

**S-3450**

**Sub. Code**

**23MZ01S1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**First Semester**

**Zoology**

**INTELLECTUAL PROPERTY RIGHTS**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is intellectual Property right?
2. Comment on WTPO.
3. What the meaning of 'Invention' under Patent Law?
4. What is trade Mark?
5. Mention any two rights recognised in Rome Convention.
6. Comment on Geographical Indications
7. Expand : (a) INTA (b) PCT.
8. What is the role of Intellectual Property Appellate Board (IPAB)?
9. What is innocent or accidental copyright infringement?
10. Comment on emerging threats to IPR.

**Part B**

(5 × 5 = 25)

Answer **all** questions by choosing either (a) or (b).

11. (a) Write a note on ownership of the copyright.

Or

- (b) Give a short note on roles of WIPO.

12. (a) Brief on geographical indications and its uses.

Or

- (b) Write briefly on types work protected under copyright.

13. (a) Narrate the E-filing of Trademark application.

Or

- (b) Write a note on Government initiatives towards protection of IPR.

14. (a) Brief about the protection of IPR against unfair trade practice.

Or

- (b) Write shortly on digital innovations

15. (a) Write a note on criminal implications in IPR infringement.

Or

- (b) Write a note on challenges of IPR with regard to Artificial intelligence.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Elaborate the fundamentals of Copynght.
  17. Write a detailed note on Commercialisation of Intellectual Property Rights.
  18. Write a detailed note on the Paris and Berne Convention.
  19. Elaborate on the laws governing intellectual property in cyberspace from an international and national perspective.
  20. Discuss on the Emerging Issues in Intellectual Property.
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**S-3452**

**Sub. Code**

**23MZO2C1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Second Semester**

**Zoology**

**CELLULAR AND MOLECULAR BIOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Protoplasm
2. Cell theory
3. Deutoplasm
4. Nucleus
5. Peroxisome
6. Mitosis
7. DNA replication
8. Genetic map
9. Integrins
10. Apoptosis

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Distinguish between prokaryotic and eukaryotic cells.

Or

- (b) Write a short notes on diversity of cell shapes and sizes.

12. (a) Describe the ultrastructure and function of nucleus.

Or

- (b) Explain the structure and role of chloroplasts.

13. (a) Write a short notes on regulation of cell cycle.

Or

- (b) Enumerate the significance of meiosis in reproduction.

14. (a) Detail account the mechanism of transcription in prokaryotes.

Or

- (b) Elaborate on genetic code and its properties.

15. (a) Discuss the role of G-protein coupled receptors in cell signaling.

Or

- (b) Explain the function of extracellular matrix in cell communication.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Write an essay on the structure and functions of the plasma membrane.
  17. Detail account on golgi bodies and its functions.
  18. Discuss about the process of translation in eukaryotes with a neat diagram.
  19. Describe in detail the regulation of gene expression in prokaryotes.
  20. Enumerate essay on oncogenes and tumor suppressor genes in cancer.
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**S-3453**

**Sub. Code**

**23MZO2C2**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Second Semester**

**Zoology**

**DEVELOPMENTAL BIOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. Define the role of juvenile hormone in insect oogenesis.
2. Explain acrosome reaction.
3. What is the importance of vitellogenin?
4. How does calcium prevent polyspermy during egg activation?
5. Differentiate invagination and involution.
6. Define determinate cleavage.
7. Explain the significance of primitive streak.
8. What is the role of morphogen during development?
9. Define the role of PTTH.
10. What is the importance of hCG?

**Part B**

(5 × 5 = 25)

Answer **all** the questions choosing either (a) or (b).

11. (a) Explain the process of spermatogenesis in man.

Or

- (b) What is the composition of yolk in crustaceans? Explain the mechanism and regulation of yolk synthesis in a crustacean.

12. (a) Write a short note on sperm capacitation and activation.

Or

- (b) Discuss the role of fertilizin-antifertilizin during fertilization in humans.

13. (a) Define cleavage. Explain the types of cleavage in relation to yolk.

Or

- (b) What is fate map? With a neat labeled diagram explain the fate map of frog.

14. (a) Give an account on the role of bicoid gene in drosophila embryonic development.

Or

- (b) Give an account on mechanism of eye development as an ectodermal derivative in humans.

15. (a) What is aging? Describe the biological mechanism of aging.

Or

- (b) What is cryopreservation? Explain the principle and application of cryopreservation and ethical issues associated with it.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Write an essay on the genetic control of vitellogenin synthesis in frog.
  17. Define parthenogenesis. Explain the types with suitable examples.
  18. Discuss the type of gastrulation and mechanism of gastrulation in Amphioxus.
  19. What is the role of homeotic genes in development? Describe the mechanisms involved and its significance.
  20. Describe the role of neurosecretory cells in the process of moulting in prawn.
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**S-3454**

**Sub. Code**

**23MZO2E1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Second Semester**

**Zoology**

**Elective — ECONOMIC ENTOMOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. What distinguishes insects from other Arthropods?
2. Explain the ecological role in insects.
3. What is Chawki rearing?
4. What is common brood diseases?
5. Define IPM.
6. *Oryctes rhinoceros*
7. Define crop rotation.
8. Name any two biological pest control.
9. Define Zoonotic.
10. Explain Vector borne diseases.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the basic concept of insect Taxonomy.

Or

- (b) Classify class Insecta.

12. (a) Explain the silkworm rearing methods in detail.

Or

- (b) Explain the methods of beekeeping.

13. (a) Classify and categories the insect pests.

Or

- (b) Describe the causes of pest out break.

14. (a) What are the methods of pest control?

Or

- (b) Explain the demerits of pest control.

15. (a) How the vector borne disease is transmitted?

Or

- (b) Classification of vector and their life cycle.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Explain in details the important role of insects in Agriculture.
17. Explain in detail the honey bee disease and pest management.

18. Explain in detail the pest management of paddy and sugarcane.
  19. Explain the IPM methods and its uses.
  20. Mosquitoes as potential vector for human disease – Justify.
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**S-3455**

**Sub. Code**

**23MZO2E2**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Second Semester**

**Zoology**

**Elective – RESEARCH METHODOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. GLP
2. Bioinformatics
3. pH meter
4. Histology
5. TEM
6. Fluorescence microscopy
7. Chromatography
8. Centrifugation
9. PCR
10. Animal cell culture

**Part B**

(5 × 5 = 25)

Answer **all** the questions, choosing either (a) or (b).

11. (a) Explain the importance of Good Laboratory Practices (GLP).

Or

- (b) Give an account on working principle and applications of a colorimeter.

12. (a) Give an account of histochemistry and its importance in biology.

Or

- (b) Explain the concept and role of bioinformatics in modern research.

13. (a) Discuss the principle and uses of phase-contrast microscopy.

Or

- (b) Compare TEM and SEM with reference to their applications in biology.

14. (a) Write a short note on the types of electrophoresis.

Or

- (b) Describe the principle and application of ELISA.

15. (a) Enumerate the importance of tracer techniques in biochemistry.

Or

- (b) Write a short note on methods of preservation in animal cell culture.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Write an essay on pH meter, working principle and its applications in research.
  17. Describe in detail the principles, preparation, and staining methods in histology.
  18. Discuss light microscopy in detail: bright field, DIC and confocal microscopy.
  19. Detail account on centrifugation types, principles and applications.
  20. Enumerate the applications of animal cell culture techniques in biological research.
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**S-3456**

**Sub. Code**

**23MZO2S1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Second Semester**

**Zoology**

**POULTRY FARMING**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Explain the American class breeds.
2. Comment on Leghorn variety.
3. Explain the importance of oyster shell grits.
4. Explain culling process.
5. Comment on FCR.
6. List out essential vitamins for feeds in poultry.
7. Comment on booster dose.
8. List out external parasites affect the chicks.
9. Comment on natural brooding process.
10. Explain about Foster Mother equipment.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the setup and advantages of cage house in poultry.

Or

- (b) Describe the present status of poultry keeping in India.

12. (a) Explain the stages of layer rearing with reference to temperature of baby chicks.

Or

- (b) Write the importance of insurance in poultry with case studies.

13. (a) Describe the ideal feed regiment for growers.

Or

- (b) Explain the uses of tube feeder and long food trough feeder.

14. (a) Give an account on causative agent, symptoms and preventive measures for tick fever disease.

Or

- (b) Describe the vaccination strategy for growers chicken.

15. (a) Explain the various sexing methods adopted for poultry.

Or

- (b) Write the technology used for composting of poultry wastes into useful products.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the construction strategy and advantages of new poultry house with deep litter system.
  17. Explain the ideal rearing conditions for broilers.
  18. List out the important nutrients and their proportions in prepared food for egg laying birds.
  19. Discuss the causative agents, symptoms and control methods for Ranikhet disease.
  20. Explain the importance of Haugh unit measurement and mention the Grades of Egg in India.
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**S-3457**

**Sub. Code**

**23MZO2A1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Second Semester**

**Zoology**

**APICULTURE**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Comment on cottage industry.
2. Describe the characteristic features of Family Apidae.
3. List out the use of uncapping knife.
4. Write the role of bee veils.
5. Comment on predatory wasps.
6. Comment on nosema disease.
7. Explain the medical role of royal jelly.
8. Comment on bee venom.
9. Define entrepreneur.
10. Comment on the role of Khadi and Village Industries Commission.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the life cycle of honey bee.

Or

- (b) Describe the behavioral pattern of honey bee.

12. (a) List out the factors affecting the honey production and mention the avoidance strategy.

Or

- (b) Explain the structural setup and uses of swarm trap and honey extractor.

13. (a) List out the ectoparasitic mites that affect honey bee colonies and mention the preventive measures.

Or

- (b) Give an account on colony collapse disorder.

14. (a) Explain the characteristics and production of bee wax.

Or

- (b) Write the importance of packaging and marketing of honey bee products.

15. (a) Discuss the scope and key success factors required for a successful apiculture entrepreneur.

Or

- (b) Write the role of Central Bee Research and Training Institute in India.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the social organization of bee colony with suitable examples.
  17. Explain the structure and advantages of Newton's hive.
  18. Discuss the causative agents, symptoms and preventive measures for foul brood diseases.
  19. Describe the chemical composition of honey and explain the honey extraction procedure in detail.
  20. Discuss the budget breakup for starting apiculture in small village and explain the status of apiculture industry in India.
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**S-3458**

**Sub. Code**

**23MZO3C1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Third Semester**

**Zoology**

**GENETICS**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. T<sub>m</sub> value
2. Z-DNA
3. Nucleosome
4. Metacentric chromosome
5. Operon
6. Competent factor
7. Insertional inactivation
8. Knock out
9. Endonuclease
10. Electroporation.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Briefly summate the properties of nucleic acids.

Or

- (b) With a suitable diagram explain the molecular structure of normal DNA.

12. (a) Comment on Down syndrome and Klinefelter's syndrome.

Or

- (b) Based on position of centromere, describe the different types of chromosomes.

13. (a) Comment on the lytic cycle of a virus and its importance to rDNA technology.

Or

- (b) Using an example describe the process of transduction in bacteria.

14. (a) Highlight the principle and application of rDNA technology using suitable examples.

Or

- (b) What are cosmids? Explain their structure and application in gene transfer.

15. (a) What are phage vectors? Highlight their use in rDNA transfer.

Or

- (b) What is replica plating? How is it used for screening and selection of cloned colonies?

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Elaborate on the alternative forms of DNA and their significance.
  17. What is a codon? Highlight the principle and structure of a genetic code. Describe the properties of genetic code with examples.
  18. What is a F-plasmid? Explain the molecular mechanism of bacterial conjugation and the role of F-plasmid in the process.
  19. What is the principle, working and application of PCR in rDNA technology?
  20. What is a cDNA library? Describe in detail how you will construct a cDNA library and add a note on their applications.
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**S-3459**

**Sub. Code**

**23MZO3C2**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Third Semester**

**Zoology**

**EVOLUTION**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. What is natural selection theory?
2. What is use and disuse theory?
3. Define the concept of Oparin and Haldane.
4. Define unicellular evolution.
5. What is evolutionary palaeontology?
6. Define Epoch.
7. Define genetic variability.
8. Define Hardy-Weinberg law.
9. What is speciation?
10. Define adaptive radiation

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Describe the salient features of Lamarck's theory of evolution.

Or

- (b) Write the significant advantages of spontaneity mutation.

12. (a) Explain extraterrestrial organic synthesis.

Or

- (b) Describe the evolution of cell membrane.

13. (a) Explain in detail the use of carbon dating.

Or

- (b) Classify the Mesozoic era.

14. (a) Write the Goals of molecular phylogeny.

Or

- (b) Explain the role of molecular tools in classifying organism.

15. (a) How Natural selection changes gene frequency?

Or

- (b) Natural selection can cause microevolution - explain.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the Darwin attributes to support natural selection.
  17. Explain in detail the Miller experiment using concept of Oparin and Haldane.
  18. Explain in detail the Geologic calendar with correlating geologic event.
  19. Describe the Molecular clocks which enable the divergence of ancestral sequences.
  20. Describe Adaptive radiation with example
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**S-3460**

**Sub. Code**

**23MZO3C3**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Third Semester**

**Zoology**

**ANIMAL PHYSIOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

Define/Explain the Following

1. Double circulation with an example
2. Tricuspid valve
3. Internal respiration
4. Alveoli
5. Neuron
6. Reflex action
7. BMR
8. Trypsin
9. Master gland
10. Steroid hormones

**Part B**

(5 × 5 = 25)

Answer **all** the questions choosing either (a) or (b).

11. (a) Describe the role of white blood cells in immunity.

Or

- (b) Explain the ABO blood grouping system.

12. (a) Describe the structure of human respiratory system with a labeled diagram.

Or

- (b) Explain the role of haemoglobin in respiration.

13. (a) What is reflex action? Explain with an example.

Or

- (b) List out the functions of human brain.

14. (a) Describe the role of different types of teeth in digestion.

Or

- (b) Explain the process of digestion in stomach and small intestine.

15. (a) Write a brief note on stress and adaptation.

Or

- (b) Elaborate the basic mechanism of hormone action.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Give a detailed account on circulation of blood in human heart with a neat diagram.
  17. Briefly explain about the mechanism of respiration.
  18. Describe about the photoreceptor and its mechanism.
  19. Explain the process about the elimination of waste in kidney.
  20. Describe menstrual cycle and the events in menstruation.
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**S-3461**

**Sub. Code**

**23MZO3E1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Third Semester**

**Zoology**

**Elective – STEM CELL BIOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Totipotency
2. What is meant by stem cell niche?
3. Define embryonic stem (ES) cells.
4. List two ectoderm-derived organs.
5. What are mesenchymal stem cells (MSCs)
6. What is stem cell plasticity?
7. Define aging.
8. What are telomeres?
9. Mention two diseases treated using stem cells.
10. What is meant by clinical outcome in stem cell therapy?

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) What are stem cells? Explain their characteristic and types.

Or

- (b) Describe the basic properties and potency of stem cells.

12. (a) Write a short note on lineage-specific differentiation of embryonic stem cells.

Or

- (b) Explain pluripotency and self-renewal of embryonic stem cells.

13. (a) Describe the sources and properties of mesenchymal stem cells (MSCs).

Or

- (b) Explain the steps involved in the production of induced pluripotent stem cells (iPSCs).

14. (a) Describe stem cell senescence and its consequences.

Or

- (b) Write a short note on tissue repair by adult stem cells.

15. (a) Describe the risks and challenges of stem cell therapy.

Or

- (b) Explain the therapeutic uses of haematopoietic stem cells (HSCs).

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Write an essay on the classification of stem cells.
  17. Describe pluripotency and self-renewal of embryonic stem cells with underlying molecular mechanisms.
  18. Give a detailed account of adult stem cells and their applications.
  19. Give a detailed account of mechanisms involved in stem cell aging.
  20. Discuss the ethical issues and challenges associated with stem cell therapy.
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**S-3462**

**Sub. Code**

**23MZO3S1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026.**

**Third Semester**

**Zoology**

**DAIRY FARMING**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** the questions.

1. Describe Holstein Friesian breed.
2. Define Average calving interval.
3. Explain the heat stress impact on composition of milk.
4. Comment on maternity pens.
5. Explain the non-conventional feeds and fodders.
6. Describe Morrison's standard on feeding.
7. Comment on casein.
8. List out salts present in milk.
9. Comment on deworming.
10. Comment on milk fever.

**Part B**

(5 × 5 = 25)

Answer **all** questions. Choosing either (a) or (b).

11. (a) Describe Unified score card system for selection of best dairy cattle.

Or

- (b) Explain different systems of breeding practiced in Dairy cattle.

12. (a) Explain the practices and importance of summer calf management.

Or

- (b) Describe the advantages and disadvantages of loose housing system.

13. (a) Explain about roughages and its importance in feeding.

Or

- (b) Explain the thumb rule method of feeding on cattle.

14. (a) List out three important milk products and its health benefits.

Or

- (b) Explain the milk flavour and chemical flavour deteriorations.

15. (a) Write the causative agents and symptoms of foot and mouth disease.

Or

- (b) Discuss the vaccination schedule for cattle.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the classification of Indian cattle breeds with examples in each category.
  17. Draw a neat layout of dairy farm and explain the floor space requirements.
  18. Discuss the feeding requirement and special feeds for pregnant dairy animals.
  19. Discuss the level and importance of main and minor constituents of milk.
  20. Explain the causative agent, symptoms and treatment options for anthrax and tuberculosis.
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**S-3463**

**Sub. Code**

**23MZO3S2**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Third Semester**

**Zoology**

**MEDICAL LABORATORY TECHNIQUES**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Define health
2. What is biomedical waste?
3. List the types of anaemia
4. What is erythrocyte sedimentation rate?
5. Define leishmaniasis
6. What is role of flowcytometry?
7. How will you calculate the blood pressure?
8. Define cardiac shock.
9. Illustrate the microtome.
10. What is the function of vital staining?

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write the salient features of good laboratory practise.

Or

- (b) Write the physiological effect of alcohol?

12. (a) Explain the total count and differential count with neat diagram

Or

- (b) Describe blood grouping and its typing.

13. (a) Explain in detail the disease caused by trypanosome.

Or

- (b) What are the four types of malarial parasite and its effect.

14. (a) Compare and contrast the blood pressure and pulse

Or

- (b) Explain the role of Electroencephalography in diagnosis

15. (a) How will you process the tissue for sectioning?

Or

- (b) Sectioning and staining methods - explain

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Describe physiological changes caused by alcoholism
  17. Explain in detail the various types of bleeding disorder in man.
  18. Compare and contrast the CT and MRI in diagnosis
  19. Write the significant function of ultrasonography
  20. Describe microtome with neat diagram.
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**S-3464**

**Sub. Code**

**23MZO3A1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Third Semester**

**Zoology**

**VERMICULTURE**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Comment clitellum.
2. Define nocturnal.
3. Comment on epigeic earthworm.
4. List out common earthworm used in vermiculture.
5. Explain the migration method of harvesting.
6. List out ideal storage conditions for vermicompost.
7. Explain P-Stabilizers.
8. Comment on plant growth regulator.
9. Explain the organic certification process.
10. Comment on Vermilizer.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Describe the external features of earthworm.

Or

- (b) Explain the fertilization process of earthworm.

12. (a) Explain the steps performed for outdoor culture of earthworm and mention the benefits.

Or

- (b) List out the advantages and limitations of monoculture and polyculture of earthworm.

13. (a) Explain the Windrows method of vermicompost preparation.

Or

- (b) Discuss the Bins method of vermicompost preparation and mention the advantages.

14. (a) Explain the benefits of vermish and mention the preparation method.

Or

- (b) Discuss the use of vermish in horticulture.

15. (a) Explain the use of vermiculture based products on sustainability.

Or

- (b) How earthworm protects soil fertility and texture- Explain.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the circulatory and excretory systems of earthworm.
  17. Discuss the suitable environmental parameters for the culture and explain the benefits of indoor culture.
  18. Discuss the setup and advantages of flow-through reactor method of vermicomposting.
  19. Describe the nutrient content and advantages of using vermicompost in agriculture.
  20. Explain the marketing potentials of vermi products and mention the various marketing strategies used.
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**S-3465**

**Sub. Code**

**23MZO4C1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Fourth Semester**

**Zoology**

**IMMUNOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Differentiate between innate and adaptive immunity.
2. Define primary lymphoid organs with examples.
3. What are adjuvants? Give one example.
4. Define an epitope.
5. Write a short note on Toll-like receptors.
6. Mention two structural differences between Class I and Class II MHC molecules.
7. What is somatic hypermutation?
8. Define monoclonal antibodies.
9. Give two examples of cytokines.
10. List any two types of hypersensitivity.

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the components and functions of the internal immune system.

Or

- (b) Write short notes on lymphocyte traffic during development.

12. (a) Discuss the characteristics of a good immunogen.

Or

- (b) Explain antigenicity vs immunogenicity with examples.

13. (a) Describe the major effector components of the cellular immune system.

Or

- (b) Explain antigen presenting cells and their immunologic significance.

14. (a) Explain the structure and functional diversity of antibodies.

Or

- (b) Write notes on complement system components and functions.

15. (a) Discuss the role of interferons in immunity.

Or

- (b) Explain the mechanism of anaphylaxis.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Give an account of the types of immunity and their functional features.
  17. Discuss antigen processing and presentation in detail.
  18. Describe monoclonal antibody production and biomedical applications.
  19. Explain complement activation pathways and their role in inflammation.
  20. Write an essay on hypersensitivity reactions (Types I-IV) with examples.
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**S-3466**

**Sub. Code**

**23MZO4C2**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Fourth Semester**

**Zoology**

**ECOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Liebig's law of minimum
2. Natality
3. Edge effect
4. Predation
5. Food web
6. Epilimnion
7. Grassland biome
8. Non-degradable pollutants
9. Minamata disease
10. Endangered species.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Describe the role of light as an ecological factor.

Or

- (b) Discuss the role of parasitism as a biotic ecological factor.

12. (a) Describe the *r* and *k* — selection.

Or

- (b) What is population? Describe its different characteristics with suitable examples.

13. (a) What is food chain? Describe different food chains with examples.

Or

- (b) Describe different kinds of ecological pyramids.

14. (a) Write short notes on the following

- (i) Alpine biome
- (ii) Forest biome
- (iii) Wetlands

Or

- (b) Describe various measures of wild life management.

15. (a) Explain the wild life protection act.

Or

- (b) Write briefly explain the grassland ecosystem.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the characteristics, biotic communities and adaptations of estuarine animals.
  17. Describe in brief various techniques of measurements of population density of animals.
  18. What is ecological succession? Describe the process of ecological succession in pond.
  19. Describe hot-spots of biodiversity.
  20. Describe the structure of an ecosystem by taking an example of pond ecosystem.
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**S-3467**

**Sub. Code**

**23MZO4E1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Fourth Semester**

**Zoology**

**Elective – AQUACULTURE**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Define mariculture.
2. How topography in relation to pond construction.
3. What do you mean by induced breeding?
4. Explain the role of live feed in hatchery.
5. What is broodstock management?
6. Mention products obtained from sea cucumbers.
7. List out viral diseases in shrimp.
8. Name any two environmental diseases of fish
9. What are the different types of ornamental fishes?
10. Briefly describe the main functions of CIBA.

**Part B**

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe types of fish ponds used in aquaculture.

Or

- (b) Describe the tools used for hypophysation.

12. (a) Explain hatchery management techniques for freshwater prawns.

Or

- (b) Explain different types of artificial feeds.

13. (a) Explain the management strategies used in intensive shrimp farming.

Or

- (b) Discuss the methods of crab culture.

14. (a) Write about fungal diseases in shrimp.

Or

- (b) What are the control measures for nutritional diseases in aquaculture?

15. (a) Explain the breeding behavior of oviparous ornamental fishes.

Or

- (b) Describe the activities of MPEDA.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the future scope of aquaculture in India.

17. Explain induced breeding in carps.

18. Describe shrimp larval rearing methods.
  19. How are viral diseases in fish diagnosed and prevented in aquaculture?
  20. How are ornamental fishes maintained in freshwater aquarium tanks?
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**S-3468**

**Sub. Code**

**23MZO4S1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Fourth Semester**

**Zoology**

**ANIMAL BEHAVIOUR**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** of the following.

1. What is SNP?
2. Define Darwinian fitness
3. Impotence of sexual selection?
4. What is conditioning in animal learning?
5. Comment on Spatial orientation.
6. What is meant by learning in animals?
7. Write a short note on ritualization.
8. Why is communication important for animals?
9. Chronotherapy — Explain.
10. What causes clock dysfunction?

**Part B**

(5 × 5 = 25)

Answer **all** the following, choosing either (a) or (b).

11. (a) Explain how multiple genes can affect behavior.

Or

- (b) Write a note on the concept of fitness in evolution.

12. (a) Comment on altruism in animals.

Or

- (b) How do animals adapt visually in dim environments?

13. (a) Discuss the mechanism of homeostasis.

Or

- (b) Explain the types of animal learning.

14. (a) What are the mechanisms of decision making in animals?

Or

- (b) Write a note on nonverbal communication in animals.

15. (a) Provide an overview of central clock systems in multicellular animals.

Or

- (b) Explain chronopharmacology with examples.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the role of genes in shaping animal behaviour.
  17. Write a detailed account on the hearing adaptations in animals.
  18. Discuss the processes involved in learning in animals.
  19. Elucidate on the complex behavior in honey bees.
  20. Describe the molecular bases of seasonality.
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**S-3469**

**Sub. Code**

**23MZO4A1**

**M.Sc. DEGREE EXAMINATION, APRIL 2026**

**Fourth Semester**

**Zoology**

**BIO-COMPOSTING**

**(CBCS – 2023 onwards)**

Time : 3 Hours

Maximum : 75 Marks

**Part A**

(10 × 2 = 20)

Answer **all** questions.

1. Biodegradation.
2. Vermiwash.
3. Wedge Method.
4. Soil fertility.
5. Windrow composting.
6. Humus.
7. Acclimatization.
8. Compost bed.
9. Monoculture.
10. Worm casting.

**Part B**

(5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write about the raw materials necessary for the biocomposting.

Or

- (b) Mention the basic steps of compost making.

12. (a) Explain the advantages of field pit of composting.

Or

- (b) Describe the method of filling the biocomposting tank.

13. (a) What are the materials necessary for biocompost pit preparation?

Or

- (b) Give an elaborate note on pot method.

14. (a) Discuss the waste reduction through composting.

Or

- (b) Give short notes on application of biocompost in waste reduction.

15. (a) Prepare the project proposal for biocompost.

Or

- (b) Explain how do the self-help group benefited from biocompost unit.

**Part C**

(3 × 10 = 30)

Answer any **three** questions.

16. List out the requirements for successful production of vermicomposting.
  17. Write an essay on compost marketing.
  18. Describe aerobic and anaerobic biocomposting in detail.
  19. Discuss the advantages of compost in soil fertility.
  20. Explain the 10 key elements needed for project proposal for self-help group.
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