NATIONAL UNIVERSITY

Third Year Syllabus
Department of Zoology

Four Year B.Sc. Honours Course
Effective from the Session: 2013–2014
National University  
Syllabus for Four Year B.Sc. Honours Course  
Subject: Zoology  
Effective from the Session: 2013-2014  
Year-wise Papers and marks distribution

THIRD YEAR

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Title</th>
<th>Marks</th>
<th>Credits</th>
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<tbody>
<tr>
<td>233101</td>
<td>Evolution, Palaeontology and Zoogeography</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>233103</td>
<td>Ecology</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>233105</td>
<td>Genetics and Animal Breeding</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>233107</td>
<td>Developmental Biology and Ethology</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>233109</td>
<td>Human Physiology</td>
<td>100</td>
<td>4</td>
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<tr>
<td>233111</td>
<td>Systematics, Demography and Family Planning</td>
<td>100</td>
<td>4</td>
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<tr>
<td>233113</td>
<td>Cell and Molecular Biology</td>
<td>100</td>
<td>4</td>
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<tr>
<td>233114</td>
<td>Zoology Practical-III</td>
<td>100</td>
<td>4</td>
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<tr>
<td>Total</td>
<td></td>
<td>800</td>
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Detailed Syllabus

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>233101</th>
<th>Marks: 100</th>
<th>Credits: 4</th>
<th>Class Hours: 60 hrs.</th>
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</thead>
</table>

Paper Title: Evolution, Palaeontology and Zoogeography

Evolution

1. Lamarckism, Darwinism, Wallace’s theory and synthetic theory.
2. Evidences of organic evolution: Biogeography, comparative anatomy, physiology, embryology, palaeontology and genetics.
4. Speciation: Definition, sympatric and allopatric speciation including induced speciation.
6. Convergent, divergent and parallel evolution.

Palaeontology

1. Introduction to palaeontology.
2. Types of fossils, process of fossilization, fossil dating methods, significance of fossils.
4. Palaeontological history of horse, camel, elephant and man.

Zoogeography

1. Introduction to Zoogeography.
3. Zoogeographical Regions and sub-regions of the world, their boundaries, physical characteristics, climatic conditions, vegetation and fauna.
5. Insular fauna.
6. Origin, evolution and pattern of diagnostic characteristic fauna of different regions with special reference to the tropical and sub-tropical zones.

Books Recommended:


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<tbody>
<tr>
<td>233103</td>
<td>100</td>
<td>4</td>
<td>60 hrs.</td>
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</table>

**Paper Title:** Ecology

1. **Introduction**
   a) Definition
   b) History and scope of ecology
   c) Study of ecology: Theoretical and practical approaches
   d) Branches of ecology

2. **The Environment**
   a) Abiotic factors: Temperature, relative humidity, pH, radiation, water, atmospheric gases, light, biogenic salts, current and pressure.
   b) Biotic factors: Positive and negative interactions (protocooperation, commensalisms, mutualism, competition, predation, parasitism).

3. **Ecosystem Ecology**
   a) Definition, structure, component and function of ecosystem
   b) Energy and its flow in ecosystem.
   c) Biogeochemical cycles: Carbon, nitrogen and carbon dioxide
   d) Aquatic ecosystems: Pond, lake, river, estuary and marine
   e) Terrestrial ecosystems

4. **Community Ecology**
   a) Definition and types of communities
   b) Community concept and analysis
   c) Community structure, composition and stratification
   d) Ecological niche and habitats
   e) Ecological succession, ecotone
   f) Concept of climax
   g) Biomes and its types

**Books Recommended**


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<tbody>
<tr>
<td>Paper Title: Genetics and Animal Breeding</td>
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</table>

1. Introduction to genetics, history of genetics.
2. Mendel’s principles of segregation of gene and of independent assortment.
5. Epistasis and reversion.
6. Test cross and back cross.
7. Multiple alleles and pseudoalleles.
8. Pleiotropism.
9. Penetration and expressivity.
10. Linkage and crossing over.
11. Sex-linked, sex-limited and sex-influenced traits.
12. Mutation and chromosomal aberrations.
13. Sex determination.
18. Animal breeding: Inbreeding, outbreeding and crossbreeding, and their application to economically important animals.

**Books Recommended**


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<tbody>
<tr>
<td>233107</td>
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**Developmental Biology (50 marks)**

1. Gametogenesis: Spermatogenesis and oogenesis in mammals.
3. Types of eggs and sperms in animals.
4. Fertilization in mammals: Types, events in fertilization, cortica changes, chemistry of fertilization, significance of fertilization.
5. Cleavage and cleavage types in animals.
6. Formation of morula, blastula and gastrula in *Branchiostoma*, toad and chicken.
7. Formation and fate of germinal layers in *Branchiostoma*, toad and chicken.
8. Extra embryonic membranes in amniotes.
10. Development of *Neanthes* and man.

**Ethology (50 Marks)**

1. **Introduction**
   a) Definitions
   b) Concepts of behaviour

2. **Development of behaviour**
   a) Ontogeny
   b) Natural selection
   c) Environmental influence upon behaviour

3. **Physical basis of behaviour**
   a) Neural control of behaviour
   b) Reflexes and behaviour
   c) Effects of hormones on sexual, aggressive and maternal behaviour.

4. **Instinct and learning**
   a) Introduction to instinct and learning behaviour
   b) Imprinting and learning
   c) Sensitive period

5. **Social behaviour**
   a) Altruism: Kin selection, mutualism, reciprocity
   b) Parental care

6. **Signals for communication**
   a) Types and functions of communication
   b) Animal calls and their uses
Books Recommended
1. S.F. Gilbert and A.M. Raunio (Editors), 1997 Embryology, Constricting the Organism, Sinauer
2. B.I. Balinsky An Introduction of Embryology,

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>233109</th>
<th>Marks: 100</th>
<th>Credits: 4</th>
<th>Class Hours: 60 hrs.</th>
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<tbody>
<tr>
<td>Paper Title:</td>
<td>Human Physiology</td>
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<tr>
<td>1. <strong>Digestion</strong>: Definition; composition and functions of saliva, digestive juices, enzymes and biles; absorption of different types of food in intestine, functions of liver and pancreas.</td>
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<tr>
<td>2. <strong>Food and nutrition</strong>: Definition, structure and function of different types of food, their nutrition with special reference to carbohydrates, lipids, proteins and vitamins.</td>
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<tr>
<td>3. <strong>Metabolism</strong>: Definition, metabolic pathways, metabolism of carbohydrates (glycolysis, Kreb’s Cycle and oxidative phosphorylation), metabolism of glycogen in liver and muscles (glycogenesis and glycogenogenesis), metabolism of lipids (deposited fats and its functions, oxidation of fats), metabolism of proteins (fate and functions of amino acids, Ornithine Cycle, transamination-transmethylation); role of endocrine glands, vitamins, phospholipids, steroids and cholesterol.</td>
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<tr>
<td>4. <strong>Circulation</strong>: Myogenic regulation of heart beat, transmission of impulse, cardiac cycle, functions of blood, blood grouping, blood pressure, mechanism of coronary and pulmonary circulations, functions of tissue fluids and lymphs.</td>
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<tr>
<td>5. <strong>Respiration</strong>: Mechanism of breathing, pulmonary ventilation, exchange of gases in lungs, oxygen and carbon dioxide transport, internal respiration.</td>
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<tr>
<td>6. <strong>Movement</strong>: Mechanism of muscle contraction and retraction, neuromuscular junction, metabolism in muscles, muscular fatigue.</td>
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<tr>
<td>7. <strong>Coordination (neural and hormonal)</strong>: Conduction of nerve impulse, reflex action, hormonal control.</td>
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</tbody>
</table>

9. **Homeostasis**: Definition, mechanism and role of various physiological systems in homeostasis. Negative feedback mechanism.

**Books Recommended**
1. C.C. Chatterjee. *Human Physiology*: Vols. I & II
2. V. Tatornor. *Human Anatomy and Physiology*.

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<tbody>
<tr>
<td>233111</td>
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</table>

**Systematics (50 marks)**

1. Introduction to taxonomy and systematics
2. History of taxonomy
3. Old and new systematics
4. Levels of taxonomy
5. Taxonomic categories
6. Species concept
7. Methods of animal collection and preservation for taxonomic studies
8. Taxonomic publications
9. Taxonomic keys: Types, preparation and significance
10. International Code of Zoological Nomenclature (ICZN), origin of the code, rules of nomenclature
11. Law of priority
12. Type specimens
13. Modern trend in taxonomic approach including cladistic
14. Formation of generic and specific names
15. Describing a new species

**Demography and Family planning (50 marks)**

1. Introduction, definition and history of demographic development
2. History and perspective of human population growth
3. Human population and its nature of growth
4. Factors for population explosion
5. Population management
6. Demographic theories
7. Logistic model of population growth
8. Density dependent and density independent factors
9. Absolute and relative growth rates
10. Human reproductive system and the accessory glands
11. Sex hormones and their role in human reproduction, puberty, ovarian cycle, menopause
12. Regulation menstrual cycle and pregnancy
13. Fertilization, pregnancy, placenta, fetus and fetal development, parturition (child birth)
14. Importance of family planning and management, ethics of family planning
15. Birth control principles and methods
Books Recommended
3. E. Mayr. 1999 *Systematics and the Origin of Species from the view point of a Zoologist*. Harvard UP. USA

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>233113</th>
<th>Marks: 100</th>
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<th>Class Hours: 60 hrs.</th>
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<tbody>
<tr>
<td>Paper Title</td>
<td>Cell and Molecular Biology</td>
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</tbody>
</table>

**Cell Biology (50 marks)**
1. Microscope: Types, functions, magnification and resolving power
2. General account of the cell: Structure of cell, prokaryote and eukaryote cells, protoplasm and its colloidal nature, organic compounds in cells, cell theory
3. Cellular structure and functions: Chemical composition of cell membrane, membrane models and functions of cell membrane; types, structures and functions of chromosomes.
4. Cellular organelles: Ultrastructure, formation and functions of Golgi complex, endoplasmic reticulum, ribosomes, lysosomes, mitochondria, centrioles, microtubules and cytoskeleton; morphology and cytochemistry of nucleus
5. Changes in chromosomal structures and numbers: Deletion, duplication, inversion, translocation, aneuploidy, euploidy and their significance
6. Cell division: Types of cell division, growth cycle, division and differentiation, significance of cell division.

**Molecular Biology (50 marks)**
1. Concepts of molecular biology
2. Gene: Chemistry and functions of nucleic acids (DNA and RNA)
3. Replication of DNA, transcription of RNA, replication of viruses
4. Genetic organization of DNA and RNA: Genome and genomics
5. Protein synthesis and its regulation
6. Immunology: Molecular biology of immune systems, structure and functions of immunoglobulins, antibody, antibody synthesis, immunization

Books Recommended

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Marks: 100</th>
<th>Credits: 4</th>
<th>Time: 2 days, 6 hours/day</th>
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<tbody>
<tr>
<td>Paper Title:</td>
<td>Zoology Practical-III</td>
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</table>

1. **Microtomy**: Preparation of permanent histological slides.
2. **Taxonomy**: Taxonomic study of different animal groups following standard taxonomic procedures and techniques.
3. **Ecology**:  
   a) Visiting pond to study pond ecosystem including faunal and floral composition and food chain.  
   b) Visiting forest and sea shore to study animals and their adaptation, and preparation of a report on the visits.  
   c) Study of the population of a species in a given area by using quadrat/transect method.  
4. **Water analysis**: Measurement of dissolved oxygen, carbon dioxide, ammonia, nitrite, pH, turbidity and salinity.
5. **Genetics**: Study of the characteristics of *Drosophila*, its identification of body parts and sex, identification of mutant flies.

6. **Physiology**: Estimation of blood pressure and pulse rate, determination of blood group, estimation of blood sugar.

7. **Animal preservation**: Collection, handling, immobilization, killing and preservation of different animal groups following standard techniques.

8. **Excursion/study tour to the sea/estuary/forest**: specimen collection, and preparation of a report.

9. **Preparation of practical class note books**

### Distribution of marks for Third Year Final Practical Examination

<table>
<thead>
<tr>
<th>Activity</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microtomy</strong></td>
<td>25</td>
</tr>
<tr>
<td>(Block preparation - 5, tissue section - 4,</td>
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<tr>
<td>tissue stretching - 5, tissue staining - 4,</td>
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<tr>
<td>tissue identification - 2, drawing and labelling - 3, identifying characteristics - 2)</td>
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<tr>
<td><strong>Taxonomy</strong></td>
<td>10</td>
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<tr>
<td>(Construction of a dichotomous taxonomic key</td>
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<tr>
<td>on the specimens - at least 10 specimens)</td>
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<tr>
<td><strong>Ecology</strong></td>
<td>10</td>
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<tr>
<td><strong>Water Analysis</strong></td>
<td>10</td>
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<tr>
<td>(One item will be given in the examination</td>
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<tr>
<td>and the following points will be mentioned -</td>
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<tr>
<td>Principles and objectives - 2, materials</td>
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<tr>
<td>required - 1, procedure - 2, data taking and</td>
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<tr>
<td>presentation - 1, data analysis and</td>
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<tr>
<td>discussion - 4)</td>
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<tr>
<td><strong>Genetics</strong></td>
<td>10</td>
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<tr>
<td><strong>Physiology</strong></td>
<td>10</td>
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<tr>
<td><strong>Excursion report and collection</strong></td>
<td>15</td>
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<tr>
<td>(Collection, preservation and identification</td>
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<tr>
<td>of different phyla, excursion report:</td>
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<tr>
<td>Collection – 5, Report- 10)</td>
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<tr>
<td><strong>Practical class note books</strong></td>
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**Total = 100 marks**

### Books Recommended


