

GOVT. BILASA GIRLS' POST - GRADUATE COLLEGE

[AUTONOMOUS]



BILASPUR (C.G.)

[Affiliated to Bilaspur Vishawvidyalaya]

SYLLABUS

B.Sc. [Zoology]

Semester III to VI

Session - 2022-23

Govt. Bilasa Girls P.G. College Bilaspur (C.G.)

Session 2022-2023
B.Sc. Semester III
SUBJECT ZOOLOGY
Paper (Pass Course)

Max. Marks: 60
Min. Pass Marks:21

ANATOMY – PHYSIOLOGY AND EVOLUTION LECTURES:45

UNIT-I Comparative Anatomy of various organs systems of Vertebrates.

1. Endoskeleton – Limbs, girdles and vertebrae.
2. Integument and its derivatives: structure of Scales, hair and feathers.
3. Alimentary canal and digestive glands in vertebrates.
4. Respiratory organs: Gills lung, Air sacs in birds.

UNIT-II 1. Circulatory system- Evolution of heart and ducts.

2. Urinogenital system –Kidney and excretory ducts.
3. Gonads and genital ducts.
4. Nervous System –General plan of brain and spinal cord.

UNIT- III 1. Digestion and absorption of dietary components.

2. Physiology of heart, Cardiac cycle and ECG.
3. Blood coagulation.
4. Respiration-Mechanism and control of breathing.

UNIT- IV 1. Excretion- Physiology of excretion, Osmoregulation,

2. Physiology of Muscle contraction.
3. Physiology of nerve impulse, Synaptic transmission.
4. Ear and Eye-structure and function.

UNIT-V Evolution

1. Evidences of organic evolution.
2. Theories of organic evolution.
3. Variation, Mutation, Isolation and Natural selection.
4. Evolution of Horse.

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
4. Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
5. Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House
6. Guyton, A.C. & Hall, J.E. (2006). *Textbook of Medical Physiology*. XI Edition. Hercourt AsiaPTE Ltd. /W.B. Saunders Company.
7. Tortora, G.J. & Grabowski, S. (2006). *Principles of Anatomy & Physiology*. XI Edition John Wiley & sons,
8. Victor P. Eroschenko. (2008). *diFiore's Atlas of Histology with Functional correlations*. XII Edition. Lippincott W. & Wilkins.

9. Arey, L.B. (1974). *Human Histology*. IV Edition. W.B. Saunders.
10. DeFiore Atlas of Human histology Physiology Vander
11. Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
12. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H.
13. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
14. Hall, B. K. and Hallgrímsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers
15. Pevsner, J. (2009). *Bioinformatics and Functional Genomics*. II Edition. Wiley-Blackwell.
16. Campbell, N. A. and Reece J. B. (2011). *Biology*. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
18. Minkoff, E. (1983). *Evolutionary Biology*. Addison-Wesley.

PRACTICAL (COMPARATIVE ANATOMY)

1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs.
2. Disarticulated skeleton of Frog, *Varanus*, Fowl, Rabbit
3. Carapace and plastron of turtle /tortoise
4. Mammalian skulls: One herbivorous and one carnivorous animal.
5. Study of permanent histological slides as per theory.

PRACTICAL (PHYSIOLOGY)

1. Recording of blood pressure using a sphygmomanometer
2. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney
3. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex)
4. Preparation/Examination of mounts: Squamous epithelium, Striated muscle fibres and nerve cells
5. Examination of sections of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid

PRACTICAL (EVOLUTION)

1. Study of fossil evidences from plaster cast models and pictures
2. Study of homology and analogy from suitable specimens/ pictures
3. Demonstration of changing allele frequencies with and without selection
4. Construction of cladogram based on morphological characteristics
5. Construction of phylogenetic tree with bioinformatics tools (Clustal X and Phylip)
6. Interpretation of phylogenetic trees

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B. Sc. ZOOLOGY – SEMESTER: IV

Paper: Choice Based Course - A

Session 2022-23

ECONOMIC ZOOLOGY (CREDITS: THEORY-3) LECTURES: 45

Max. Marks: 60

Min. Pass Marks:21

Unit 1: Bee-keeping and Bee Economy (Apiculture)

Varieties of honey bees and Bee pasturage; Setting up an apiary: Langstroth's/Newton's hive, bee veil, brood and storage chambers, iron frames and comb sheets, drone excluder, rearing equipments, handling of bees, artificial diet; Diseases of honey bee, American and European Foulbrood, and their management; Honey extraction techniques; Physico-chemical analysis of honey; Other beneficial products from bee; Visit to an Apiculture Institute and honey processing Units

Unit 2: Silk and Silk Production (Sericulture)

Different types of silk and silkworms in India; Rearing of *Bombyxmori* – Rearing racks and trays, disinfectants, rearing appliances, black boxing, Chawki rearing, bed cleaning, mountages, harvesting of cocoons; Silkworm diseases: Pebrine, Flacherie, Grasserie, Muscardine and Aspergillosis, and their management; Silkworm pests and parasites: Uzi fly, Dermestid beetles, and their management; Silk reeling techniques; Quality assessment of silk fibre.

Unit 3: Aquaculture

Brood stock management; Induced breeding of fish and prawn; Management of hatchery of fish; Management of nursery, rearing and stocking ponds; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish; Role of water quality in aquaculture; Fish diseases: Bacterial, viral and parasitic; Preservation and processing of harvested fish; Fishery by-products.

Unit 4: Poultry Farming

Introduction; Indigenous and exotic breeds; Rearing, housing, feed and rationing; Commercial importance of poultry farming; Varietal improvement techniques; Diseases and their management; poultry farm management and business plan; Visit to any Poultry Poultry farm.

Unit 5: Dairy Farming

Introduction; Indigenous and exotic breeds; Rearing, housing, feed and rationing; Commercial importance of dairy farming; Varietal improvement techniques; Diseases and their management; Dairy farm management and business plan; Visit to any Dairy farm.

SUGGESTED READINGS

1. Prost, P. J. (1962). *Apiculture*. Oxford and IBH, New Delhi.
2. Sericulture, *FAO Manual of Sericulture*.
3. Hafez, E. S. E. (1962). *Reproduction in Farm Animals*, Lea and Fabiger Publishers.
4. Srivastava, C. B. L. (1999). *Fishery Science and Indian Fisheries*. Kitab Mahal publications, India.
5. Sardar Singh, *Beekeeping in India*, Indian council of Agricultural Research, New Delhi.
6. Dhyan Singh Bisht, *Apiculture*, ICAR Publication.
7. Knobil, E. and Neill, J. D. (2006). *The Physiology of Reproduction*, Vol. 2, Elsevier Publishers.

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B. Sc. ZOOLOGY – SEMESTER: IV

Paper: Choice Based Course - B

Session 2022-23

WILD LIFE CONSERVATION AND MANAGEMENT

LECTURES: 45

Max. Marks: 60
Min. Pass Marks: 21

Unit 1:

Wild life - Values of wild life - positive and negative; Our conservation ethics; Importance of conservation; Causes of depletion; World conservation strategies. Habitat analysis, Evaluation and management of wild life - Physical parameters: Topography, Geology, Soil and water; Biological Parameters: food, cover, forage, browse and cover estimation; Standard evaluation procedures: remote sensing and GIS.

Unit 2:

Management of habitats - Setting back succession; Grazing logging; Mechanical treatment; Advancing the successional process; Cover construction; Preservation of general genetic diversity.

Unit 3:

Population estimation: Population density, Natality, Birth rate, Mortality, fertility schedules and sex ratio computation; Faecal analysis of ungulates and carnivores: Faecal samples, slide preparation, Hair identification, Pug marks and census method.

Unit 4:

National Organizations involved in wild life conservation; Elementary idea of Wild life Legislation - Wild Protection act - 1972, its amendments and implementation.

Management of excess population & translocation; Bio-telemetry; Care of injured and diseased animal; Quarantine; Common diseases of wild animal

Unit 5

Protected areas National parks & sanctuaries, Community reserve; Important features of protected areas in India; Tiger conservation - Tiger reserves in India; Management challenges in Tiger reserve. Management planning of wild life in protected areas; Estimation of carrying capacity; Eco tourism / wild life tourism in forests; Concept of climax persistence;

PRACTICALS

1. Identification of flora, mammalian fauna, avian fauna, herpeto-fauna
2. Demonstration of basic equipment needed in wildlife studies use, care and maintenance (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of Cameras and lenses)
3. Familiarization and study of animal evidences in the field; Identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers etc.
4. Demonstration of different field techniques for flora and fauna
5. PCQ, Ten tree method, Circular, Square & rectangular plots, Parker's 2 Step and other methods for ground cover assessment, Tree canopy cover assessment, Shrub cover assessment.
6. Trail / transect monitoring for abundance and diversity estimation of mammals and bird (direct and indirect evidences).

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B. Sc. ZOOLOGY – SEMESTER: IV

Paper: Choice Based Course - C

Session 2022-23

IMMUNOLOGY

(CREDITS: THEORY-3)

THEORY

LECTURES: 45

Unit 1: Overview of Immune System

Historical perspective of Immunology, Early theories of Immunology, Haematopoiesis, Cells and organs of the Immune system

Unit 2: Innate and Adaptive Immunity

Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive: Artificial and natural Immunity, Active: Artificial and natural Immunity, Immune dysfunctions.

Unit 3: Antigens

Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T-Cell epitopes

Immunoglobulins

Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions, Immunoassays, Polyclonal sera, Monoclonal antibodies, Hybridoma technology

Unit 4 Major Histocompatibility Complex

Structure and functions of endogenous and exogenous pathway of antigen presentation
Cytokines-Properties and functions, Cytokine-based therapies

Unit 5: Hypersensitivity

Gell and Coombs' classification and Brief description of various types of hypersensitivities
Vaccines -Types of vaccines: Recombinant vaccines and DNA vaccines

PRACTICAL

1. Demonstration of lymphoid organs
2. Ouchterlony's double immuno-diffusion method
3. ABO blood group determination
4. Preparation of single cell suspension of splenocytes from chick spleen, cell counting and viability test
5. ELISA/ dot Elisa (using kit)
6. Principles, experimental set up and applications of immuno-electrophoresis, RIA, F

SUGGESTED READINGS

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.
2. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*, VII Edition, Mosby, Elsevier Publication.
3. Abbas, K. Abul and Lichtman H. Andrew (2003.) *Cellular and Molecular Immunology*. V Edition. Saunders Publication.

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Practical

B.Sc. Semester III +IV

Session: 2022-23 (M.M. 50)

PRACTICAL WORK

SCHEME OF PRACTICAL EXAMINATION

1. Spots-8(Slides-4, Bones-4)	16
2. Exercise based on Physiology	04
3. Exercise based on Evolution	05
4. Two Exercises based on Applied Zoology/ Wild life/Immunology	10
5. Viva	05
6. Sessional marks	10
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Total	50

Govt. Bilasa Girls P.G. College Bilaspur (C.G.)

Session 2022-2023
B.Sc. Semester V
SUBJECT ZOOLOGY
Paper (Pass Course)

Max. Marks : 60
Min. Pass Marks :21

VERTEBRATE ENDOCRINOLOGY, REPRODUCTIVE BIOLOGY, BEHAVIOR, TOXICOLOGY & MICROBIOLOGY AND MEDICAL ZOOLOGY

UNIT-I

1. Endocrine glands –Classification and histology.
2. General Characters of Hormones.
3. Hormone receptor.
4. Biosynthesis and secretion of thyroid, Adrenal, Ovarian and testicular hormones.
5. Endocrine disorder due to hormones of the other gland.

UNIT- II

1. Reproductive cycle in vertebrate.
2. Menstruation, Lactation and Pregnancy.
3. Mechanism of parturition.
4. Hormonal regulation of Gametogenesis.
5. Extra embryonic membrane.

UNIT-III

1. Introduction to Ethology.
2. Patterns of Behavior Taxis, Reflexes, Drives and Stereotypes Behavior.
3. Reproductive Behavioral Patterns.
4. Hormones, Drugs and Behavior.

UNIT-IV Toxicology and Microbiology

1. Definition of Toxicity, Principle of systematic toxicology.
2. Classification of toxicants.
3. Toxic agents and their action-metallic and inorganic agents.
4. Animal poisons –Snake venom, Scorpion and bee poisoning.
5. Food poisoning.
6. General and Applied microbiology.
7. Microbiology of Domestic water and sewage.
8. Microbiology of milk and products.

UNIT-V Medical microbiology

1. Brief introduction to pathogenic microbes-viruses, Rickettsia, Spirochaetes and Bacteria.
2. Brief account of life History, pathogenicity of the following pathogens with reference to man; prophylaxis and treatment.
 - (a) Pathogenic Protozoan- Entamoeba, Trypanosoma and Giardia .
 - (b) Pathogenic helminthes – Schistosoma Nematode pathogenic parasites of man
3. Vector insects.

SUGGESTED READINGS

1. Austin, C.R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
2. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
3. Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
4. Hatcher, R.A. et al. The Essentials of Contraceptive Technology. Population Information Programme.
5. David McFarland, *Animal Behaviour*, Pitman Publishing Limited, London, UK.
6. Manning, A. and Dawkins, M. S, *An Introduction to Animal Behaviour*, Cambridge University Press, UK.
7. John Alcock, *Animal Behaviour*, Sinauer Associate Inc., USA.
8. Paul W. Sherman and John Alcock, *Exploring Animal Behaviour*, Sinauer Associate Inc., Massachusetts, USA.

PRACTICAL

1. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
2. Study of permanent slides of endocrine glands of mammals.

PRACTICAL

1. To study different types of animal behaviour such as habituation, social life, courtship behaviour in insects, and parental care from short videos/movies and prepare a short report.
2. To study nests and nesting habits of the birds and social insects.
3. To study geotaxis behaviour in earthworm.
4. To study the phototaxisbehaviour in insect larvae.
5. Visit to Forest/ Wild life Sanctuary/Biodiversity Park/Zoological Park to study behavioural activities of animals and prepare a short report.

PRACTICAL

- 1.Detection of gram positive and gram negative bacteria.
- 2.Study of permanent slides of parasites based on theory paper.

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Session 2022-2023
B.Sc. Semester VI
SUBJECT ZOOLOGY
Paper (Pass Course)

Max. Marks: 60
Min. Pass Marks: 21

Genetics, Cell Physiology, Biochemistry, Biotechnology, Bio-techniques

UNIT –I Genetics.

1. Linkage and Linkage maps.
2. Varieties of gene expression-Multiple alleles; Lithogenesis, Pleiotropic genes, interaction of gene, epistasis.
3. Sexchromosome system and sex linkage.
4. Mutation and chromosomal alteration, meiotic consequences.
5. Human genetics-chromosomal and single gene disorders (somatic cell genetics).

UNIT-II Cell Physiology

1. General idea about pH and Buffer.
2. Transport across membranes-cell membrane, Mitochondria and Endoplasmic reticulum.
3. Active transport and its mechanism, Active transport in Mitochondria and Endoplasmic reticulum.
4. Hydrolytic enzymes-their chemical nature, Activation and specificity.

UNIT-III Biochemistry

1. Aminoacids and peptides-Basic structure and biological function.
2. Carbohydrate and its metabolism- Glycogenesis, Gluconeogenesis, Glycolysis, Glycogenolysis, Cori cycle.
3. Lipid metabolism-Oxidation of glycerol, oxidation of fatty acid.
4. Protein metabolism- Deamination, Transamination, Transethylation, Biosynthesis of Protein.

UNIT-IV Biotechnology

1. Biotechnology- Scope and Importance.
2. Recombinant DNA and Gene cloning.
3. Cloned genes and other tools of Biotechnology.
4. Applications of Biotechnology in (i) Pharmaceutical industries, (ii) Food processing industries.

UNIT-V Biotechniques

1. Principle and technique of pH meter. Colorimeter.
2. Microscopy- Light microscopes, phase contrast and electron microscopes.
3. Centrifugation
4. Separation of biomolecules by chromatography and electrophoresis.
5. Histochemical methods for determination of Protein, Lipids and Carbohydrate

SUGGESTED READINGS

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India.
2. Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings.
4. Russell, P. J. (2009). *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.

5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.
6. Cox, M.M and Nelson, D.L. (2008). *Lehninger Principles of Biochemistry*, V Edition, W.H. Freeman and Co., New York.
7. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). *Biochemistry*, VI Edition, W.H. Freeman and Co., New York.
8. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). *Harper's Illustrated Biochemistry*, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
9. Hames, B.D. and Hooper, N.M. (2000). *Instant Notes in Biochemistry*, II Edition, BIOS Scientific Publishers Ltd., U.K.
10. Brown, T.A. (1998). *Molecular Biology Labfax II: Gene Cloning and DNA Analysis*. II Edition, Academic Press, California, USA.
11. Glick, B.R. and Pasternak, J.J. (2009). *Molecular Biotechnology - Principles and Applications of Recombinant DNA*. IV Edition, ASM press, Washington, USA.
12. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). *An Introduction to Genetic Analysis*. IX Edition. Freeman and Co., N.Y., USA.
13. Snustad, D.P. and Simmons, M.J. (2009). *Principles of Genetics*. V Edition, John Wiley and Sons Inc.
14. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). *Recombinant DNA- Genes and Genomes- A Short Course*. III Edition, Freeman and Co., N.Y., USA.
15. Beauchamp, T.I. and Childress, J.F. (2008). *Principles of Biomedical Ethics*. VI Edition, Oxford University Press.

PRACTICAL WORK

Blood group detection (A,B,AB,O).

R.B.C. count.

W.B.C. count. Blood Coagulation time.

Preparation of Haematin crystals from blood of rat.

Observation of *Drosophila* wild and mutant.

Chromatography – paper or gel.

Colorimetric estimation of haemoglobin/glucose/KMnO₄.

Mitosis in onion root tip.

Biochemical detection of carbohydrate, protein and lipid.

Study of permanent slides of parasites based on theory paper.

Working principles of pH meter, colorimeter, centrifuge and microscopes.

Govt. Bilasa Girls P.G. College Bilaspur (C.G.)

PRACTICAL

B.Sc. Semester V +VI

Session: 2022-23

SCHEME OF EXAMINATION

TIME- 3 Hrs.

M.M. 50

1. Hematological (RBC/WBC Counting/Blood Group Detection)	05
2. Exercise based on behavior	04
3. Exercise based on endocrine and reproductive biology(Spotting)	06
4. Exercise based on medical microbiology (Spotting)	08
5. Staining of Gram+ ve and Gram- ve Bacteria/mitosis in onion root tip)	05
6. Biochemical test of carbohydrate, protein and lipid./ Chromatography	08
7. Working principle of pH meter/colorimeter/centrifuge/microscope	04
8. Viva voce	05
9. <u>Sessional</u>	<u>05</u>
TOTAL	50