

Integral University, Lucknow

**Department of Biosciences
B.Sc (Zoology, Botany, Chemistry)**

INTEGRAL UNIVERSITY
Department of Biosciences

B.Sc. ZBC II yr

Subject Name: Chordata “Agnatha to Mammals”

Semester: III

Subject Code: BS263

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Unit-I

8

Agnatha: General features of living Agnatha and classification of cyclostomes up to classes; **Pisces:** General features and Classification (up to orders) with examples; Osmoregulation, locomotion and migration in Fishes.

Unit-II

8

Amphibia: General characters and classification of different classes of Amphibia (upto orders) with examples; Origin of tetrapods, parental care, paedomorphosis.

Unit-III

8

Reptiles: General characters and Classification up to orders; Origin of reptiles, Poisonous and non-poisonous snakes, Biting mechanism in snakes.

Unit-IV

8

Aves: General features and Classification up to orders; Origin of birds, Flight adaptations and migration in birds.

Unit-V

8

Mammals: General characters and classification upto orders; general features of egg laying mammals, pouched-mammals and aquatic mammals, Origin of mammals.

Recommended Books

1. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
2. Pough H. Vertebrate life, VIII Edition, Pearson International.
3. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub Co.
4. Hall B.K. and Hallgrimsson B. (2008). Strickberger’s Evolution. IV Edition. Jones and Bartlett Publishers Inc.
5. Publishers Inc.
6. R.L.Kotpal, 2000. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).
7. E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.).
8. G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii.

***NOTE:** Subject : CH221 Inorganic and Physical Chemistry-1 from Chemistry department

INTEGRAL UNIVERSITY
Department of Biosciences

B.Sc. LS II yr Semester: III

Subject Name: Angiosperm Morphology and Taxonomy

Subject Code: BS222

UNIT I

8

Plant systematics: Nomenclature of plants; the international code of botanical nomenclature. Documentation: Herbarium: Functions, preparation and management; important herbaria and botanical gardens of the world and of India; Flora; Keys; Numerical taxonomy and chemotaxonomy.

UNIT II

8

Angiosperm taxonomy: Unique features of angiosperms and diversity; identification, brief reference of Angiosperm Phylogeny Group (APG) Classification: Bentham and Hooker; Comparative account of outline of various systems of classification of angiosperms (Bentham & Hooker, Engler & Prantl and Hutchinson); Origin and evolution of angiosperms.

UNIT III

8

Organization of plant body: Important modifications of stems, leaves and roots, Inflorescence: major types, Flower: Floral whorls, Parts, Flower as a modified shoot, Fruits: major types, Seed: Types.

UNIT IV

8

Angiospermic Families(A): Study of main characters and economic importance of angiospermic families: Brassicaceae, Fabaceae, Euphorbiaceae, Malvaceae, Cucurbitaceae,

UNIT V

8

Angiospermic Families(B): Study of main characters and economic importance of angiospermic families: Asteraceae, Solanaceae Poaceae, Liliaceae, and Orchidaceae.

Suggested Reading:

1. Angiosperm Phylogeny Group An update of the Angiosperm Phylogeny Group classification for the orders and families of the flowering plants: APG II. Botanical Journal of the Linnaean Society 141: 399- 436.
2. Crawford, D.J. Plant Molecular Systematics. Cambridge University Press, Cambridge, UK.
3. Cronquist, A. An Integrated System of Classification of Flowering Plants. Columbia University Press, New York.
4. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. and Donoghue, M.J. 5 Stussy, T.F. 1990. Plant Taxonomy, Columbia University Press, USA
6. Gangulee, H.C., Das, K.S, Dutta, C.D. and Kar, A.K. College Botany Vol. III
7. Daniel M. –Taxonomy – Evolution at work
8. Singh, G. Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.

INTEGRAL UNIVERSITY
Department of Biosciences

B. Sc. (BT) 1st year 2nd sem

Subject: FUNDAMENTALS OF MICROBIOLOGY

Subject Code: BS113

(Revised w.e.f. session 2015-2016)

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UNIT I

8

History and classification of microbiology: Pasteur's experiments, Various forms of microorganisms (bacteria, fungi, viruses, protozoa, PPLOs); Nutritional classification of microorganisms; Nature of the microbial cell surface, gram positive and gram negative bacteria; Growth curve.

UNIT II

8

Control of Microorganisms: Physical agents (Autoclave, Hot air oven, Laminar airflow and membrane filter.), chemical agents (Alcohol, Halogens and Gaseous agents, antibiotics), Radiation Methods (UV rays). **Pathogenesis of microorganisms:** Some common pathogenic microorganisms: Bacterial (tuberculosis, gall), viral (SARS, TMV), fungal (red rot of sugar cane, dermatitis) and protozoan (malaria).

UNIT III

8

Microbes in extreme environments and microbial interactions: The thermophiles alkalophiles, acidophiles and symbiosis and antibiosis among microbial population, N₂ fixing microbes in agriculture and forestry.

UNIT IV

8

Recombination in Prokaryotes: Photophosphorylation, Transformation, Conjugation and Transduction.

UNIT V

8

Bacteriophage: Lytic and lysogenic cycle. Stains and staining techniques: Principles of staining, Types of stains – simple stains, structural stains and Differential stains.

Suggested Reading:

1. Introduction to Microbiology, Ingraham, 2ed.
2. Brock Biology of Microorganisms, Madigan et al, 9th ed.
3. General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L. Wheelis and P.R. Painter, Macmillian
4. Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill
5. Principles of Microbiology, R.M. Atlas, Wm C. Brown Publisher.
6. The Microbial World, Roger Y. Stanier, Prentice Hall
7. Howe.C. (1995) Gene Cloning and manipulation, Cambridge University Press, USA
8. Lewin, B., Gene VI New York, Oxford University Press.
9. Sambrook et al (2000) Molecular cloning Volumes I, II, & III Cold spring Harbor Laboratory Press, New York, USA
10. Walker J.M. and Gingold, E.B. (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry U.K

***NOTE:** CH222 Organic and Physical Chemistry-I from Chemistry department
CH223 Chemistry Practical-III from Chemistry department

INTEGRAL UNIVERSITY
Department of Biosciences

B.Sc. ZBC II yr
Subject Name: Animal Diversity Lab-II

Semester: III
Subject Code: BS262
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1. External characters of *Scoliodon*.
2. Permanent stained preparation of ampullae of Lorenzini
3. Glycerine and permanent preparation of placoid scales
4. Dissection: *Scoliodon*
5. Embryonic membranes-Whole mount of 72 hr chick embryo
6. Study of poisonous and non-poisonous snakes
7. Difference between Crocodile, *Alligator*, and *Gavialis*
8. Study of the following specimens: *Herdmania*, *Amphioxus*, *Anguilla*, *Acipenser*, *Ambystoma*, *Rana*, *Varanus*, *Viper*, *Heloderma*, *Naja*, *Pavo*, *Psittacula*, *Porcupine*, *Platypus*, *Oryctolagus*, *Armadillo*, *Manis*
9. Study of the permanent histology (various organs) slides

Suggested Reading:

1. Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
Pough H. *Vertebrate life*, VIII Edition, Pearson International.
2. Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.

INTEGRAL UNIVERSITY
Department of Biosciences

B.Sc. ZBC II yr
Subject Name: Evolutionary Biology and Wildlife

Semester: IV
Subject Code: BS271
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3 1 0

Unit-I **8**
Animal distribution: Continental distribution, Aspects and Patterns of animal distribution (Continuous, Discontinuous and Bipolar), Factors affecting distribution, Geological distribution and Geographical distribution with their characteristic fauna, Wallace's line, Animal Diversity: Alpha, Beta and Gamma

Unit-II **8**
Origin of Life: Theories of origin of life, Missing link, Natural selection (Example: Industrial melanism), Types of natural selection (Directional, Stabilizing, Disruptive), Sexual selection, Concept of genetic drift

Unit-III **8**
Evolution: Concepts of Evolution, Theories of evolution: Lamarckism, Criticism of Lamarckism, Neo-Lamarckism, Darwinism, Theory of sexual, artificial and natural selection, Objection to Darwinism, Neo-Darwinism, Evidences of evolution

Unit-IV **8**
Species Concept: Speciation, Modes of speciation (Allopatric, Sympatric and Parapatric), Morphological, Genetic and Biological species concept, Monotypic and Polytypic species, Subspecies categories (Clines and Deme)

Unit-V **8**
Wild life of India: Modern Concepts (IUCN categories), endangered species, Different projects launched for the preservation of animal species, Important sanctuaries, national parks of India, in-situ and ex-situ conservation of wildlife

Suggested Reading:

1. Biodiversity and Quality of Life. Sengupta. Mc Millan India Pvt. Ltd.
2. Biology: P. H. Raven & G. B. Jhonson
3. Organic Evolution by Veer Bala Rastogi
4. Evolution Paperback: by Douglas J. Futuyma, Mark Kirkpatrick
5. Evolutionary biology: Singh and Tomar

INTEGRAL UNIVERSITY
Department of Biosciences

B.Sc. ZBC II yr
Subject Name: Comparative Anatomy & Developmental Biology

Semester : IV
Subject Code: BS322
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Unit I

Integumentary System: Derivatives of integument w.r.t. glands and digital tips, Skeletal System: Evolution of visceral arches, Digestive System: Brief account of alimentary canal and digestive glands.

Unit II

Respiratory System: Gills, lungs and air sacs; Circulatory System: Evolution of heart and aortic arches; Urinogenital System: Succession of kidney, Evolution of urinogenital ducts

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Unit III

Nervous System: Comparative account of brain; Sense Organs: Types of receptors

8

Unit IV

Gametogenesis, Fertilization, Egg: structure and types. Types and patterns of cleavage. Stem Cell and Its potency. Cell lineage, Genomic equivalence.

8

Unit V

Process of Blastulation and Gastrulation. Fate Map, Development of Chick up to formation of Primitive streak and mammal (in outline) Extra embryonic membranes of chick. Placentation and types of Placenta.

Suggested Readings

1. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
2. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
3. Weichert C.K and William Presch (1970). *Elements of Chordate Anatomy*, Tata McGraw Hills • Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
4. Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House. B.
5. *Developmental Biology*, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
6. Balinsky, B.I. (2008). *An introduction to Embryology*, International Thomson Computer Press.
7. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
8. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
9. Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.
10. Gilbert, S. F. (2006). *Developmental Biology*, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.

***NOTE:** CH224 Inorganic and Physical Chemistry-II from Chemistry Department
CH225 Organic and Physical Chemistry-II from Chemistry Department

INTEGRAL UNIVERSITY
Department of Biosciences

B.Sc BC I yr II sem

B.Sc LS II yr IV sem

Subject name: Plant Physiology

(w.e.f 2018-2019)

Subject Code: BS232

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UNIT I

8

Plant-water relations: Importance of water, Diffusion and water potential, Osmosis, Ascent of sap, Transpiration and its significance; Factors affecting transpiration, guttation.

UNIT II

8

Mineral nutrition and transport: Essential elements, macro and micronutrients, Role of essential elements; Absorption of mineral salts, Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps. Translocation in phloem, Composition of phloem sap.

UNIT III

8

C and N metabolism: Photosynthesis Photosynthetic Pigments (Chl a, b); Photosystem I and II, Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration. Nitrogen metabolism Biological nitrogen fixation; Nitrate and ammonia assimilation.

UNIT IV

8

Plant growth regulators: Enzymes: general structure and properties, Plant growth regulators: Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene. role and applications in agri-horticulture. Seed Physiology: Dormancy, Breaking of dormancy, Germination.

UNIT V

8

Growth and Development: Plant response to light and temperature: Photomorphogenesis, Plant movements, Photoperiodism, (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Growth response to temperature, Vernalization. Introduction to Stress physiology.

Suggested Reading:

1. Taiz, L., Zeiger, E., Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Huner, N.P., Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3. Bajracharya, D., Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Frank B. Salisbury, Cleon W. Ross: Plant Physiology. Wadsworth Publishing Company

INTEGRAL UNIVERSITY, LUCKNOW
DEPARTMENT OF BIOSCIENCES

B.Sc. ZBC IInd year / IVth Semester

Subject code: BS272

Subject name: CYTOGENETICS AND ANGIOSPERM TAXONOMY LAB

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1. Use of Micrometer and calibration, measurement of onion epidermal cells and yeast.
2. Cell division: Mitotic and meiotic studies onion root tips and flower bud.
3. Chromosomes: Study of polytene chromosomes by slides; Barr bodies.
4. Karyotype analysis – with the help of slides
5. Study of vegetative and floral characters of any one representative genus of following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e)
Brassicaceae, Fabaceae, Euphorbiaceae, Malvaceae, Cucurbitaceae, Asteraceae and Liliaceae.
6. Morphology study of flower parts, inflorescence, seed, fruit types
7. Mounting of a properly dried and pressed specimen of any twelve wild plants with herbarium label (to be submitted in the record book).

***NOTE:** CH226 Chemistry Practical-IV from Chemistry Department