

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER-I**  
(Non-Chordates and Chordates)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the mechanism of filter-feeding in Mollusca.
2. Give an account of organs of excretion in Annelida.
3. Describe hydrostatic movement in Coelenterates.
4. Describe the organs of respiration in Prawn.
5. Write notes on any **Two** of the following :—
  - (a) Acoelomate
  - (b) Tracheal System
  - (c) Bipinaria larva
  - (d) Nephridia

**GROUP 'B'**

6. Describe the different epidermal glands found in Vertebrates.
7. Classify living Reptiles up to orders with important characters and examples.
8. Describe the brain of Amphibia and compare it with that of Mammal.
9. Describe the structure and affinities of Balanoglossus.
10. Write notes on any **Two** of the following :—
  - (a) Tadpole larva
  - (b) Placoid scale
  - (c) Wheel organ
  - (d) Echidna

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**Examination Programme, 2016**  
**M.Sc. Zoology, Part-I**

<b>Date</b>	<b>Papers</b>	<b>Time</b>	<b>Examination Centre</b>
12.05.2016	Paper-I	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
14.05.2016	Paper-II	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
16.05.2016	Paper-III	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
18.05.2016	Paper-IV	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
20.05.2016	Paper-V	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
24.05.2016	Paper-VI	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
26.05.2016	Paper-VII	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
28.05.2016	Paper-VIII	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
<b>Exam Centre : MGM College, Kankarbagh Main Road, Opposite Chandan Automobiles Hero Showroom, Patna-800020.</b>			

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER-II**  
(Taxonomy, Biodiversity and conservation)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Give an account of theories of biological classification.
2. Describe in detail regarding application of Biosystematics in Biology.
3. Discuss, different types of Biodiversity.
4. Describe the process of typification.
5. Write notes on any **Two** of the following:—
  - (a) Intra specific species
  - (b) Zoological types
  - (c) Genetic diversity
  - (d) Cytotaxonomy and Molecular taxonomy.

**GROUP 'B'**

6. Give an account of Threatened and endangered species.
7. Describe the Characteristic features and faunal adaptation of marine biome.
8. Give reasons of depletion of Wildlife in India.
9. Describe the various theories of Biodiversity variations.
10. Write notes on any **Two** of the following:—
  - (a) N.G.O.
  - (b) Taxon
  - (c) Captive breeding
  - (d) Pug marking

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**Examination Programme, 2016**  
**M.Sc. Zoology, Part-I**

<b>Date</b>	<b>Papers</b>	<b>Time</b>	<b>Examination Centre</b>
12.05.2016	Paper-I	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
14.05.2016	Paper-II	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
16.05.2016	Paper-III	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
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24.05.2016	Paper-VI	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
26.05.2016	Paper-VII	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
28.05.2016	Paper-VIII	12.00 Noon to 3.00 PM	MGM College, Kankarbagh Main Road, Patna
<b>Exam Centre : MGM College, Kankarbagh Main Road, Opposite Chandan Automobiles Hero Showroom, Patna-800020.</b>			

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER—III**  
(Ecology, Environmental Biology and Toxicology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe different types and various hypothesis put forward to explain Sexual Selection.
2. Give an account of different types of competition found in nature.
3. Describe the role of predation in nature.
4. Give an account of evolution of life history traits.
5. Write notes on any **Two** of the following:—
  - (a) Ecological Model
  - (b) Niche concept
  - (c) Life table.
  - (d) Mutualism.

**GROUP 'B'**

6. Describe the impact of temperature on various life processes.
7. Explain how animals are adapted with the change in environment.
8. Describe the physiology of oxygen deficiency in animals.
9. Give an account of environmental Acts in India.
10. Write notes on any **Two** of the following:—
  - (a) Solar energy
  - (b) Acid Rain
  - (c) Oxygen toxicity
  - (d) Tolerance

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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER-IV**  
(Ethology and Evolution)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Give an account of Parental care in fishes.
2. Write an essay on Birds migration.
3. Describe the types and role of signals.
4. Give an account of Social organization of Insects, citing an example of honeybee.
5. Write notes on any **Two** of the following:—
  - (a) Innate behavior
  - (b) Biological clock
  - (c) Diapause
  - (d) Cognitive Skills

**GROUP 'B'**

6. Describe models, explaining changes in genetic structure of population.
7. Write an essay on Lamarckism.
8. Explain briefly biological species concept, adding notes in its limitation.
9. Give an account of destabilizing forces of Neo-Darwinism.
10. Write notes on any **Two** of the following:—
  - (a) Reproductive isolation
  - (b) Phenotypic variation
  - (c) Gene Pool
  - (d) Phylogenetic tree

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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER-V**

(Animal physiology and Biochemistry)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe physiological adaptation in marine animals.
2. Describe the mechanism of muscle contraction.
3. Give an account of audio signal in Animals.
4. Give an account of transport of oxygen and carbon dioxide in mammals.
5. Write notes on any **Two** of the following:—
  - (a) Bohar's Effect
  - (b) Pheromons
  - (c) Operon Concept
  - (d) Oceanic Zone

**GROUP 'B'**

6. Give an account of biological role of plasma lipoproteins.
7. Describe the short-term and long term regulation of fatty acid synthesis.
8. Describe the events in initiation and elongation of peptide chain in eukaryotes.
9. Give an account of  $\beta$ -oxidation of fatty acid.
10. Write notes on any **Two** of the following:—
  - (a) HMP Shunt
  - (b) Ribozyme
  - (c) Lipotropic factors
  - (d) ATP-ADP translocation

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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER-VI**  
(Cytogenetics and Microbial Genetics)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the Characterization of human chromosomes on the basis of different banding technique.
2. Describe the Sex-Chromosomes abnormalities of human being and also mention it syndromes.
3. Write an essay on cell harvesting.
4. Describe the techniques in human chromosome analysis and molecular cytogenetic approaches.
5. Write notes on any **Two** of the following:—
  - (a) Non-disjunction of chromosome
  - (b) Nucleosome organization
  - (c) Lamp brush chromosome.
  - (d) Chromosomal Puffs.

**GROUP 'B'**

6. Describe the genetic regulation of cell cycle in eukaryotes.
7. Give an account of finger printing technique of DNA and its application.
8. Describe the cytogenetic effects of ionized and non-ionized radiation.
9. Describe the separation of chromosome by flow cytometer.
10. Write notes on any **Two** of the following:—
  - (a) T4-Phage
  - (b) Turner's syndrome
  - (c) FISH
  - (d) Bacterial genome

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<p><b>For Practical Counselling Class &amp; Practical Examination Programme Please See on Back Page.</b></p>
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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER-VII**  
(Molecular Biology and Genetics)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the history of molecular biology.
2. Describe the promotion sites of initiation of transcription of Prokaryotes.
3. Give two classical experiments to demonstrate Semi-conservation mode of DNA replication.
4. Describe the process of RNA editing in reference to mitochondrial genome.
5. Write notes on any **Two** of the following:—
  - (a) Enhancer sites
  - (b) TATA Box
  - (c) Template
  - (d) Antiterminator

**GROUP 'B'**

6. Describe translation process in Prokaryotes.
7. Describe the mechanism of DNA repair.
8. Describe the recombination of protein in E.Coli.
9. Describe the procedure of gene cloning.
10. Write notes on any **Two** of the following:—
  - (a) Libraries
  - (b) Gene conversion
  - (c) Teminism
  - (d) Elongation factor

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<p><b>For Practical Counselling Class &amp; Practical Examination Programme Please See on Back Page.</b></p>
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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-I**  
**PAPER–VIII**

(Basic physiology and chemical principles and instrumentation)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe Glycolysis and its energetics.
2. Give an account of effect of radiation in biological system.
3. Give an account of hydrogen bond and its significance in biological system.
4. Explain how biological energy transducers play an important role in all living organisms?
5. Write notes on any **Two** of the following:—
  - (a) ATP
  - (b) Energy rich bonds
  - (c) HMP shunt
  - (d) Buffers

**GROUP 'B'**

6. Describe the mechanism of photometer.
7. Describe the principle of working of Colorimeter.
8. Give an account of thin layer chromatography (TLC).
9. Give an account of different component of HPLC.
10. Write notes on any **Two** of the following:—
  - (a) X-ray
  - (b) Sedimentation
  - (c) Indicator
  - (d) Redox Potential

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<p><b>For Practical Counselling Class &amp; Practical Examination Programme Please See on Back Page.</b></p>
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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–IX**  
(Quantitative Biology & Microbiology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. What do you mean by correlation coefficient? Describe different types of correlation.
2. Describe different types of regression.
3. Define variance and standard deviation and discuss their computations from ungrouped scores of a sample.
4. Define harmonic and geometric mean and discuss their merits and demerits.
5. Write notes on any **Two** of the following:—
  - (a) Normal distribution
  - (b) Standard error
  - (c) Error of inference
  - (d) Rank's correlation

**GROUP 'B'**

6. Describe the role of microbes in improvement of soil and in dairy industries.
7. Describe the structure, pathogenesis and mode of infection of HIV infection.
8. Write an essay on Host microbes interaction.
9. Give an account of elementary ideas of Bioinformatics.
10. Write notes on any **Two** of the following:—
  - (a) Homology and Analogy
  - (b) Nitrogen fixation
  - (c) Alcoholic fermentation
  - (d) Single cell propein



**Examination Programme, 2016**  
**M.Sc. Zoology, Part-II**

Date	Papers	Time	Examination Centre
01.06.2016	Paper-IX	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
03.06.2016	Paper-X	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
07.06.2016	Paper-XI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
09.06.2016	Paper-XII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
11.06.2016	Paper-XIII	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
13.06.2016	Paper-XIV	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
15.06.2016	Paper-XV	12.00 Noon to 3.00 PM	Nalanda Open University, Patna
17.06.2016	Paper-XVI	12.00 Noon to 3.00 PM	Nalanda Open University, Patna

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER-X**  
(Biotechnology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the working principle of Spectrophotometer giving its two applications.
2. Describe Southern blotting technique. Give an account of major steps involved in isolation of a particular gene from genome.
3. Discuss principles and basis of scanning electron microscopy.
4. Give an account of steps involved in DNA amplification method for RNA assay and significance of RNA assay.
5. Write notes on any **Two** of the following:—
  - (a) Radioisotopes
  - (b) HIV virus
  - (c) Beta Decay
  - (d) Radiation detecting devices.

**GROUP 'B'**

6. Write an essay on RIA and its application.
7. What is fixation? Give an account of nature of fixatives and properties of chemical fixing reagents.
8. Describe comet assay technique for detection of apoptotic cells.
9. Discuss the labeling antibodies.
10. Write notes on any **Two** of the following:—
  - (a) Staining
  - (b) Biosensor
  - (c) SDS-PAGE
  - (d) TLC

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–XI**

(Immunology, cells and Tissues)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Give a detail account of structure of MHC molecules.
2. Give general properties of antigen.
3. Give an account of role played by biological system in immunogenicity.
4. Give a detailed account of adjuvants and their properties.
5. Write notes on any **Two** of the following:
  - (a) Hapten
  - (b) Complement deficient diseases
  - (c) Atopy
  - (d) Natural Killer Cells.

**GROUP 'B'**

6. Give an account of active transport across cell membrane.
7. How microfilament and microtubule play their role in cytoskeleton?
8. Describe molecular organization of cell membrane.
9. Describe the basic mechanism of cell signaling.
10. Write notes on any **Two** of the following:
  - (a) Radial spokes
  - (b) DAG
  - (c) Adipose tissue
  - (d) Sorting of protein

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–XII**  
(Parasitology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the life history and Pathogenic effect of *Wuchereria bancrofti*.
2. What causes Kala-azar? Describe symptoms, diagnosis, treatment and its preventions.
3. Describe the life-cycle and pathogenic effect of *Entamoeba histolytica*.
4. Describe the mode of transmission of mosquito parasite in human body.
5. Write notes on any **Two** of the following:
  - (a) Bed bug
  - (b) Encystment
  - (c)  $\beta$ -lymphocytes
  - (d) Fleas

**GROUP 'B'**

6. Describe in detail antigen and antibody reaction in clinical parasitology.
7. Give an account of prevention and control of Poultry diseases.
8. Describe different types of cells acting in immune system.
9. Enumerate the technique of Counter Immunoelectrophoresis.
10. Write notes on any **Two** of the following:
  - (a) Macrophages
  - (b) Bone marrow
  - (c) Mast Cells
  - (d) Natural Killer Cells.

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–XIII**  
(Development Biology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the process of vitellogenesis.
2. Give an account of events that lead to differentiation of sperms and eggs during gametogenesis.
3. Describe structure of matured mammalian gametes.
4. Give an account of different patterns of cleavage.
5. Write notes on any **Two** of the following:
  - (a) Acrosome formation.
  - (b) Graffien follicles
  - (c) Telolecithal eggs.
  - (d) Blastula formation

**GROUP 'B'**

6. Describe the method of bone marrow transplantation.
7. Describe the pattern of cell movement during gastrulation in vertebrates.
8. Give an account of juvenile hormone in insect metamorphosis.
9. Describe the role of ecdysome in insects metamorphosis.
10. Write notes on any **Two** of the following:
  - (a) Neurulation
  - (b) Stem Cells
  - (c) Juvenile hormone
  - (d) Bone marrow

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–XIV**  
(Endocrinology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Describe the histology of Thyroid gland and biosynthesis of thyroxin.
2. Describe the chemistry, source and physiological action of glucagon.
3. Describe the different diseases produced due to imbalance of different hormones.
4. Describe cortical hormones and also discuss their physiological effects.
5. Write notes on any **Two** of the following:
  - (a) Oxitocin
  - (b) Nor-adrenalin
  - (c) Cushing's syndrome.
  - (d) Hypothyroidism

**GROUP 'B'**

6. Describe the hormonal control of testosterone production.
7. Describe the histology of ovary and also discuss the physiology of ovarian hormones.
8. Describe the role of hormones in carbohydrate metabolism.
9. Describe the mechanism of action of hormones.
10. Write notes on any **Two** of the following:
  - (a) Conn's disease
  - (b) Implantation
  - (c) Feedback mechanism
  - (d) Emergency hormone

**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–XV**  
(Entomology)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. How cuticle is formed? Explain mechanism of moulting.
2. Give an account of sound producing organs in insects.
3. Describe respiration in terrestrial Insects.
4. Give an account of internal and external genitalia of Insects.
5. Write notes on any **Two** of the following:
  - (a) Chemoreceptor
  - (b) Hermaphroditism
  - (c) Air Sacks
  - (d) Spiracles

**GROUP 'B'**

6. Describe the role of chemicals in insect post management.
7. Describe the life cycle of any two pests of cereals and their control.
8. Describe the methods for estimation of pest population.
9. Write an essay on "Host microbe interaction".
10. Write notes on any **Two** of the following:
  - (a) Migrant pests
  - (b) Parasitic insects
  - (c) Mixed Cropping
  - (d) Juvenile Hormone

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<p><b>For Practical Counselling Class &amp; Practical Examination Programme Please See on Back Page.</b></p>
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**NALANDA OPEN UNIVERSITY**  
**M.Sc. Zoology, Part-II**  
**PAPER–XVI**  
(Ichthyology and Inland Fisheries)  
*Annual Examination, 2016*

**Time: 3 Hours.**

**Full Marks: 80**

*Answer five questions in all, selecting at least Two Questions from each Group.  
All Questions carry equal marks.*

**GROUP 'A'**

1. Give an account of structure and functions of acoustico-lateral line system in fishes.
2. Describe the structure of gastro-intestinal trach of any carnivore fish and add a note on its feeding habit.
3. Define estuary and describe the estuarine fisheries of India.
4. Classify fishes up to orders with atleast one example of each order.
5. Write notes on any **Two** of the following:
  - (a) Gill ventilation
  - (b) Opercular suction pump
  - (c) Condrichthyes
  - (d) Plankton feeders

**GROUP 'B'**

6. Describe artificial breeding in fishes.
7. Give an account of Prawn Culture in sea water in India.
8. Describe the fish diseases caused by various crustaceans with treatment.
9. Describe the Control of physico-chemical factors in management of fish farms.
10. Write notes on any **Two** of the following:
  - (a) Gear and crafts
  - (b) Fish Liver Oil
  - (c) Mahajal
  - (d) Brakish Water

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<b>For Practical Counselling Class &amp; Practical Examination Programme Please See on Back Page.</b>
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