

**M. Sc. ZOOLOGY (SEMESTER- IV)**  
**Session 2018-19**  
**PAPER- I (ENVIRONMENTAL PHYSIOLOGY)**

Max. M.–80

NUMBER OF UNITS: IV

**UNIT-I**

1. Adaptations
  - 1.1 Levels of adaptation.
  - 1.2 Mechanisms of adaptation.
2. Adaptations to different environments.
  - 2.1 Marine, shores and estuaries.
  - 2.2 Freshwater.
  - 2.3 Terrestrial Life.

**UNIT-II**

3. Adaptations to different environments.
  - 3.1 Aerial
  - 3.2 Polar
  - 3.3 Deep sea environment
  - 3.4 Desert, Cave
  - 3.5 Wet land
  - 3.6 Parasitic habitats.

**UNIT-III**

4. Stress Physiology
  - 4.1 Basic concepts of environmental stress and strain, Concept of elastic and plastic strain.
  - 4.2. Stress avoidance, stress tolerance and stress resistance.
  - 4.3. Acclimatization, acclimation and adaptation.
  - 4.4. Endothermic and physiological mechanism of regulation of body temperature.

**UNIT -IV**

5. Stress physiology in different conditions
  - 5.1 Osmoregulation in aqueous and terrestrial habitats.
  - 5.2 Physiological response to oxygen deficient stress.
  - 5.3 Physiological response to body exercise.
  - 5.4 Effect of meditation and yoga

**M. Sc. ZOOLOGY (SEMESTER- IV) Session 2018-19**  
**PAPER- II (IMMUNOLOGY AND PARASITISM)**

Max. M.–80

NUMBER OF UNITS: IV

**UNIT-I**

1. Cells of immune system
  - 1.1 B-Lymphocytes, T-lymphocytes, Null Cells
  - 1.2 Mononuclear cells
  - 1.3 Granulocytic cells (Neutrophils, Eosinophils and Basophils)
  - 1.4 Mast cells
  - 1.5 Dendritic cells
2. Organs of immune system
  - 2.1 Primary lymphoid organs (Thymus, bone marrow)
  - 2.2 Secondary lymphoid organs (Lymph nodes, spleen, mucosal associated lymphoid tissue, cutaneous associated lymphoid tissue)

**UNIT-II**

3. Immunoglobulin structure and function
  - 3.1 Molecular structure of Ig, Light chain and Heavy chain
  - 3.2 Immunoglobulin classes
    - 3.2.1 IgG
    - 3.2.2 IgM
    - 3.2.3 IgE
    - 3.2.4 IgD
  - 3.3 Monoclonal antibodies

**UNIT-III**

4. Antigens
  - 4.1 Immunogenicity
    - 4.2.1 Complement System: Classical & Alternative Pathways
    - 4.2.2 Contribution of the immunogens.
    - 4.2.3 Contribution of Biological system.
5. Antigen - Antibody Interaction
6. Vaccine
  - 6.1 Active and passive immunization
  - 6.2 Whole organism vaccine
  - 6.4 Recombinant vector vaccines
  - 6.5 DNA vaccines

**UNIT-IV**

7. Immune system in Health disease
  - 7.1 Immune response to infectious disease
  - 7.2 Immune response in cancer
8. Pathophysiology of parasitic infection
  - 8.1 Viral infections
  - 8.2 Bacterial infection
  - 8.3 Helminths infection
9. AIDS

**M. Sc. ZOOLOGY (SEMESTER- IV)**  
**Session 2018-19**  
**PAPER- III (ICHTHYOLOGY)**

Max. M.–80

NUMBER OF UNITS: IV

**UNIT-I**

1. Skin and its derivatives in fishes.
2. Skeleton in fishes.
3. Fins-Types, structure, modification, functions
4. Locomotion in fishes.
5. Food, feeding habit and alimentary canal of fishes.

**UNIT-II**

6. Respiration and accessory respiratory organs.
7. Swim bladder and Weberian ossicles.
8. Blood, heart and blood vascular system of fishes.
9. Excretion and Osmoregulation in fishes.

**UNIT-III**

10. Nervous system and sense organs in fishes
11. Specialized organs in fishes (organs of sound production & electric organs).
12. Reproduction in fishes
13. Development in fishes
14. Endocrine glands

**UNIT -IV**

15. Adaptation:
  - 15.1 Colouration
  - 15.2 Deep sea fishes
  - 15.3 Hill stream fishes
16. Larvivorous fishes
17. Exotic fishes
18. Fish products and by-products
19. Setting and maintenance of an aquarium

**M. Sc. ZOOLOGY (SEMESTER- IV)**  
**Session 2018-19**  
**PAPER- IV (AQUACULTURE AND FISHERIES)**

Max. M.–80

NUMBER OF UNITS: IV

**UNIT-I**

1. General characteristics, classification, evolution and phylogeny of the following:

- Placoderms
- Elasmobranchs
- Holocephali
- Dipnoi.
- Teleostomi.

**UNIT-II**

2. Fish culture in fresh water

Physicochemical condition of water and its effect on fishes.

Construction and maintenance of fish farm, management of ponds

Fresh water fish breeding (dry and wet bundh breeding, induced breeding)

Stocking and transport of fish seed and brood fish.

Intensive culture of air breathing fishes.

Fish cum paddy culture.

**UNIT-III**

3. Composite fish culture

4. Integrated fish farming

5. Sewage fisheries

6. Prawn fishery

7. Inland fisheries

8. Marine fisheries

**UNIT-IV**

9. Fish diseases

9.1 Viral diseases

9.2 Bacterial and protozoan diseases

9.3 Helminth parasites of fishes

9.4 Prophylaxis and treatment of fish diseases

**M. Sc. ZOOLOGY (SEMESTER IV)**

**Session 2018-19**

**Practical- I**

**I. Environment Physiology**

1. Study of the effects of starvation / surfacing prevention on opercular activity in a teleost fish.
2. Study of effect of fluoride toxicity on muscle protein in a fish.
3. Study of changes in chromatophores in fish kept against white and black backgrounds.
4. Toxicity test (LC 50)
5. Adaptive modification of feet or claws in birds.
6. Adaptive modification in mouth parts of insects.
7. Analysis of soil and water.
8. Other exercises related to theory paper.

**II. Immunology and Parasitism**

1. Alternate methods of dissection of primary and secondary immune organs from fish/fowl- Preparation and study of cell suspension from spleen (spleenocytes) of Fish / fowl.
2. Total and differential counting of leucocytes.
3. Protein estimation by Lowry's method in normal and infected blood sample.
4. Determination of Blood group.
5. Study of permanent slides (for spotting); thymus, lymph nodes, spleen, bone marrow, types of cells squamous, cuboidal, columnar, epithelial cells, blood cells, nerve cells, muscles cells, connective tissue of various types, adipose tissue, mitotic and meiotic chromosomes and their different phases cancer cells of various types etc.
6. Study of parasites in fish
7. Study of various parasites through slides and specimen.
8. Other exercises related to theory paper.

**Scheme of Practical Examination:**

- |   |                   |
|---|-------------------|
| 1. Exercises based on Environmental physiology  | 30 marks.         |
| 2. Exercises based on Immunology.               | 20 marks.         |
| 3. Protein Estimation by Lowry's method.        | 10 marks          |
| 4. Identification and Comments on spots 1 to 10 | 20 marks.         |
| 5. Viva-voce                                    | 10 marks.         |
| 6. Sessional                                    | 10 marks.         |
| <b>Total Marks</b>                              | <b>100 marks.</b> |

**M. Sc. ZOOLOGY (SEMESTER-IV)**  
**Session 2018-19**  
**Practical- II**

**III. Ichthyology**

1. Study of distinguishing features, identification and classification of important species of fish available in the museum.
2. Study of fish anatomy and histology through available slides.
3. Identification of important cultivable species of fish.
4. Display of visceral organs, cranial nerves (Wallago/Mystus), breathing organs (air breathing species) and weberian ossicles (Wallago/Mystus); preparation of fish skeleton; alizarine preparation.
5. Age determination of fishes with the help of scale method.
6. Study of various hematological parameters (RBC, WBC, Hb).
7. Study of osteology of fishes.
8. Other exercises related to theory paper.

**IV. Aquaculture and Fisheries**

1. Estimation of hydro biological parameters- pH, conductivity, salinity, dissolved oxygen.
2. Identification of eggs, spawn, fry and fingerlings of cultivable fishes of India.
3. Study of feeding habits of fishes by gut content analysis.
4. Study of Aquarium design and maintenance.
5. Visit to fish farm/three to four day tour to study various fisheries activities at selected centers/sites.
6. Determination of gonadosomatic index.
7. Demonstration of induced breeding techniques.
8. Other exercises related to theory paper.

**Scheme of Practical Examination:**

- |  |                   |
|--|-------------------|
| 1. Alternate methods of major dissection.          | 12 marks.         |
| 2. Alternate methods of minor dissection.          | 08 marks.         |
| 3. Exercise on fish hematology.                    | 10 marks.         |
| 4. Morphometry and identification.                 | 20 marks.         |
| 5. Experiment based on hydro biological Parameter. | 10 marks.         |
| 6. Identification and Comments on spots 1 to 10    | 20 marks.         |
| 7. Viva-voce                                       | 10 marks.         |
| 8. sessional                                       | 10 marks.         |
| <b>Total Marks</b>                                 | <b>100 marks.</b> |

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**Govt. D.B. Girls' P.G. College, Raipur**  
**M.Sc. Zoology Syllabus 2018-19**

**Semester I**

Paper I: Biosystematics, taxonomy and biodiversity  
Paper II: General physiology and endocrinology  
Paper III: Structure and function of invertebrates  
Paper IV: Molecular biology and biotechnology  
Practical I  
Practical II

**Semester II**

Paper I: Quantitative biology and computer application  
Paper II: Development biology  
Paper III: Population genetics and evolution  
Paper IV: Tools and techniques in biology  
Practical I  
Practical II

**Semester III**

Paper I: Comparative anatomy of vertebrates  
Paper II: Biological chemistry  
Paper III: Environmental biology and population ecology  
Paper IV: Animal behaviour  
Practical I  
Practical II

**Semester IV**

Paper I: Environmental physiology  
Paper II: Immunology and parasitism  
Paper III: Ichthyology  
Paper IV: Aquaculture and fisheries  
Practical I  
Practical II

**Structure for theory paper**

<b>a. Theory</b>	<b>80 marks</b>
<b>b. Seminar</b>	<b>10 marks</b>
<b>c. Unit test</b>	<b>10 marks</b>
<b>Total</b>	<b>100marks</b>

**Structure for each practical**

<b>a. Regularity and records</b>	<b>10 marks</b>
<b>b. Practical exercises</b>	<b>90 marks</b>
<b>Total</b>	<b>100 marks</b>