

ZOOLOGY
B. Sc. II: Sem III
LIFE & DIVERSITY OF CHORDATA AND
CONCEPT OF EVOLUTION

There shall be following paper and practical for B.Sc.Part-II Semester Third examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory Sessions and 25 practical sessions during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which, 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

Marks 1) Paper-III: Life & Diversity of Chordata and Concept of Evolution

Theory (Written)	80
Internal assessments	20
2) Practical:	50

Total : 150 Marks

Life & Diversity of Chordata and Concept of Evolution

Unit I : Phylum Chordata; Origin of Chordata. Protochordates:- Type study: Amphioxus: Habits and habitat , External Characters - Digestive system and feeding, Excretory organs, gonads- Affinities of Amphioxus. Affinities of .Agnatha: Series Pisces: Type study: Scoliodon sarrokawah (Dogfish) – Habits and habitat, External Characters, Digestive system: alimentary canal and digestive glands, Respiratory system: respiratory organ and mechanism of respiration, circulatory System: Structure and working of Heart, major arteries and veins, Lateral line receptors, Migration in fishes-Types, causes and significance.

Unit II : Class Amphibia: Type Study – Rana tigrina, Habits and habitat, external, characters. Respiratory organs- Circulatory system; Structure of Heart, major arteries and veins, urinogenital system.. Parental care in amphibia. Class Reptilia: Type study- Calotes versicolor- Habits and habitat, External characters, circulatory system- Structure of Heart, major arteries and veins. Urinogenital system, snake venom and anti-venom.

Unit III : Class Aves: Type study: Pigeon-Columba livia Habits and habitat, External characters, Respiratory system, urinogenital system. Flight adaptations, Migration in birds. Class Mammalia: Primitive mammals: salient features of Prototheria and Metatheria, Morphology of mammalian endocrine glands. Aquatic mammals.

Unit IV : Evolution: Meaning and scope, Indirect Evidences of evolution: Evidences of organic evolution- morphological and anatomical, physiological and biochemical, embryological. Direct

evidences of evolution: Paleontological evidences: Fossils and fossilization: petrified fossils dead and preserve bodies cast and moulds, trails and foot prints, condition for fossilizations.–, Radioactive carbon dating of fossils - Living fossils.Importance of fossil record. Evidences from connecting links- Peripatus and Archaeopteryx.

Unit V : Evolutionary Processes: Natural selection: Darwinism.Lamarckism. Speciation - definition of species –mode of speciation – Allopatric and Sympatric speciation. Modern concept of organic evolution-Neo Darwinism. Population Genetic :Hardy –Weinberg equilibrium, Gene pool, Gene frequency, Genetic drift, Convergent, Divergent and Parallel evolution, Co-evolution

Unit VI : Adaptive radiations in mammals. Evolution of Man- brief accounts of Parapithecus, Dryopithecus, Ramapithecus, Australopithecus, Homocreatus Neanderthal man, Cro-Magnon man and modern man. Evolution of heart, aortic arches, and urinogenital systems of vertebrates
Animal Adaptation: Desert aquatic and terrestrial.

Practicals - Life & Diversity of Chordata and Concept of Evolution

A) Taxonomy of Chordata:

1. General characters and classification of Phylum Chordata:
2. General characters and Classification up to orders of the following chordates or as per the availability in the laboratory from the major orders, (Specimens or Models):
Protochordata: Herdmania, Doliolum Salpa, Amphioxus.
Agnatha: Petromyzon, Myxine.
Pisces: Scoliodon, Torpedo, Acipenser, Exocoetus. Hippocampus
Amphibia: Ichthyophis, Salamander, Bufo, Hyla.
Reptilia: Varanus, Phrynosoma, Chameleon, Cobra, krait, Russell's viper, Typhlops,
Hydrophis
Aves: Duck, Woodpecker, Kingfisher, Parrot.
Mammalia: Mongoose, Squirrel. Manis. Bat., monkey,

B) Dissections:

1. Dissection - afferent and efferent branchial vessels, cranial nerves, internal ear of scoliodon.
2. Dissection - Digestive system, Arterial system, venous system, reproductive system of rat.
3. Permanent micro-preparations .a. Fish scales. b. Ampullae of Lorenzini. c. Eyeball muscles.
4. Observations of air bladder in air breathing fishes.

C) Osteology.

Rabbit, Varanus (excluding loose bones of skull).

D) Evolution:

1. Study of fossils, including living fossils.
2. Study of Evidences of evolution. i) Analogous and Homologous organs. ii) Connecting links (Peripatus, Archaeopteryx, Limulus) iii) Embryological evidences
3. Application of Hardy weinberg's law
4. Study of Mesozoic Reptiles (By Models/Charts).
5. Mimicry, coloration in animals.

6. Beak and Leg modifications with reference to: Parrot, Woodpecker, Kingfisher, Heron, Duck, Sparrow/Pigeon, Hawk/Kite, Owl.

E) Histological Slides :-

Amphioxus : T.S, Oral hood, Pharynx, Tail

Frog :- T.S. lung, Stomach, Kidney, T.S. Intestine,

Rat :- T.S. Liver, Pancrease, Ovary, Testies, Pituitary, Thyroid, Adrenal.

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION.

1. Dissection:	- 10
2. Permanent stained micro preparation.	- 05
3. Spotting. (Specimens, Slides, bones, fossil)	- 10
4. Practical on evolution	- 10
5. Class record	- 05
6. Viva - Voce	-05
7. Submission of study tour report.	-05

Total Marks: 50

REFERENCE BOOKS:

1. Integrated Principles of Zoology, 7th Edition, Hickman, C.P. Jr., F.M. Hickman and L.S. Roberts, 1984. Times Mirror/Mosby College Publication. St. Louis. 1065 pp.
2. A life of Vertebrate – K.Z. Young, ELBS Oxford University Press.
3. A Text Book of Chordates – H.S. Bharmah and Kavita Juneja.
4. Modern Text Book of Zoology Vertebrate – R.L. Kotpal, Rastogi Publication Meerut.
5. A Text Book of Chordates – A. Thangamani, S. Prasannakumas, L.M. Narayanan and Arunmugam Saras Publication, Nagercoil.
7. A Text Book of Chordate Zoology – R.C. Dalela – Jaiprakashnath Publication Meerut.
8. Chordate Zoology – E.L. Jordan and P.S. Verma, S. Chand and Company New Delhi.
9. A Text book of Practical Zoology Vertebrate – S.S. Lal, Rastogi. Publication, Meeru
10. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p.
11. Chordate Zoology and Elements of Animal Physiology, Jordan, E.K. and P.S. Verma, 1995. 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp.
12. Zoology of Chordates, Nigam, H.C., 1983. Vishal Publications, Jalandhar - 144 008, 942.
13. The Phylum Chordata, Newman, H.H., 1981. Satish Book Enterprise, Agra - 282 003, 477 pp.
14. Text Book of Zoology, Vol. II (Chordata), Parker and Haswell, 1964. A.Z.T, B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp
15. Chordate Structure and Function, Waterman, Allyn J. et al., 1971. Mac Millan & Co., New York, 587 pp.
16. Simpson, G.C. 1967 - The meaning of Evolution. Revised Edition – New Haven, Yale University Press.
17. Colbert, E.H. 1969 - Evolution of Vertebrates, Wiley, New York.

18. Mayr, Ernst, 1973 - Animal Species and Evolution. The Belknap Press of Harvard University, Cambridge.
19. Dobzansky, T. 1976 - Genetics and the Origin of Species. Oxford and TBH Publishing Co. New Delhi.
20. Savage, J.M. 1976 - Evolution. Amerind Publishing Co. Pvt. Ltd. New Delhi.
21. Elic. Minkoff, 1983 - Evolutionary Biology, Addison Wesley.
22. Life, Origin, Evolution and Adaption (2002) - Sanjib Chattopadhyay. Books and Allied (p) Ltd.
23. P.S.Verma & V.K.Agrawal.(2008) Cell Biology, Genetics, Molecular Biology, Evolution & Ecology –S. Chand Publications.
24. Dhabade. D.S. I. A. Raja. R.A>Gulhane. A.P.Charjan. A.K.Patki., And P.S.Patil.,A Text Book of Evolution: Sanket Publicatin. Washim
25. Zoology for Degree Students, Prof.Dr.V.K.Agrawal.

S.V.College, D.Raja (Zoology)

ZOOLOGY
B. Sc. II: Sem IV
ADVANCED GENETICS AND ANIMAL ECOLOGY

There shall be the following paper and practical for B.Sc. Part-II Semester IV examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory sessions and 25 practical sessions) during the complete semester. There shall be one compulsory theory paper of 3 hours duration the semester, as stated below and a practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks (80 for written examination and 20 marks for internal assessment) and a practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

Semester IV 1) Paper-I: Marks Allotted Advanced Genetics and Animal Ecology.

Written examination..... 80

Internal assessment 20

2) Practical: 50 _____

Total: 150 Marks

Advanced Genetics and Animal Ecology

UNIT I : Concept of genes. Mendel's laws of hereditary – Monohybrid – Laws of dominance, law of segregation. Dihybrid cross – Law of independent assortment. Interactions of genes: , Supplementary factor, complementary factor, duplicates factor, inhibitory factors, and lethal factors – dominant and recessive.

UNIT II : Linkage - Types of linkage, linkage group, arrangement of linked genes, and significance of linkage. Crossing over – Mitotic and meiotic crossing over, Mechanism of crossing over, theories of crossing over – Darlington's theory, breakage and exchange theory, and copy choice theory. Types of crossing over – Single, double and multiple crossing overs. Factors affecting crossing over, Significance of crossing over. Multiple alleles. Multiple alleles in relation to eye color in Drosophila. Blood group in man, Erythroblastosis foetalis.

UNIT III : Sex determination: Autosomes and sex chromosomes, Sex determination in animals, Chromosomal Theory. Genic Balance Theory. Environmentally and hormonally controlled sex determination, Gynandromorphs. Genetic disorders; Sickle cell anemia, , Huntington's chorea. Diabetes mellitus. Non-disjunction: Turner's syndrome, Klinefelter's syndrome, Down's syndrome. Edward's Syndrome, Biochemical genetics: Cystic fibrosis, Phenylketonuria, Albinism, Alkaptonuria, Goiters, cretinism. Sex linked genetic disorders and their inheritance in man; Hemophilia and color blindness.

UNIT IV : Genetic Screening and parental diagnosis: - Parental, Carrier, Predictive, CVS (Chorionic Villous Sampling), Amniocentesis, Gene probe and DNA analysis. Genes in Human Heredity: - Inheritance of eye color. Skin color. Recessive genes and consanguineous marriages Genetic counseling: - Risk of marriages in affected family. Birth control measures (male and female). Kinds of twins: - Identical, Fraternal, Siamese twins. Significance of twins study.

UNIT V : Ecology: concept and scope: Abiotic factors: Water: Properties, water problem in terrestrial and aquatic habitat. Temperature: Temperature range, Temperature tolerance, Effects of temperature on animals. Homeotherms, poikilotherms. Dormancy, hibernation, aestivation & diapause. Light: Spectral distribution, Biological effects of light on aquatic and terrestrial animals: Reproduction, Metamorphosis, pigmentation, vision, photokinesis, phototropism, photoperiodism, migration. Biotic factors: Intra specific and interspecific associations, Predation, parasitism, Antagonism. , commensalisms, mutualism, competition, (Gause's Principle).

UNIT VI : Ecosystem: Relationship between habitat and ecological niche - Autotrophic and heterotrophic producer, consumer - trophic level - energy flow in an ecosystem - food chain - food web - pyramids - Ecotypes. Homeostasis of ecosystem. Terrestrial ecosystem: Classification and Biomes, Aquatic ecosystem: Fresh water ecosystem-Lentic and lotic ecosystem, Marine ecosystem: Characteristics, salinity, temperature - pressure, zonation and stratification Estuarine ecology: Characteristics types, fauna and their adaptations.

Practical:- Advanced Genetics and Animal Ecology

Two practical per week of 3 periods duration. Examination shall be of 5 Hrs. duration and of 50 marks.

A) Genetic experiments:

1. Recording of Mendelian traits in man.
2. Detection of monohybrid and dihybrid cross with the help of plastic beads.
3. Culturing *Drosophila* using standard methods. *Drosophila* – male and female identification, Mutant forms (from pictures)
4. Demonstration of bar bodies.
5. Preparation of human Karyotypes from Xerox pictures.
6. Photo slides for, Turner's syndrome, Klinefelter's syndrome, Down's syndrome
7. Detection of syndrome from chromosome spread picture.
8. Study of following human genetic traits and application of Hardy Weinberg Principle to them – Baldness, length of index and ring Finger, attached and free earlobes, rolling of tongue, PTC taste. Other notable traits.

B) Ecology

1. Use of pH meter for estimation of pH in soil samples, b. Use of pH meter for estimation of pH in water samples
2. Estimation of Dissolved oxygen, salinity, pH, free CO₂, carbonates and bicarbonates, calcium in water samples.
3. Adaptations of aquatic and terrestrial animals based on a study of museum specimens. Such as

- rocky, sandy, muddy shore animals, flying and burrowing animals.
4. Study of natural ecosystem and field report of the visit.
 5. Field collection methods;
 6. Identification of common animals - Soil invertebrate diversity, diversity of birds and mammals in parks / botanical gardens, threats to local biodiversity.
 7. Construction of a food web diagram based on a field visit.
 8. Mounting of plankton.
 9. Qualitative analysis of fresh water plankton

C) General:-

1. Visit to a National park or sanctuary, and submission of report.

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION.

1. Ecological: Estimations -/Analysis	10
2. Spotting. (2Spot from Sec.A & 3 Spot from Section B of 2 Marks each)....	10
3. Micro preparation.....	05
4. Genetic experiment -.....	10
5. Class record	05
6. Viva – Voce.....	05
7. Submission of study tour report.....	05
Total Marks : 50	

REFERENCE BOOKS:

1. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology – P.S.Verma & V.K.Agrawal.
2. Principles of Genetics – S.K.Jain
3. Genetics – P.K.Gupta
4. Applied Genetics – C.Pmmanuol.
5. Genetics: M.W.Strickberger, New York.
6. Principles of Genetics: Sinnot, Dunn and Dobzansky.
7. Principles of Genetics: Edidon Gardner.
8. Genetics. Verma, P.S. and V.K. Agarwal.. S.Chand & co. New Delhi
9. Gene VI .Lewin, B. 1998. Wiley Eastern Ltd., New Delhi.
10. Human Genetics. Rothwell, N.V.1979. Prentice Hall of India, New Delhi