**[6513]-4**

**M.Sc.- I**

**ZOOLOGY**

**ZOO-504-MJ : Medical Entomology**

**(2023 &2024 Credit 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) Name the Vector of Dubonic plague.
- b) Define integrated vector surveillance.
- c) Define ectoparasites.
- d) Define allergies.
- e) Enlist the two insect vector from order diptera.
- f) Name the vector of bartonellosis.

**Q2) a) Explain the morphology, life cycle & medical importance of cat flea. [6]**

b) Describe the mode of transmission & prophylaxis of dengue fever. [4]

**Q3) a) Describe the pathogenicity, mode of transmission & control measure of leishmaniasis. [6]**

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

*P.T.O.*

- Q4)** a) Explain the life cycle, medical importance & control measure of forest fly. [6]
- b) Forensic importance of Dermestid beetles & sap beetle. [4]

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

- a) Ecological method of vector control.
- b) Explain envenomization with examples.
- c) Morphology & life cycle of reduviid bug.



Total No. of Questions : 5]

SEAT No. :

**PE4560**

[Total No. of Pages : 1

**[6513]-5**

**M.Sc. - I**

**ZOOLOGY**

**ZOO 505 MJ : Biosystematics and Biodiversity**

**(2023 & 2024 Credit Pattern) (2 Credits) (Semester - I)**

*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 equal marks.

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

- a) Define 'Systematics'.
- b) What is 'endemic species'? Mention 2 examples of it.
- c) What is ICZN?
- d) What do you mean by 'Point Count Method'?
- e) What is Holotype?
- f) State names of any 3 Biodiversity Hotspots from India.

**Q2) a) Write an essay on 'Zoological Nomenclature'. [6]**

b) Write a note on "Voucher specimen and its importance". [4]

**Q3) a) Give an account of : Linnean system of Classification. [6]**

b) Explain briefly 'The Radio-tracking' method. [4]

**Q4) a) Give a comparative account of Shannon and Simpson's diversity indices.[6]**

b) Write a note on : Indian Wildlife Protection Act, 1972. [4]

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

- a) Biodiversity Management Committee (BMC).
- b) Animal Biodiversity in India.
- c) DNA Barcoding.

**x x x**

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PE4561**

**[6513]-6**

**M.Sc.-I**

**ZOOLOGY**

**ZOO - 508 MJ : Biostatistical Applications  
(2023 & 2024 Credit 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.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of statistical table and calculator is allowed.*

**Q1) Attempt any 5 of the following. [5]**

- a) Define raw data.
- b) Define median of raw data.
- c) Define contingency tables for categorical data.
- d) Explain scatter diagram.
- e) Explain the concept of correlation.
- f) Explain the concept of regression.

**Q2) a) Find the arithmetic mean, median and mode of the following data of weights of birds in gm. 61, 62, 63, 62, 63, 62, 64, 64, 60, 65. [6]**

b) Define standard-deviation and coefficient of variation of raw data. [4]

**Q3) a) The following results were obtained from records of age(x) and systolic blood pressure (y) of a group of 10 persons.  
 $\bar{x} = 53, \bar{y} = 142, \text{var}(x) = 130, \text{var}(y) = 165, \text{cov}(x - y) = 122$ . Find the appropriate regression equation and hence estimate the blood pressure of a person whose age is 45 years. [6]**

b) Explain the concept of sample and population, parameter and statistic.[4]

**P.T.O.**

**Q4) a)** Explain the chi-square test for independence of two attributes. **[6]**

b) Explain Type-I and Type-II errors. **[4]**

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

a) Describe two sample t-test.

b) Describe ANOVA-one way and two way tables.

c) Level of significance, p-value.



Total No. of Questions : 5]

SEAT No. :

PE-4562

[Total No. of Pages : 2

[6513]-7

M.Sc.(Part-I)

ZOOLOGY

ZOO - MJ 510 : Freshwater Zoology

(2023 & 2024 Pattern) (Semester - I) (2 - Credit)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

**[5]**

- a) Hardness
- b) Wetlands
- c) Tardigrada
- d) Biotic homogenization
- e) pH of Water
- f) Temperature of water

**Q2)** a) Write in detail about the habitat and distinguishing features of aquatic insects.

**[6]**

- b) Explain the effect of transparency and dissolved oxygen on Freshwater fauna.

**[4]**

**Q3)** a) Explain the impact of hydrological alteration on freshwater habitat. **[6]**

- b) Write a Note on need and importance of conservation.

**[4]**

*P.T.O.*

- Q4)** a) Describe the economical and ecological importance of crabs and prawns. **[6]**  
b) Write the distinguishing features of Tadpole Shrimps. **[4]**

- Q5)** Solve any Two of the following : **[10]**  
a) Litforal Zone  
b) Rotifers  
c) Eutrophications



Total No. of Questions : 5]

SEAT No. :

PE-4563

[Total No. of Pages : 2

[6513]-8

M.Sc.(Part-I)

ZOOLOGY

ZOO - 514 MJ : Research Methodology

(2023 & 2024 Pattern) (Semester - I) (2 Credit)

*Time : 2 Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

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

- a) Define Research
- b) Explain Plagiarism
- c) Define Primary data
- d) What is ISSN?
- e) What is Literature review
- f) What is INFLIBNET

**Q2)** a) What is data processing? Explain how to analyse and interpretate the data. **[6]**

b) Explain Biomedical waste disposal, Biodiversity act 2008. **[4]**

**Q3)** a) What is patent? Explain criteria and procedure of patenting. **[6]**

b) Explain how to quote references in thesis. **[4]**

*P.T.O.*

- Q4)** a) What is data collection? Explain methods and tools of data collection. **[6]**  
b) Give importance of literature survey in Research. **[4]**
- Q5)** Write short notes on any Two of the following : **[10]**  
a) Multidimensional scaling  
b) IPR  
c) Components of Research design.



Total No. of Questions : 5]

SEAT No. :

**PE4564**

[Total No. of Pages : 1

[6513]-21

M.Sc. - I

**ZOOLOGY**

**ZOO 551 MJ : Molecular Biology**

**(2023 & 2024 Credit 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) *Questions 2 to 5 carry equal marks.*

**Q1) Solve any five of the following. [5]**

- a) Differentiate between positive and negative supercoiling.
- b) Name TBP Associated Factors (TAF).
- c) Define primosome.
- d) What are leading and lagging strand.
- e) Define replication.
- f) What is alternative splicing?

**Q2) a) Describe the regulation of replication in prokaryotes. [6]**

b) Explain Ribonucleoproteins (SnRNPs & ScRNPs). [4]

**Q3) a) Give an account of aminoacylation of tRNA. [6]**

b) Write about RNA polymerases and their functions. [4]

**Q4) a) Describe the mechanism of termination of translation in prokaryotes. [6]**

b) Write about cot  $\frac{1}{2}$  kinetic & sequence complexity. [4]

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

- a) Assembly of nucleosome after replication.
- b) Salient features of Genetic code.
- c) Mechanism of chromatin remodelling reconstruction.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 1

**PE4565**

**[6513]-22**

**M.Sc. - I**

**ZOOLOGY**

**ZOO-552-MJ : Comparative Endocrinology**

**(2023 & 2024 Credit 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) Which part of the Brain maintain homeostasis mechanism of the body?
- b) Name the hormone which regulate calcium levels in the blood.
- c) Enzyme involved in glycogen metabolism.
- d) Which gland is known as master gland in vertebrate?
- e) Symptoms of Acromegaly - explain.
- f) Enlist hormones release from kidney.

**Q2)** a) What is hypothyroidism? Describe the symptoms of cretinism & myxoedema. **[6]**

b) Describe the role of parathyroid gland. **[4]**

**Q3)** a) Explain hormonal control of carbohydrate metabolism. **[6]**

b) Describe peptide hormones of mammals. **[4]**

**Q4)** a) Describe calcium & phosphate homeostasis in nonmammalian vertebrates. **[6]**

b) Explain the disorders of thyroid hormone. **[4]**

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

- a) Role of Glucocorticoids in regulation of various metabolism.
- b) Bioregulation of Digestion.
- c) Orexigenic factors in Teleost Fish.



Total No. of Questions : 5]

SEAT No. :

**PE4566**

[Total No. of Pages : 1

**[6513]-23**

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

**ZOOLOGY**

**ZOO 553 MJ : Comparative Animal Physiology**

**(2023 & 2024 Credit 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 equal marks.*

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

- a) Define lungs and give its importance.
- b) Define osmo conformers with examples.
- c) Define hyper osmotic regulation.
- d) What are auditory organs? Give examples.
- e) Define Loop of Henle.
- f) Define the thermoregulation term-evaporation.

**Q2) a) Explain the cardiac cycle in mammals. [6]**

b) Give general outline of digestive system of a fish. [4]

**Q3) a) Explain the interaction between actin-myosin filament. [6]**

b) Give the structure and functions of hemerythrin. [4]

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

b) Describe the structure of mammalian kidney. [4]

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

- a) Biokinetic zones
- b) Photoreception
- c) Aminotelism



Total No. of Questions : 5]

SEAT No. :

**PE4567**

[Total No. of Pages : 1

**[6513]-24**

**M.Sc. - I**

**ZOOLOGY**

**ZOO - 554 - MJ : Biochemical Techniques**

**(2023 & 2024 Credit 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 equal marks.

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

- a) Write the examples of Gel beads used in chromatography?
- b) What is capillary electrophoresis?
- c) What is Fixed angle rotors?
- d) What is absorption spectroscopy?
- e) Write functions of phase plates?
- f) What is NGS?

**Q2) a) Elaborate the principle and application of HPLC. [6]**

b) Describe X-ray diffraction techniques. [4]

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

b) Write the working of 2-D electrophoresis. [4]

**Q4) a) Explain dye terminator method of DNA sequencing. [6]**

b) Write applications of centrifugation. [4]

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

- a) UV/vis spectroscopy
- b) Write the advantages of PAGE.
- c) Write the applications of TEM.

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Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**PE4568**

**[6513]-25**

**M.Sc.- I**

**ZOOLOGY**

**ZOO-555-MJ : Integrated Pest Management  
(2023 & 2024 Credit Pattern) (Semester-II) (2Credits)**

*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 Q.2 to Q.5 carry equal marks.*

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

**[5]**

- a) Define IPM
- b) Define pesticides
- c) What is the role of ICT in IPM?
- d) Define Economic Injury level.
- e) What is the role of gas sensors in pest management?
- f) What is the application of remote sensing in IPM?

**Q2) a) Describe the methods of diagnosis of insect. pests and diseases in pest management.**

**[6]**

b) Explain principles and tools in pest management

**[4]**

**Q3) a) Describe cultural control of pest management.**

**[6]**

b) Explain genetic manipulation of pest population.

**[4]**

**P.T.O.**

**Q4)** a) Describe chemical control of pest management. [6]

b) Explain regulatory control in pest management. [4]

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

a) Entomopathogenic viruses in insect pest control.

b) Importance of economic threshold level.

c) Entomopathogenic nematodes in IPM.



Total No. of Questions : 5]

SEAT No. :

**PE4569**

[Total No. of Pages : 1

**[6513]-26**  
**M.Sc. (Part-I)**  
**ZOOLOGY**  
**ZOO 560 MJ : Medical Parasitology**  
**(2023 & 2024 Credits 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 the term parasitoid.
- b) Define polymorphism in immune system.
- c) Give and two examples of class Nematode.
- d) Give scientific name of Flea and Lice.
- e) Define immunological diagnosis.
- f) Give any two uses of artemisinin.

**Q2) a) Write a note on adaptation to parasitism. Explain it's biochemical adaptations with examples.** **[6]**

b) Write a note on social parasitism with examples. **[4]**

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

b) Strategy for vaccine development against parasites. **[4]**

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

b) Give preventive and control measures of Brucellosis. **[4]**

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

- a) Tissue biopsy.
- b) Genetic control of parasites.
- c) Clinical features and disease management of Dracanculus Medinensis.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PE4570**

**[6513]-27**

**M.Sc. - I**

**ZOOLOGY**

**ZOO 562 MJ : Economic Zoology**

**(2023 & 2024 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.No. 2 to 5.*
- 3) *Questions 2 to 5 carry equal marks.*

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

**[5]**

- a) Define shell fish culture.
- b) Write the names of any two insects harmful to live stock.
- c) What is heterotrophic type of biofloc system?
- d) Give the names of types of fisheries.
- e) What is poultry farming?
- f) Write the names of any two fish products.

**Q2)** a) Describe polyculture in aquaculture.

**[6]**

b) Explain types of ornamental fishes.

**[4]**

**Q3)** a) Describe harvesting and preservation of prawns.

**[6]**

b) Explain present status, scope and challenges in culture of molluscs. **[4]**

**P.T.O.**

- Q4)** a) Describe tank design and construction in biofloc production system.[6]  
b) Explain parasitic nematodes harmful to human domestic animals and live stock. [4]

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

- a) Problems of aquaculture in global and Indian perspective.
- b) Principles, prospects and challenges in biofloc fish farming.
- c) Sponge culture & its applications.



Total No. of Questions :7]

SEAT No. :

[Total No. of Pages : 2

**PE4571**

**[6513]-31**

**M.Sc.- II**

**ZOOLOGY**

**ZOO-601-MJ : Animal Physiology-I**

**(2023 &2024 Credit 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 Q.2 to Q.7 carry equal marks.*

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

**[10]**

- a) Define Resistance
- b) What is cataract
- c) What is osteomyelitis
- d) Name the muscle proteins.
- e) What is a neurotransmitter
- f) Write about sarcomere.

**Q2) Answer the following questions**

- a) Explain in detail the internal structure of Ear **[7]**
- b) Draw neat and well labelled diagram of Internal Structure of skeletal muscle. **[5]**

**Q3) Answer the following questions**

- a) Describe the biochemical and molecular mechanism of luminescence.**[7]**
- b) Discuss the structure and functions of bones. **[5]**

**Q4) Answer the following questions.**

- a) Describe the neuroanatomy of brain. **[7]**
- b) Discuss the different disorders of eyes. **[5]**

**P.T.O.**

**Q5)** Answer the following questions.

- a) Explain in detail the physiology of eyesight. [7]
- b) Explain the regulation of body temperature in Poikilotherms [5]

**Q6)** Answer the following questions.

- a) What is haematopoiesis? Explain the molecular mechanism of blood clotting [7]
- b) Write about different diseases of bones. [5]

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

- a) Mechanism of cardiac cycle.
- b) Mechanism of saltatory conduction.
- c) Voluntary and Involuntary action of motor system.



Total No. of Questions :7]

SEAT No. :

[Total No. of Pages : 2

**PE4572**

**[6513]-32**

**M.Sc.- II**

**ZOOLOGY**

**ZOO-601-MJ : Entomology-I**

**(2023 &2024 Credit Pattern) (Semester-III) (4 Credits) (Special)**

*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 Endopterygota.
- b) Write the structure and example of serrate antenna.
- c) Explain elytra.
- d) Explain fossorial leg.
- e) Explain oligopneustic tracheal system.
- f) Explain luciferin.

**Q2) a) Explain modifications of head capsule in insects.**

**[7]**

b) Explain the characters of Hemiptera with two examples.

**[5]**

**Q3) a) Explain in brief the origin and evolution in insects.**

**[7]**

b) Describe structure of integument in insects.

**[5]**

**Q4) a) Give an account of the alimentary canal of any orthopteroid insect.**

**[7]**

b) Explain the characters of Phasmida with two examples.

**[5]**

**Q5) a) Give the distinguishing characters of order Diplura with two examples.**

**[7]**

b) Explain Telotrophic ovariole.

**[5]**

**P.T.O.**

- Q6)** a) Mention the distinguishing characters of Lepidoptera with two examples. [7]
- b) Explain female reproductive system of generalized insects. [5]

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

- a) Piercing & sucking type of mouthparts.
- b) Corpora cardiaca and corpora allata.
- c) Structure and functions of fat bodies.



Total No. of Questions :7]

SEAT No. :

[Total No. of Pages : 2

**PE4573**

**[6513]-33**

**M.Sc.- II**

**ZOOLOGY**

**ZOO-601-MJ : Genetics-I**

**(2023 & 2024 Credit Pattern) (Semester-III) (4 Credits) (Special)**

*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) *Q.2 to Q.7 carry equal marks.*

**Q1) Solve Any Five of the following: [10]**

- a) Define one gene one enzyme theory.
- b) Enlist evolutionary forces which changes Hardy Weinberg frequency.
- c) What is high frequency recombinant (Hfr)?
- d) What is the sequence of transcription initiation site RNA polymerase III in eukaryotes.
- e) Enlist the type of data used in phylogenetic analysis.
- f) Define mosaicism and chimerism.

**Q2) a) Explain three point test cross along with interference & coincidence. [7]**

b) Distinguish between generalized & specialized transduction. [5]

**Q3) a) What is polygenic inheritance? Explain measurement of heritability and quantitative inheritance in human. [7]**

b) Explain in brief assortative mating. [5]

**Q4) a) What is epigenetics? Explain molecular basis of epigenetics. [7]**

b) Describe the role of DNA and allozyme polymorphism in natural population. [5]

*P.T.O.*

- Q5)** a) Describe the complications to the basic pedigree patterns. [7]  
b) Explain mechanism of steroid hormones and stress induced gene expression. [5]
- Q6)** a) What is molecular evolution? Explain patterns of change in nucleotide and amino acid sequences. [7]  
b) Describe the mode of action and application of ligases and polymerases. [5]
- Q7)** Write short notes on any two of the following: [12]  
a) Plasmids & Plasmid Vectors.  
b) Genetics of female infertility.  
c) Selection mutation equilibrium.



Total No. of Questions : 5]  
**PE4574**

SEAT No. :   
[Total No. of Pages : 1

**[6513]-34**  
**M.Sc. -II**  
**ZOOLOGY**  
**ZOO - 602 - MJ : Physiology of Reproduction**  
**(2023 & 2024 Credit 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) Questions 2 to 5 carry equal marks*

- Q1)** Solve any 5 of the following: **[5]**
- a) Gametogenesis
  - b) Inseminations
  - c) Implantations
  - d) Testicular Hormones
  - e) GnRH
  - f) Fertilization
- Q2)** a) Describe ultrastructure of ovary with neat labelled diagram? **[6]**  
b) Describe the functions of sertoli cells and leydig cells? **[4]**
- Q3)** a) Explain in detail hormonal regulation in pregnancy? **[6]**  
b) Describe Lactogenesis and galactopoiesis? **[4]**
- Q4)** a) Describe spermatogenesis with labelled diagram? **[6]**  
b) Differentiate seasonal breeders from contineous breeder **[4]**
- Q5)** Write a short notes on any Two of the following. **[10]**
- a) Explain Infertility causes and its treatment?
  - b) Describe all testicular hormones?
  - c) Write a short note on puberty?



Total No. of Questions : 5]

SEAT No. :

**PE4575**

[Total No. of Pages : 2

**[6513]-35**

**M.Sc. - II**

**ZOOLOGY**

**ZOO-603-MJ : Developmental Biology**

**(2023 & 2024 Credit 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 question 2 to question 5.*
- 3) *Questions 2 to 5 carry equal marks.*

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

**[5]**

- a) Define teratogenesis.
- b) Give any two characteristics features of a model organism.
- c) What is heterotypy?
- d) What are caspases?
- e) What is phenotypic plasticity?
- f) What is Thalidomide?

**Q2) a) Describe the molecular signaling in neural induction.**

**[6]**

b) Explain the role of telomerase in promoting longevity.

**[4]**

**Q3) a) Explain the lens and retina differentiation in vertebrate eye.**

**[6]**

b) Explain the role of diet in polyphenism.

**[4]**

**P.T.O.**

**Q4) a)** Describe extrinsic pathway of apoptosis. **[6]**

b) Describe phyletic constraints on evolution. **[4]**

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

a) Chicken as a model organism.

b) Significance of environmental cues in normal development.

c) Alcohol as teratogen.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**PE4576**

**[6513]-36**

**M.Sc.- II**

**ZOOLOGY**

**ZOO-604-MJ : Insect Physiology and Biochemistry  
(2023 & 2024 Credit Pattern) (Semester-III) (2Credits)**

*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 Q.2 to Q.5 carry equal marks.*

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

- a) What is role of AKH hormone?
- b) Name any two biochemical components of Microsomal Oxidases.
- c) What are Lipophorins?
- d) Name any two Muscle Proteins.
- e) Write names of any four types of Hemocytes in insects.
- f) Write the name of cell organelle wherein  $\text{Ca}^{++}$  is stored in muscle cells.

**Q2) a) Give an account of different roles played by Insect Integument.** **[6]**

b) Explain the process of urine formation in terrestrial Insects. **[4]**

**Q3) a) Enlist and explain various ventilatory movements and mechanisms in Terrestrial Insects.** **[6]**

b) Write a note on: Molting and Juvenile Hormones. **[4]**

*P.T.O.*

- Q4)** a) Explain the carbohydrate digestion in Insects. [6]  
b) Explain briefly the process of flight muscle contraction in Insects. [4]

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

- a) Microsomal degradation of Insecticides.
- b) Structure of Fat body.
- c) Hemocytes in Insects



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 1

**PE4577**

**[6513]-37**

**M.Sc.-II**

**ZOOLOGY**

**ZOO-610-MJ : Applied Genetics**

**(2023 & 2024 Credit Pattern) (Semester - III) (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.*

**Q1) Solve any five of the following. [5]**

- a) Genetic engineering.
- b) Embryonic stem cell.
- c) Transduction.
- d) Shuttle vectors.
- e) Mitochondrial inheritance.
- f) Monoclonal antibodies.

**Q2) a) Describe various invasive and non-invasive diagnostic tests. [6]**

b) What are molecular scissors used in genetic engineering. [4]

**Q3) a) Define genomics. Add a note on human genome project. [6]**

b) Write a short on DNA barcoding. [4]

**Q4) a) What are molecular markers? Add note on it's types. [6]**

b) Describe gene cloning. [4]

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

- a) Write a short note on gene therapy.
- b) What is somatic cell genetics? Add a note on its application.
- c) Describe in detail the process of genetic counseling.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 1

**PE4578**

**[6513]-38**

**M.Sc. - II**

**ZOOLOGY**

**ZOO - 612 MJ:Animal Behaviour**

**(2023 & 2024 Credit Pattern) (Semester - III) (2 Credits)**

*Time : 2Hours]*

*[Max. Marks : 35*

*Instructions to the candidates:*

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

**Q1) Answer any five of the following. [5]**

- a) Define innate behaviour.
- b) What is aggression?
- c) What is altruism?
- d) What is sperm competition?
- e) What is schooling in fishes?
- f) What is territoriality?

**Q2) a) Describe optimal Foraging theory. [6]**

b) Write a note on migration in birds. [4]

**Q3) a) Describe social organization in insects. [6]**

b) Write a note on mating systems. [4]

**Q4) a) Describe in detail types of mimicry. [6]**

b) Write a note on courtship. [4]

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

- a) Reproductive strategies.
- b) Parental care.
- c) Visual communication in animals.



Total No. of Questions : 7]

SEAT No. :

[Total No. of Pages : 2

**PE4579**

**[6513]-41**

**M.Sc. - II**

**ZOOLOGY**

**ZOO 651 MJ : Animal Physiology - II**

**(2023 & 2024 Credit Pattern) (4 Credits) (Semester - IV)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) Question No. 1 is compulsory.
- 2) Solve any five questions from Q2 to Q7.
- 3) Questions 2 to 7 carry equal marks.

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

**[10]**

- a) Write the functions of insulin hormone.
- b) What are the three basic renal processes that lead to the formation of Urine.
- c) What is working memory?
- d) Name the peripheral chemoreceptors.
- e) Distinguish between respiratory acidosis and respiratory alkalosis.
- f) What is Nephron?

**Q2) Answer the following questions.**

- a) Explain the endocrine and neural control of insulin in absorptive state.[7]
- b) Describe the neural mechanism for Directed Attention. [5]

**Q3) Answer the following questions.**

- a) Write about the mechanism of gas exchange between alveoli and pulmonary capillaries. [7]
- b) Describe the vestibular apparatus of the inner ear. [5]

**P.T.O.**

**Q4)** Answer the following questions.

- a) Describe the functions of central and peripheral receptors in neuronal control of respiration. [7]
- b) How do the liver and adipose tissue metabolize glucose during the absorptive state. [5]

**Q5)** Answer the following questions.

- a) Briefly describe a neural mechanism that determines the sleep wake cycle.[7]
- b) Describe the role of photoreceptors and their response. [5]

**Q6)** Answer the following questions.

- a) Describe the functional organization of chromatophore system. [7]
- b) Describe the function of renin-angiotensin system. [5]

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

- a) Schizophrenia
- b) Organ of corti
- c) Anatomy of Renal corpuscle

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Total No. of Questions :7]

SEAT No. :

[Total No. of Pages : 2

**PE4580**

**[6513]-42**

**M.Sc.-II**

**ZOOLOGY**

**ZOO-651-MJ : Entomology-II (Special)**

**(2023 & 2024 Credit Pattern) (Semester-IV) (4 Credits)**

*Time : 3 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) Question No. 1 is compulsory.
- 2) Solve any Five questions from Q.2 to Q7.
- 3) Questions 2 to 7 carry equal marks.

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

**[10]**

- a) Explain oviposition habits in phytophagous insects.
- b) Explain hemimetabolous development.
- c) Define regeneration.
- d) Explain hemicephalous larva with suitable example.
- e) Define eclosion in insect.
- f) Explain protopod phase of insect embryo.

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

**[7]**

b) Explain the structure and types of eggs in insect.

**[5]**

**Q3) a) Describe cleavage and blastoderm formation in insects. Add a note on its control.**

**[7]**

b) Describe embryonic development of tracheal system in insects.

**[5]**

**Q4) a) Describe the blastokinesis in insects.**

**[7]**

b) Describe obtect pupa with suitable examples.

**[5]**

**P.T.O.**

- Q5)** a) What is metamorphosis? Explain gradual metamorphosis in insects. [7]  
b) Describe initiation and preparation for diapause. [5]
- Q6)** a) Explain Hadorn's experiments with imaginal discs. [7]  
b) Describe embryonic development of digestive system in insects. [5]
- Q7)** Write short notes on any Two of the following: [12]  
a) Viviparity.  
b) Polypod larva.  
c) Embryonic membranes.



Total No. of Questions :7]

SEAT No. :

[Total No. of Pages : 2

**PE4581**

**[6513]-43**

**M.Sc.-II**

**ZOOLOGY**

**ZOO-651-MJ : Genetics -II**

**(2023 & 2024 Credit Pattern) (Semester-IV)**

*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) *Q.2 to Q.7 carry equal marks.*

**Q1)** Answer Any Five of the following:

**[10]**

- a) Define phage genetics.
- b) What is the function of tumor suppressor genes?
- c) Explain the concept of genetic drift.
- d) What are mitochondrial disorders?
- e) State the role of oncogenes in cancer.
- f) Describe twin study design in behavioural genetics.

**Q2)** a) Explain the regulatory switch between lytic & lysogenic cycles in bacteriophages. **[7]**

b) Explain the genetic basis of sex determination in Drosophila. **[5]**

**Q3)** a) Discuss the function & significance of retroviral oncogenes. **[7]**

b) Describe the molecular mechanism of lysosomal storage disorders. **[5]**

**Q4)** a) Explain whole-genome & exome sequencing for candidate gene identification. **[7]**

b) Explain the concept of positional cloning. **[5]**

**P.T.O.**

**Q5)** a) Describe the genetic & molecular aspects of circadian rhythm in Drosophila. [7]

b) What are HLA polymorphism & their association with disease. [5]

**Q6)** a) Explain the role of environmental influence on genetic expression & behaviour. [7]

b) Discuss the importance of inbred strains in mouse genetic studies. [5]

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

a) Quantitative trait loci.

b) Biochemical basis of Alzheimer's disease.

c) Mechanism of error-prone DNA repair pathways.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 1

**PE4582**

**[6513]-44**

**M.Sc. - II**

**ZOOLOGY**

**ZOO-652-MJ : Ecology And Evolution**

**(2023 & 2024 Credit Pattern) (Semester - IV)**

*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) What do you mean by the term 'Evolution'?
- b) Give two examples of mass extinction.
- c) What is "Natural Selection".
- d) Define 'Genetic Drift'.
- e) Write names of any three abiotic components.
- f) Define the term 'Biosphere'.

**Q2)** a) Explain the concept-and-process of ecological succession with examples. **[6]**

b) Write short notes on : Evolution of Anthropoids. **[4]**

**Q3)** a) Write an essay on : Biotic components of ecosystem. **[6]**

b) Differentiate between "Analogy and Homology" and highlight their evolutionary importance. **[4]**

**Q4)** a) Discuss the 'Big Bang Theory' and its limitations. **[6]**

b) Write a short note on : Aquatic Ecosystem. **[4]**

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

- a) Hardy-Weinberg law.
- b) Palaeontological evidences of evolution.
- c) Origin of Eukaryotic cells.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**PE4583**

**[6513]-45**

**M.Sc.- II**

**ZOOLOGY**

**ZOO-653-MJ : Environmental Biology**

**(2023&2024 Credit Pattern) (Semester-IV) (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 Q.2 to Q.5 carry equal marks.*

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

**[5]**

- a) What is keystone species? Give its two examples.
- b) Give two examples of Terrestrial Biomes.
- c) Write 3 examples Airborne Microbial diseases.
- d) Give two examples of Natural Resources of India.
- e) What is ex-situ remediation?
- f) What do you mean by carrying capacity?

**Q2) a) What is biome? Write short notes on:**

**[6]**

- i) Tropical Rainforest
- ii) Savanna.

b) Explain in brief: Ozone layer depletion and its consequences.

**[4]**

**Q3) a) Write an essay on: Exploitation and recycling of Mineral Resources. [6]**

b) Write a brief account of : Importance and Applications of Human Ecology.

**[4]**

**P.T.O.**

- Q4)** a) Give a detailed account of: Rain water harvesting and its importance. **[6]**  
b) Write a note on: How temperature acts as a limiting factor? **[4]**

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

- a) Regulation of Population growth.
- b) Acute and chronic Toxicity
- c) Zero waste management.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

**PE4584**

**[6513]-46**

**M.Sc.- II**

**ZOOLOGY**

**ZOO-660-MJ : Applied Entomology**

**(2023 & 2024 Credit Pattern) (Semester-IV) (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 livestock entomology
- b) Define Forensic entomology
- c) Define sericulture
- d) What is non-insect pest?
- e) Define Forestry entomology
- f) Write biological name of sugarcane shoot borer

**Q2)** a) Describe the morphology, nature of damage and control measures of rice yellow stem borer. **[6]**

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

**P.T.O.**

**Q3)** a) Describe the life cycle of the silk moth and explain the economic importance of silk. [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 brinjal fruit borer. [6]

b) Explain different types of honey bee species. [4]

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

a) Applied entomology

b) Nature of damage and control measures of Asiatic pink stem borer.

c) Nature of damage and control measures of pink bollworm.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

**PE4585**

**[6513]-47**

**M.Sc.-II**

**ZOOLOGY**

**ZOO-662-MJ : Immunology**

**(2023 Credit Pattern) (NEP) (Semester-IV)**

*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 followings:

**[5]**

- a) Define Adaptive immunity.
- b) Enlist types of hypersensitivity.
- c) What is RIA?
- d) Enlist the types of antigenic determinants.
- e) Define cell migration.
- f) Mention types of MHC.

**Q2)** a) Give a detailed account of secondary lymphoid organs.

**[6]**

b) What is vaccine? Explain any three types of vaccines.

**[4]**

**Q3)** a) Write the principle and applications of Immunoelectrophoresis.

**[6]**

b) Describe various theories of antibody synthesis.

**[4]**

**P.T.O.**

- Q4)** a) What is antibody? Describe the structure and function of antibody. [6]
- b) Explain the principle of hybridoma technology and mention its applications. [4]

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

- a) Explain the concept of Immunological tolerance.
- b) Describe the mechanism of antigen processing and presentation.
- c) Write a note on immediate responses of immune system.

