SYLLABUS FOR
THREE-YEAR DEGREE COURSE
IN ZOOLOGY HONOURS

(With effect from the session 2014 - 2015)

THE UNIVERSITY OF BURDWAN

BURDWAN, 713104

WEST BENGAL, INDIA

New Syllabus for Three-Year Degree Course in Zoology Honours accepted in the meeting of UGBS held on 11th February, 2014.

(Dr. Anupam Basu)
Chairman,
UGBS in Zoology,
The University of Burdwan

With the help and active participation of Members of the Committee for the Preparation of New Syllabus:

1. Dr. Anupam Basu, Head of the Deptt. Of Zoology, University of Burdwan & Chairman.
2. Dr. Padmanava Chakraborty, Deptt. Of Zoology, University of Burdwan & Advisor.
3. Dr. Debaprasad Mukhopadhyay, Jt. Convener of Syllabus Committee, Deptt. Of Zoology, Kalna College.
4. Dr. Apurba Chattopadhyay, Jt. Convener of Syllabus Committee, Deptt. Of Zoology, Burdwan Raj College.
5. Dr. Sanjay Mandal, Member, Deptt. Of Zoology, B. B. College. Asansol.
6. Dr. Anilava Kabiraj, Member, Deptt. Of Zoology, Kalyani University.
7. Dr. Abhijit Majumdar, Member, Deptt. Of Zoology, University of Burdwan.
8. Dr. Koushik Ghosh, Member, Deptt. Of Zoology, University of Burdwan.
9. Dr. Soumendranath Chatterjee, Member, Deptt. Of Zoology, University of Burdwan.
10. Dr. Ranjit Banerjee, Member, Principal, B.N.Dutta Mahavidyalaya, Hatgobindapur, Burdwan.
11. Dr. Manabesh Majumdar, Member, Deptt. Of Zoology, B.N.Mahavidyalaya, Itachuna, Hooghly.
12. Dr. Mala Bose, Member, Deptt. Of Zoology, Sorojini Naidu College, Kolkata.

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TOTAL MARKS : 800

	THEORETICAL PAPERS	PRACTICAL PAPERS	MARKS DISTRIBUTION	TOTAL MARKS
PART – I	2	2	100+100	200
PART – II	3	1	150+50	200
PART – III	2	2	200+200	400
TOTAL	7	5	450+350	800

Part – I — **F.M. 200**

Theory

Paper - I (F.M. 50)	-	Systematics; Animal Structures and Functions (Non-Chordata).
Paper - II (F.M. 50)	-	Animal Structures and Functions (Chordata).

Practical

Paper - III (F.M.50)	-	Non-Chordata.
Paper - IV (F.M. 50)	-	Chordata.

Part – II — **F.M. 200**

Theory

Paper - V (F.M. 50)	-	Zoogeography, Adaptation and Evolutionary Biology.
Paper - VI (F.M. 50)	-	Cell Biology and Genetics.
Paper - VII (F.M. 50)	-	Biochemistry, Biological tools & techniques and Physiological processes.

Practical

Paper - VIII (F.M. 50)	-	Practical works: Cell Biology, Genetics, Physiology and Biochemistry.

Part – III — **F.M. 400**

Theory

Paper – IX (F.M. 100)	-	Ethology & Biodiversity conservations, Ecology, Biometry, Applied Zoology, Microbiology, Parasitology and Medical Entomology.
Paper - X (F.M. 100)	-	Molecular Biology & Biotechnology, Human Immunology, Developmental Biology and Endocrinology.

Practical

Paper - XI (F.M. 100)	-	**Practical works:** Ecology, Applied Zoology and Field-based study/Review work/ Term paper.
Paper – XII (F.M. 100)	-	**Practical works**: Histology, Endocrinology, Statistical analysis, Microbiology and Parasitology. and Visit to agricultural/sericulture/fishery /poultry farm/Marine or forest ecosystem.

PART -I

Paper - I: Systematics and Animal Structures, Functions (Non-Chordata):50 marks, Time 2 hours
Paper - II: Animal Structures and Functions (Chordata): 50 marks Time 2 hours
Paper - III: Practical works (Non-Chordata): 50 marks Time 4 hours
Paper - IV: Practical works (Chordata): 50 marks Time 4 hours

THEORETICAL PAPERS

Paper – I **Theoretical Paper: Systematics ; Animal Structures and Functions (Non-Chordata):**

Total 60 classes

[Questions are to be set covering the entire syllabus; 7 questions each of 2 marks and 4 to be answered ; 5 questions each of 6 marks and 3 to be answered ; 4 questions of 12 marks and 2 to be answered]

Group – A : Systematics: (10 Classes)

1. Definitions: Classification, Systematic and Taxonomy; Hierarchy, Taxonomic types.
2. General idea of Codes of Zoological Nomenclature; Principle of priority; Synonym and Homonym.
3. Basic idea of Cytological and Biochemical taxonomy.

Group – B : Non-Chordate Diversity, Relationships And Systematics (15 Classes)

1. Classificatory schemes of the living world - Six-Kingdom concept;
   Outline classification of Sub-kingdom Protozoa (up to Phyla; examples with Scientific names) (Levine et al., 1980) and Minor Phyla.
2. Classification with characteristic features and examples with Scientific names of (upto Classes)
   a. Phylum Nematoda; Phylum Arthropoda - as per Ruppert and Barnes (7th Ed. 2003).
   b. Up to Sub-classes: Phylum Cnidaria, Phylum Platyhelminthes, Phylum Mollusca and Phylum Echinodermata - as per Ruppert and Barnes (7th Ed. 2003).
   c. Up to Orders: Phylum Porifera - as per Hyman (1940);
   and Phylum Annelida - as per Ruppert and Barnes (7th Ed. 2003).
3. Origin of Metazoa; Coelom, Metamerism and Symmetry.

Group – C : Type study of Non-Chordate Animals: (25 Classes)

1. *Paramoecium* (Locomotion, Osmoregulation, Reproduction).
2. *Sycon* (Cell types, Spicules,).
3. Earthworm (General Morphology, Reproductive System).
4. *Periplaneta* (General Morphology, Excretory System, Reproductive System).
5. *Pila* (Torsion, Feeding, Respiratory System).
6. *Asterias* (General Morphology, Water vascular System).

Group – D : Specialized Features of Non-Chordate Animals (10 Classes)

1. Canal System in Porifera.
2. Polymorphism in Siphonophora and Social insect (Honey bee).
3. Formation, Types and Distribution of Coral Reefs.
4. Metamorphosis in Insects.

Suggested Readings :

Blackwelder, R. E., (1967). Taxonomy- A text and reference book. John Wiley & Sons.
Kapoor, V. C. (2008). Theory and practice of animal taxonomy. 6th Ed. Oxford & IBH Publishing Company Pvt. Ltd.
Mayr, E. (1969). Principles of Systematic Zoology. Tata McGraw-Hill.
Mayr, E. & Ashlock, P. D. (1991). Principles of Systematic Zoology. 2nd Ed., McGraw-Hill.
Simpson, G. G. (1961). Principles of Animal Taxonomy. Columbia University Press. New York.
Quicke, D.A.J. (1993). Principles and Techniques of Contemporary Taxonomy. Blackie Academic & Professional.
Anderson, D. T. (Ed.) (2001). Invertebrate Zoology. 2nd Ed. Oxford University Press.
Barnes, R. D. & Ruppert, E. E., (1994). Invertebrate Zoology. 6thEd. Brooks Cole.
Ruppert E. E., Fox, R. & Barnes R. D. (2003). Invertebrate Zoology: a Functional Evolutionary Approach. 7th Ed. Brooks Cole.
Barrington, E. J. W. (1981). Invertebrate Structure and function. 2nd Ed. ELBS & Nelson.
Brusca, R. C. & Brusca, G. J. (2002). Invertebrates. 4th Ed. Sinauer Associates.
Hyman, L. H. (1951). The Invertebrates (Vol-I). Mc.GrawHill Book Company.
Jordan, E. L. & Verma, P. S. (2006). Invertebrate Zoology. S. Chand & Company Ltd. New Delhi.
Meglitsch, P. A. & Schram, F. R. (1991). Invertebrate Zoology. Oxford University Press.
Pechenik, J. A. (1998). Biology of the Invertebrates, 4th Ed. McGraw Hill.
Sinha, K. S., Adhikari, S., & Ganguly, B. B. Biology of Animals. Vol. I. New Central Book Agency (p) Ltd. Kolkata.
Parker, T. J. & Haswell, W. (1972). Text Book of Zoology, Volume I. Macmillan Press, London.
ভট্টাচার্য, কেদারনাথ (২০১০). প্রাণীবিজ্ঞান. চতুর্থ সংস্করণ. বুকস অ্যান্ড অ্যালায়েড (প্রাইভেট) লিমিটেড. কোলকাতা.
মাইতি, শঙ্করপ্রসাদ. মিদ্যা, ত্রিলোচন. (২০০৫). সমকালীন প্রাণিবিদ্যা. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
রায়, বিজ্ঞান, ভট্টাচার্য, বীরেন্দ্রনাথ., বসু, বুদ্ধদেব, (২০০২). প্রাণিবিদ্যা. প্রথম খন্ড. প্রথম সংস্করণ. অভিনব প্রকাশন. কলকাতা.
চট্টোপাধ্যায়, দেবজ্যোতি. (২০০৯). স্নাতক প্রাণিবিদ্যা. প্রথম খন্ড. তৃতীয় সংস্করণ. বুক সিন্ডিকেট প্রাইভেট লিমিটেড, কলকাতা
মাইতি, শঙ্করপ্রসাদ., মিদ্যা, ত্রিলোচন. (২০০৪). প্রাণিবিদ্যা. প্রথম খন্ড. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
চট্টোপাধ্যায়, অসীমকুমার., চক্রবর্তী, চন্দ্রশেখর. (২০০৭). প্রাণিবিদ্যা. প্রথম সংস্করণ. নির্মলা লাইব্রেরী. কোলকাতা.
ইসলাম, আমিনুল. (২০০১). প্রাণিবিদ্যার রূপরেখা. প্রথম খন্ড. তৃতীয় সংস্করণ. শ্রীভূমি পাবলিশিং কোম্পানী. কোলকাতা.
বন্দ্যোপাধ্যায়, সমীর., বিশ্বাস, পার্থপ্রতিম (১৯৯৯). ত্রি-বার্ষিক প্রাণিবিদ্যা. প্রথম খন্ড. ওরিয়েন্টাল বুক কোম্পানি প্রাঃ লি. কলকাতা.
ঘোষ, শ্যামাপ্রসাদ., রাহা, সলিলকুমার (১৯৮৪). আদ্যপ্রাণী. পশ্চিমবঙ্গ রাজ্য পুস্তক পর্ষদ. কোলকাতা.

Paper – II **Theoretical Paper: Animal Structures and Functions (Chordata):** Total 60 classes

[Questions are to be set covering the entire syllabus; 7 questions each of 2 marks and 4 to be answered ; 5 questions each of 6 marks and 3 to be answered ; 4 questions of 12 marks and 2 to be answered]

Group - A: Chordate Diversity and Relationships (15 Classes)

1. Classification with characteristic features and examples with Scientific names of:
   a) Up to Classes: Sub-Phyla Urochordata and Cephalochordata - as per J. Z. Young (1981).
   b) Up to Order: Superclass Agnatha - as per J. Z. Young (1981).
   c) Up to Sub-Classes: Chondrichthyes and Osteichthyes - as per Nelson (2006); and Aves - as per Pough(9th. Edition).
   d) Up to living Orders: Amphibia - as per Duellman and Trueb (1986); Reptilia and Mammalia - as per J. Z. Young (1981).
2. Anatomical peculiarities, Distribution and Evolutionary significance of *Dipnoi.*
3. Anatomical peculiarities, Distribution and Importance of *Sphenodon*.

Group - B: Type Study of Chordate Animals (30 Classes)

1. *Branchiostoma* (Chordate Features, Feeding, Circulatory System).
2. *Labeo* (General Morphology, Circulatory, Respiratory System).
3. Toad (General Morphology, Skeletal structures, Circulatory, Urinogenital System).
4. *Calotes* (General Morphology, Circulatory, Excretory System).
5. *Columba* (Exoskeleton, Endoskeleton, Flight muscles, Respiratory System).
6. *Cavia* (Endoskeleton, Brain & Cranial nerves).

Group - C: Specialized Features of Chordate Animals (15 Classes)

1. Biting apparatus & Biting mechanism; Composition & Types of Venom in Snakes.
2. Retrogressive (in *Ascidia*) and Progressive (in Toad/Frog) metamorphosis; Neoteny and Paedogenesis.
3. Aerodynamics of Avian flight.
4. Echolocation in Micro chiropterans and Cetaceans.
5. Glands, Hair and Horn in Mammals.

Suggested Readings :

Hildebrand, M. (1995). Analysis of Vertebrate Structure. John Wiley & Sons.
Chaki, K.K. Kundu, G. & Sarkar, S. (2005). Introduction to General Zoology. Vol. 1. New Central Book Agency (P) Ltd. Kolkata.
Jordan, E.L. & Verma, P.S. (2003). Chordate Zoology. S. Chand & Company Ltd. New Delhi.
Kardong, K. V. (2002). Vertebrates: Comparative anatomy, function evolution. Tata McGraw Hill.
Kent, G. C. & Carr, R. K. (2001). Comparative anatomy of the Vertebrates. 9th Ed. Mc Graw Hill.
Saxena, R.K. & Saxena, S.C.(2008) : Comparative Anatomy of Vertebrates, Viva Books Pvt. Ltd.
Nelson, J.S., (2006) : Fishes of the World, 4th Edn., Wiley.
Romer, A. S. & Parsons, T. S. (1986). The vertebrate body. 6th Ed. Saunders College Publishing.
Pough, F.H., Heiser, J.B. & McFarland W. N. (1985). 3rd Ed. Vertebrate Life. Macmillan Publishing Company, New York.
Sinha, K. S., Adhikari, S., Ganguly, B. B. & Bharati Goswami, B. D. (2001). Biology of Animals. Vol. II. New Central Book Agency (p) Ltd.
Parker, T. J. & Haswell, W. (1972). Text Book of Zoology , Volume II: Marshall and Willam (Eds.) 7th Ed. Macmillan Press,London.
Young, J. Z. (1981). The Life of Vertebrates. 3rd Ed. ELBS.
Weichert, C. K. & Presch, W. (1984). Elements of Chordate Anatomy. Tata-McGraw Hill Pub. Comp.
ভট্টাচার্য, কেদারনাথ (২০১০). প্রাণীবিজ্ঞান. চতুর্থ সংস্করণ. বুকস অ্যান্ড অ্যালায়েড (প্রাইভেট) লিমিটেড. কোলকাতা.
মাইতি, শঙ্করপ্রসাদ. মিদ্যা, ত্রিলোচন. (২০০৫). সমকালীন প্রাণিবিদ্যা. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
রায়, বিজ্ঞান, ভট্টাচার্য, বীরেন্দ্রনাথ., বসু, বুদ্ধদেব, (২০০২). প্রাণিবিদ্যা. প্রথম খন্ড. প্রথম সংস্করণ. অভিনব প্রকাশন. কলকাতা.
চট্টোপাধ্যায়, দেবজ্যোতি. (২০০৯). স্নাতক প্রাণিবিদ্যা. দ্বিতীয় খন্ড. তৃতীয় সংস্করণ. বুক সিন্ডিকেট প্রাইভেট লিমিটেড, কলকাতা
মাইতি, শঙ্করপ্রসাদ., মিদ্যা, ত্রিলোচন. (২০০৪). প্রাণিবিদ্যা. প্রথম খন্ড. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
চট্টোপাধ্যায়, অসীমকুমার., চক্রবর্তী, চন্দ্রশেখর. (২০০৭). প্রাণিবিদ্যা. প্রথম সংস্করণ. নির্মলা লাইব্রেরী. কোলকাতা.
ইসলাম, আমিনুল. (২০০১). প্রাণিবিদ্যার রূপরেখা. প্রথম খন্ড. তৃতীয় সংস্করণ. শ্রীভূমি পাবলিশিং কোম্পানী. কোলকাতা.
বন্দ্যোপাধ্যায়, সমীর., বিশ্বাস, পার্থপ্রতিম (১৯৯৯). ত্রি-বার্ষিক প্রাণিবিদ্যা. প্রথম খন্ড. ওরিয়েন্টাল বুক কোম্পানি প্রাঃ লি. কলকাতা.

PRACTICAL PAPERS

Paper – III **Practical Paper: Non-Chordata: 50 Marks: Time: 4 hours**

[Questions are to be set with Non-chordate specimens : One Major dissection (12 marks), One Minor dissection (8 marks), One Preparation/staining-mounting (5 marks), Identification of Five specimens with reasons (5 X 4 = 20) and Laboratory Note Book (5 marks)]

Group - A: Non-Chordate Major Dissections

1. Earthworm : Reproductive System
2. Cockroach : Male Reproductive System

Group - B: Non-Chordate Minor Dissections

1. Earthworm : Nervous System
2. Cockroach : Salivary apparatus, Nervous System, Female Reproductive System

Group - C: Non-Chordate Preparations/Staining-Mounting

1. Earthworm : Setae
2. Cockroach : Mouthparts

Group - D: Non-chordate specimen identifications with reasons

(As per Classification Schemes of theoretical paper)

Euglena, Paramoecium , Euspongia , Scypha , Obelia , Aurelia , Physalia, Porpita , Sea-Anemone, *Fasciola, Ascaris, Chaetopterus, Aphrodite , Sabella , Eupagurus, Apus, Balanus, Hippa , Squilla, Oniscus, Belostoma , Buthus, Mantis, Chiton, Patella , Doris, Pinctada , Mytilus, Sepia , Loligo, Octopus, Ophiura , Astropecten , Antedon , Balanoglossus.*

Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.

Paper – IV **Practical Paper: Chordata: 50 Marks: Time: 4 hours**

[Questions are to be set with Chordate specimens : One Major dissection (12 marks), One Minor dissection 8 marks), One Preparation/staining-mounting (5 marks), Identification of Five specimens with reasons (5 X 4 = 20) and Laboratory Note Book (5 marks)]

Group - A: Chordate Major Dissections

a. Indian Major Carp (any one; 6-8″) : IXth and Xth Cranial Nerves - Origin and Distributions.
b. Fowl : Vth Cranial Nerves - Origin and Distributions.

Group - B: Chordate Minor Dissections

a. Indian Major Carp (any one; 6-8″) : Brain.
b. Fowl : Brain and Hyoid apparatus.

Group - C: Chordate Preparations/Staining-Mounting

a. Staining-Mounting of Cycloid and Ctenoid scales.
b. Mounting of Weberian ossicles (carp).
c. Pecten of fowl.

Group - D: Chordate specimen identifications with reasons:

(As per Classification Schemes of theoretical paper)

Ascidia, Doliolum , Branchiostoma , Petromyzon , Myxine, Ammocete larva, *Torpedo, Hippocampus, Heteropneustes, Clarias, Exocoetus, Syngnathus,* Tadpole*, Rana, Ambystoma , Rhacophorus, Necturus, Pleurodeles (=Tylototriton), Draco, Typhlops, Chamaeleo, Naja , Ptyas, Daboia (=Vipera), Hydrophis, Psittacula , Passer, Pycnonotus, Alcedo, Pteropus, Funambulus, Suncus.*

Group - E: Identification of bones with reasons

1. Skull: Toad, *Varanus, Columba, Cavia*, Old world monkey.
2. Appendicular bones: *Columba, Cavia.*
3. Girdle bones: *Columba, Cavia.*
4. Vertebrae: *Columba, Cavia.*

Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.

PART -II

Paper - V: Zoogeography, Adaptation and Evolutionary Biology:	**50 marks**	**Time 2 hours**
Paper - VI: Cell Biology and Genetics:	**50 marks**	**Time 2 hours**
Paper - VII: Biochemistry, Biological Tools & Techniques and Physiology:	**50 marks**	**Time 2 hours**
Paper - VIII: Practical works:	**50 marks**	**Time 4 hours**

THEORETICAL PAPERS

Paper – V **Theoretical Paper: Zoogeography, Adaptation and Evolutionary Biology :**

Total 60 classes

[Questions are to be set covering the entire syllabus; 7 questions each of 2 marks and 4 to be answered ; 5 questions each of 6 marks and 3 to be answered ; 4 questions of 12 marks and 2 to be answered]

Group - A: Zoogeography and Adaptation (30 Classes)

1. Geological Time Scale (Schematic).
2. Zoogeographical Realms with examples; Barriers, Dispersals and their impact on Animal Distribution.
3. Adaptive features (Morphological and Physiological) of Aquatic vertebrates (Fish and Whale).
4. Adaptive features of Desert animals (Reptiles and Mammals).
5. Adaptive significance of Coloration and Mimicry in Animal world.

Group - B: Evolutionary Biology (30 Classes)

1. Origin of Life - Chemical basis and Experiments.
3. Darwinism and Outline idea of Modern Synthetic Theory of Evolution.
4. Isolating mechanisms and Modes of speciation.
5. Species Concept (Biological & Evolutionary).
6. Hardy-Weinberg equilibrium and factors affecting it.
7. Genetic Drift.

Suggested Readings :

Barton, N.H., Briggs, D.E.G., Eisen, J.A., Goldstein, D.B. & Patel, N.H. (2007). Evolution. CSHL Press.
Dobzhansky, T., Ayala, F. J., Stebbins, G. L. & Valentine, J. W. (1977). Evolution. Surjeet Publications, New Delhi.
Futuyama, D. (1997). Evolutionary Biology. 3rd Ed. Sinauer Associates, INC.
Futuyama, D. (2005). Evolution. Sinauer Associates, INC.
Kardong, K. (2004). An Introduction to Biological Evolution. McGraw-Hill.
Hall, B. K., Hallgrimson, B. (2008). Strickberger's Evolution. 4th Ed. Jones and Bartlett.
Minkoff, D. (1983). Evolutionary Biology. 3rd Ed. Sinauer Associates, INC.
Page, R. D. M. & Holmes, E. C. (1998). Molecular Evolution: A Phylogenetic Approach Blackwell Science Ltd (2nd Reprint, 2001).
Ridley, M. (1996). Evolution. 2nd Ed. Blackwell Science Ltd.
Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Low Price Cambridge Edition.
Stearns, S. C. & Hoeskstra, R. F. (2005). Evolution. Blackwell Science Ltd.
Stebbins, G. L. (1969). Process of Evolution. Tata McGraw-Hill.
Volpe, E. P. & Rossenbaum, P. A. (1999). Evolution. Mc-Graw Hill Science Engineering.
Willmer, P. et. al. (2001). Physiological Adaptations. W. H. Freeman.
Hartl, D. L. (2005) Principles of Population Genetics. 4th Ed. Sinauer Associates.
ভট্টাচার্য, কেদারনাথ (২০১০). প্রাণীবিজ্ঞান. চতুর্থ সংস্করণ. বুকস অ্যান্ড অ্যালায়েড (প্রাইভেট) লিমিটেড. কোলকাতা.
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রায়, বিজ্ঞান, ভট্টাচার্য, বীরেন্দ্রনাথ., বসু, বুদ্ধদেব, (২০০১). প্রাণিবিদ্যা. দ্বিতীয় খন্ড. প্রথম সংস্করণ. অভিনব প্রকাশন. কলকাতা.
চট্টোপাধ্যায়, দেবজ্যোতি. (২০০৯). স্নাতক প্রাণিবিদ্যা. দ্বিতীয় খন্ড. তৃতীয় সংস্করণ. বুক সিন্ডিকেট প্রাইভেট লিমিটেড, কলকাতা
মাইতি, শঙ্করপ্রসাদ., মিদ্যা, ত্রিলোচন. (২০০৪). প্রাণিবিদ্যা. প্রথম খন্ড. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
মাইতি, শঙ্করপ্রসাদ., মিদ্যা, ত্রিলোচন. (২০০৫). প্রাণিবিদ্যা. দ্বিতীয় খন্ড. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
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গুহ, সুহিতা. (১৯৯৪). জীন, বংশধারা ও বিবর্তন. দ্বিতীয় সংস্করণ. পশ্চিমবঙ্গ রাজ্য পুস্তক পর্ষদ. কোলকাতা.

Paper – VI **Theoretical Paper: Cell Biology and Genetics: Total 60 classes**

[Questions are to be set covering the entire syllabus; 7 questions each of 2 marks and 4 to be answered ; 5 questions each of 6 marks and 3 to be answered ; 4 questions of 12 marks and 2 to be answered]

Group - A: Cell Biology (30 Classes)

1. Ultra structure and Outline Functions of Plasmamembrane. Mitochondria, Golgi complex, Endoplasmic reticulum and Ribosome.
2. Nucleic Acids: Chemical and Physical structure.
3. Chromatin/Chromosome: Nucleosome Concept.
4. Cell cycle, Mitotic and Meiotic cell divisions and their Significance.
5. Spindle apparatus and Synaptonemal complex.

Group - B: Genetics (30 Classes)

1. Mendelian Principles; Extensions to Mendel's Law.
2. Allele: Types, Multiple alleles, ABO Blood Group (with simple problems).
3. Linkage, Crossing over (Holliday model).
4. Chromosome Mapping in diploids with Problems.
5. Simple Mendelian traits in Man and Modes of Autosomal Inheritance.
6. Inheritance of Sex-linked traits in *Drosophila* and Man.
7. Sex Determination in *Drosophila* and Man.

Suggested Readings :

Alberts, B. et al. (2008). Molecular Biology of the Cell. 5th Ed. Garland Publishing House.
Banerjee, P.K. (2006). Problems on Genetics, Molecular Genetics and Evolutionary Genetics. New Central Book Agency (P) Ltd.
Becker. (2009). The World of the Cell. 7th Ed. Benjamin-Cummings.
Brown, T.(2002). Genomes 2. Wilely-Liss.
Clark, D. P. (2005). Molecular Biology. Elsevier.
Cooper, G. M. (2004). The Cell. 3rd Ed. ASM Press.
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Karp, G. (2008). Cell and Molecular Biology: Concepts and experiments.5th Ed., John Wiley. Kendrew, S. J. (Ed.) (1994).
The Encyclopedia of Molecular Biology. Blackwell Science.
Mandal, S. (2010). Fundamentals of Human Genetics. 4th Ed. New Central Book Agency. Kolkata.
Nussbaum, R. L., McInnes, R. R., Willard, H. F. (2007). Thompson & Thompson: Genetics in Medicine. Elsevier.
Molecular Biology of the Gene. 6th Ed. Benjamin Cummings.
Malacinski, G. M. (2003). Essentials of Molecular Biology. 4th Ed. Jones & Bartlett.
McConkey, H. (1993). Human Genetics: The molecular Revolution. Jones & Bartlett Publishers.
Ratledge, C. & Kristiansen, B. (2005). Basic Biotechnology. 2nd Ed. Cambridge University Press.
Snustad, D. P. & Simmons. M. J. (2004). Principles of Genetics. 4th Ed. John Wiley and Sons.
Stansfield, W. D. (1991). Schaum's Outline Series: Theory & Problems of Genetics.3rd Ed. McGraw-Hill.
Strachan, T. & Read, A. P. (2004). Human Molecular Genetics-3. Garland Science.
Strickberger M.W. (1985). Genetics. 3rd Ed, Prentice Hall of India Pvt. Ltd., New Delhi.
Tamarin, R. H. (2004). Principles of Genetics. Tata McGraw-Hill Publishing Comp. Ltd.
Watson, J.D., Baker, T.A. & Bell, S.P. (2007). Molecular Biology of the Gene. 6th Ed. Benjamin Cummings.

ভট্টাচার্য, কেদারনাথ (২০১০). প্রাণীবিজ্ঞান. চতুর্থ সংস্করণ. বুকস অ্যান্ড অ্যালায়েড (প্রাইভেট) লিমিটেড. কোলকাতা.
মাইতি, শঙ্করপ্রসাদ. মিদ্যা, ত্রিলোচন. (২০০৫). সমকালীন প্রাণিবিদ্যা. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
রায়, বিজ্ঞান, ভট্টাচার্য, বীরেন্দ্রনাথ., বসু, বুদ্ধদেব, (২০০১). প্রাণিবিদ্যা. দ্বিতীয় খন্ড. প্রথম সংস্করণ. অভিনব প্রকাশন. কলকাতা.
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চট্টোপাধ্যায়, অমিয়কুমার. (২০১১). কোষতত্ত্ব ও জীনতত্ত্ব. প্রথম খন্ড. পশ্চিমবঙ্গ রাজ্য পুস্তক পর্ষদ. কোলকাতা.
ঘোষাল, সুধাংশু., মিদ্যা, ত্রিলোচন. (২০১১). কোষতত্ত্ব ও জীনতত্ত্ব. দ্বিতীয় খন্ড. পশ্চিমবঙ্গ রাজ্য পুস্তক পর্ষদ. কোলকাতা.
গুহ, সুহিতা. (২০০১). সাইটোলজি. তৃতীয় সংস্করণ. পশ্চিমবঙ্গ রাজ্য পুস্তক পর্ষদ. কোলকাতা.

PAPER-VII **Theoretical Paper: Biochemistry, Biological Tools & Techniques and Physiological Processes :Total 60 classes**

[Questions are to be set covering the entire syllabus; 7 questions each of 2 marks and 4 to be answered; 5 questions each of 6 marks and 3 to be answered ; 4 questions of 12 marks and 2 to be answered]

Group - A: Biochemistry, Biological tools & techniques (25 Classes)

1. Definitions with examples from Biological systems of Optical Isomerism, Hydrophobic and Hydrophilic interactions, Hydrogen bond, S-S bond, Van der Waal's force; pH and Buffer.
2. Concepts of Osmosis, Diffusion, Donnan membrane equilibrium.
3. Biological Macromolecules - Carbohydrates, Proteins and Lipids.
4. Enzymes - Classes; Kinetics and Factors affecting enzyme action.
5. Microscopy - Light (Bright-field, Dark-field and Phase contrast) and Electron (SEM and TEM).

Group - B: Metabolism and Physiological Processes: (35 Classes)

1. Metabolism of Carbohydrates - Glycolysis, Pentose phosphate pathway and Gluconeogenesis.
2. Metabolism of Amino acids; Transamination and Oxidative and Non-oxidative Deamination.
3. Beta-oxidation of Fatty acids.
4. Integration: Kreb's cycle and Electron transport chain.
5. Role of Hemoglobin in O_2 and CO_2 transport in Man.
6. Physiology of Nerve impulse propagation and Muscular contraction.

Suggested Readings :

Berg, J. M., Tymoczko, J. K. & Stryer, L. (2007). Biochemistry. 6th Ed. W. H. Freeman & Company.
Boyer, R. (2000). Modern Experimental Biology. Pearson Education. English Universities Cambridge Low-price Ed.
Cantor, C.R. & Schimmel, P.R. (2003). Biophysical chemistry (3 vol. set). W. H. Freeman & Co.
Devlin, T. M. (Ed.). (2002). Textbook of Biochemistry with clinical correlations. 5 Ed. Wiley-Liss.
Das, D.(2005), Biochemistry, 20th Edn. Academic Publishers.
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Mandal, S. (2007). Insect neuroendocrinology. Emkay Publication. New Delhi.
Hames, B.D., Hooper, N.M. & Houghton, J.D. (2002). Instant notes in Biochemistry. 2nd Ed. Viva Books Private Limited.
Hill, R.W., Wyse, G.A. & Anderson, M. (2008). Animal Physiology. 2nd Ed. Sinauer Associates Inc.
Joshi, V.D. & Joshi-Mendhurwar, S. (2006). Physiology. 3rd Ed. Elsevier.
Mathews, C. K., Van Holde, K. E. & Ahern K. G. (2001). Biochemistry.3rd Ed. Person Education.
Ganong, W. F. (2003). Review of Medical physiology. 21st Ed. McGraw Hill.
Chaudhuri, S. K. (2000). Concise Medical Physiology. New Central Book Agency (P) Ltd. Kolkata.
Metzler, D. E. (2003). Biochemistry: The Chemical reactions of living cell. Vol. 1 & 2. Academic Press.
Murray, R. K., Granner, P., Mayes A. & Rodwell, V. W. (2003). Harper's Illustrated Biochemistry. 25th Ed. McGraw-Hill.
Nelson, D. L. & Cox. M. M. (2004). Lehninger's Principles of Biochemistry. 2nd Ed., Macmillan Worth Publishers.
Bajpai, P.K. (2006). Biological Instrumentation and Methodology. 1st Ed. S. Chand & Company Ltd.
Ghoshal & Shrivastava (2009). Fundamentals of Bioanalytical Techniques and Instrumentation. PHI
Randall, D., Burgren, W. & French, K.(2002). Eckerts' Animal Physiology- Mechanisms and Adaptation. 5th Ed. W. H. Freeman.
Roy, R.N. (2005). A Text Book of Biophysics. New Central Book Agency (P) Ltd. Kolkata.
Sherwood L. (2003). Human Physiology: from Cell to Systems. Thompson Brooks/ Cole.
Sharma, V. K. (1991). Techniques in Microscopy and Cell Biology. Tata-McGraw Hill.
Vander, A. J., Sherman, J.H. & Luciano, D. S. (1990). Human Physiology 5th Ed. McGraw-Hill Publishing Company.
Van Holde, K. E., Johnson, W. C. & Ho, P. S. (2006). Principles of Physical Biochemistry. 2nd Ed. Pearson Prentice Hall.
Voet, D., Voet, J. G. & Pratt C. W. (1999). Fundamentals of Biochemistry. Upgrade edition. John Wiley & Sons.
ভট্টাচার্য, কেদারনাথ (২০১০). প্রাণীবিজ্ঞান. চতুর্থ সংস্করণ. বুকস অ্যান্ড অ্যালায়েড (প্রাইভেট) লিমিটেড. কোলকাতা.
রায়, বিজ্ঞান, ভট্টাচার্য, বীরেন্দ্রনাথ., বসু, বুদ্ধদেব, (২০০২). প্রাণিবিদ্যা. প্রথম খন্ড. প্রথম সংস্করণ. অভিনব প্রকাশন. কলকাতা.
চট্টোপাধ্যায়, দেবজ্যোতি. (২০০২). স্নাতক প্রাণিবিদ্যা. তৃতীয় খন্ড. প্রথম সংস্করণ. বুক সিন্ডিকেট প্রাইভেট লিমিটেড, কলকাতা.
মাইতি, শঙ্করপ্রসাদ., মিদ্যা, ত্রিলোচন. (২০০৫). প্রাণিবিদ্যা. দ্বিতীয় খন্ড. নিউ সেন্ট্রাল বুক এজেন্সি (প্রাঃ) লিমিটেড, কলকাতা.
বন্দ্যোপাধ্যায়, সমীর., বিশ্বাস, পার্থপ্রতিম (২০০০). ত্রি-বার্ষিক প্রাণিবিদ্যা. দ্বিতীয় খন্ড. ওরিয়েন্টাল বুক কোম্পানি প্রাঃ লি. কলকাতা.
দাস, স্বপন কুমার. (২০১১). প্রাণী শারীরবৃত্ত. পশ্চিমবঙ্গ রাজ্য পুস্তক পর্ষদ. কোলকাতা.

PRACTICAL PAPER

Paper – VIII **Practical Paper: 50 Marks: Time: 4 hours**

[Questions are to be set with TWO experiments each of 15 marks, each from Group – A (Preparation of Mitotic/Meiotic stage, drawing of a stage under microscope field and its identification) and Group – B (Estimation of total Carbohydrate/Total Protein); Next ONE experiment of 5 marks from Group – B (Enzyme/DC); Pedigree analysis with comment (10 marks); Laboratory Note Book (5 marks).]

Group - A: Cell Biology & Genetics:

1. Preparation and Identification of Mitotic stages from Onion Root-tip.
2. Preparation and Identification of Meiotic stages from Grass-hopper Testis.
3. Human Pedigree Chart analysis.

Group - B: Physiology and Biochemistry:

1. Quantitative Estimation by Colorimetric Methods of Total Carbohydrate (as per Umbreit et al., 1958) and Total Protein (as per Lowry et al, 1951).
2. Action of Salivary Amylase - Effects of Temperature.
3. Differential Count of Human Blood.

Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.

PART – III

Paper - IX:	**Ethology, Biodiversity Conservations, Ecology, Biometry, Applied Zoology, Microbiology, Parasitology, Medical entomology :**	**100 marks**	**Time 4 hours**
Paper - X:	**Molecular Biology, Biotechnology, Immunology, Developmental Biology, Endocrinology:**	**100 marks**	**Time 4 hours**
Paper - XI:	**Practical works:**	**100 marks**	**Time 6 hours**
Paper - XII:	**Practical works:**	**100 marks**	**Time 6 hours**

THEORETICAL PAPERS

Paper -IX:

Theoretical Paper: Unit – I : Ethology, Biodiversity conservations, Ecology, Biometry;

Unit – II : Applied Zoology, Microbiology, Parasitology, Medical entomology : Total 120 classes

[Questions are to be set covering the entire syllabus; 14 questions (7 from each UNIT) each of 2 marks and 8 to be answered; 10 questions (5 from each UNIT) each of 6 marks and 6 to be answered; 8 questions (4 from each UNIT) of 12 marks and 4 to be answered]

UNIT – I : 50 Marks

Group : A : Ethology and Biodiversity Conservations (30 Classes)

1. Concept of Ethology; Innate and Learned Behaviour, Fixed Action Pattern.
2. Elements of Sociobiology: Selfishness, Cooperation, Altruism and Kinship.
3. Mating systems and their Significance.
4. Biodiversity: Definition, levels, values, causes of depletion; In-situ and Ex-situ conservation, Bio-diversity Hotspots and Mega diversity countries; Biodiversity Act; Biopiracy.
5. Endangered and Critically Endangered Vertebrate Wildlife of India; Management Strategies with special reference to Tiger and Rhinoceros in India; Wildlife Protection Laws.

Group – B : Ecology (30 Classes)

1. Concept of Ecosystems: Components, Basic properties and Principles;
   Concept of Limiting Factor-impact of Temperature on biota.
2. Energy Flow through trophic levels and Ecological efficiencies.
3. Population Dynamics: Natality and Mortality, Growth forms, Regulation of Population density.
4. Community structure: Characteristics, Types, Niche concept, Resource partitioning.
5. Ecological Succession: Concept of Community change, Theories of Climax, Models of Succession.
6. Salient features (characteristics and importance) of Indian Rain Forest.

Group - C: Biometry: (15 Classes)

1. Definition and importance of Biometry in Zoology.
2. Methods of Sampling.
3. Measures of Central Tendency - General idea and Simple problem solving.
4. General idea of Probability.
5. Test of Significance (Student's t-Test).
6. Goodness of fit (Chai-Square Test).

UNIT – II : 50 Marks

Group – A : Applied Zoology: (20 Classes)

1. Pond Management; Induced Breeding and Composite culture of Carp.
2. Sericulture - Rearing and Cocoon production; Diseases and Pests and their Control in *Bombyx mori.*
3. Poultry - Major Fowl Breeds; Deep Litter System of Rearing; Common diseases and their Control measures.
4. Animal Husbandry - Types and Distribution of Cattle Breeds (Cow only) in India; Artificial Insemination : Merits and Demerits.
5. Pest Biology - Pests and their Control - Cultural, Mechanical, Chemical, Biological; Integrated Pest Management; Bionomics, Damage and Control measures of *Nilaparvata, Apion, Sitophilus.*

Group – B : Microbiology, Parasitology and Medical Entomology (25 Classes)

1. Types of Microbes; Normal flora in Man and their Protective role
2. Basic structure of Bacteria.
3. Interactions among Organisms: Phoresis, Commensalisms, Parasitism and Mutualism
4. Parasites and Hosts: types and examples; Host-Parasite Interactions: Morphological and Physiological changes.
5. Morphology, Life-cycle, Pathogenicity and Control of *Giardia intestinalis, Leishmania sp, Ascaris lumbricoides and Wuchereria bancrofti.*
6. Biology of Vectors and their Control measures: *Anopheles*, *Culex* and *Phlebotomus*

Suggested Readings :

Alcock, J. (2001). Animal Behaviour: An Evolutionary Approach. Sinauer Associates. Inc. USA.
Basu, R.N. (2004). A Compendium of Terms in Ecology and Environment. Naya Udyog.
Begon, M., Harper, J. L. & Townsend, C. R. (2006). Ecology: Individuals, Populations and communities. 4th Ed. Blackwell science.
Chapman, R. L. and Reiss, M. J. (2000). Ecology - Principles & Application. Cambridge University Press.
Colinvaux, P. (1993). Ecology 2. John Wiley & Sons, Inc. New York.
Cunningham, W. P. & Cunningham, M. A., (2007). Principles of Environmental Science: Inquiry & Applications. 4th Ed. Tata McGraw-Hill
Danchin, E., Giraldeau, L. A., & Cezilly, F. (2008). Behavioural Ecology: An Evolutionary Perspective on Behaviour. Oxford University Press,
Dash, M. C., (2001). Fundamental of Ecology. 2nd Ed. Tata McGraw-Hill Company.
Enger, E. D. & Smith, B. F. (2008). Environmental Science: A study of Interrelationships. 11th Ed. McGraw-Hill Higher Education.
Faurie, C., Ferra, C., Medori, P. & Devaux, J. (2001). Ecology-Science and Practice. Oxford & IBH Publishing Company.
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Joshi, P.C. & Joshi, N. (2009). A Text Book of Ecology and Environment. Himalaya Publishing House.
Gupta, I. J. & Mondal, D. K. (2005). Red data Book (Part - 2): Butterflies of India. ZSI.
Kormondy, E. J. (2002). Concepts of Ecology. 4th Indian Reprint, Pearson Education.
Krebs, C. J. (2001). Ecology. Benjamin Cummings.
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Ricklefs, R. E. & Miller, G. L. (2000). Ecology. 4th Ed. W. H. Freeman & Company.
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Paper – X :

Theoretical Paper: Unit – I : Molecular Biology & Biotechnology, Human Immunology;
Unit – II : Developmental Biology and Endocrinology: Total 120 classes
[Questions are to be set covering the entire syllabus; 14 questions (7from each Unit) each of 2 marks and 8 to be answered; 10 questions (5 from each Unit) each of 6 marks and 6 to be answered ; 8 questions (4 from each Unit) of 12 marks and 4 to be answered]

UNIT - I : 50 Marks

Group – A : Molecular Biology and Biotechnology: (40 Classes)

1. DNA Replication - Semi-conservative DNA replication; Factors involved and Replication mechanism in *E. coli.*
2. Chromosomal Aberrations (both Structural & Numerical); Down, Turner, Klinefelter and Cri-du-Chat syndromes.
3. Transcription in *Escherichia coli*.
4. Transcription in Eukaryotes.
5. Concept of Genetic Code.
6. Translation in *Escherichia coli* - Mechanism and Factors involved.
7. Regulation of Gene expression - Operon Concept (Inducible and Repressible operon).
8. Cancer : Types, Tumor, Properties of Transformed Cells.
9. Genetic Disorders and Diseases in Man - PKU, Albinism, Sickle-cell anaemia and Thalassemia
10. Basic concept of Genetic Engineering; Recombinant DNA and Cloning; DNA Fingerprinting and its Application.

Group - B: Human Immunology (20 Classes)

1. Immunity: Innate and Adaptive.
2. Immunoglobulin classification.
3. Cells involved in Acquired Immune System (Outline idea).
4. Basic Structures of Antigen and Antibody.

UNIT - II : 50 Marks

Group – A : Developmental Biology: (40 Classes)

1. Gametogenesis - Germ cell migration, Spermatogenesis and Oogenesis.
2. Ultra structure of Sperm and Egg; Physical and Biochemical events in Fertilization.
3. Egg-types and role of yolk in Cleavage.
5. Morphogenetic movement; Gastrulation in Frog and Chick; Concept of Fate Map.
6. Concepts of Organizer, Induction and Competence.
7. Development of Extra embryonic membranes in Chick; Types of Placenta in Mammals.
8. Organogenesis - Development of Eye and Heart in Chick.
9. Regeneration - Basic mechanism.

Group – B : Endocrinology: (20 Classes)

1. General idea of Invertebrate and Vertebrate Endocrine systems (Name and Locations of Endocrine Glands, Name of hormones and Chemical nature).
2. Pituitary : Hormones and their Functions.
3. Brief descriptions of Major Endocrine disorders in Human (Gigantism, Acromegaly, Cretinism, Myxoedema, Goiter, Cushing's disease & Addison's disease).

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বন্দ্যোপাধ্যায়, সমীর., বিশ্বাস, পার্থপ্রতিম (২০০০). ত্রি-বার্ষিক প্রাণিবিদ্যা. দ্বিতীয় খন্ড. ওরিয়েন্টাল বুক কোম্পানি প্রাঃ লি. কলকাতা.

PRACTICAL PAPERS

Paper – XI : Practical Paper

100 Marks : Time: 6 hours

[Questions are to be set with Three experiments : A) Micro measurement and Drawing (15 marks), B) Estimation of DO/free CO_2(15 marks), C) Determination of Soil pH (10 marks); Identification with reasons of any Four Pests and any Four Fishes (8X5=40 marks); Laboratory Note Book (5 marks); Brief presentation of Field-based Study/Review work (15 marks)]

Group - A: Ecology :

1. Use of Micrometers and Camera Lucida (Prism-type) in measuring and drawing of Zooplankton.
2. Quantitative estimation of Dissolved O_2 (Winkler's method) and Free CO_2 (APHA method) of natural water by titrimetric methods.
3. Determination of soil pH using pH meter.

Group - B: Applied Zoology:

1. Identification of ectoparasites and pests (up to Order and Generic characters*): Menopon , Pediculus, Xenopsylla, Scirpophaga , Leptocorisa , Nilaparvata , Apion, Spodoptera, Sitophilus, Tribolium*.

2. Identification of fish (up to Sub-Class and Species characters): *Cirrhinus mrigala , Labeo bata , Labeo rohita , Labeo calbasu, Catla catla , Channa stratus, Mystus vittatus, Pampus argenteus, Harpadon nehereus, Notopterus notopterus.*

Group - C: Field-based Study/ Review Work :

1. Zoology Honours students should complete a Field-based study OR a Review work OR a Term paper on a particular topic within the first two-year tenure of their degree course. If the candidate choose project work, this may be a group work, involving not more than 4 students.

2. Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.

Paper – XII : Practical Paper

100 Marks : Time : 6 hours

[Questions are to be set with Four experiments: A) Microtomy (from Group – A : 15 marks), B) Chi-square test (from Group – A : 10 marks), C) Bacterial staining (from Group – B : 10 marks), D) Preparation of gut content for Protozoan Parasites (from Group – B : 15 marks); Identifications of any Five Tissue Sections with reasons (from Group – A : 5X5=25 marks) and Identifications of Two Parasites and One Vector (from Group – B : 3X5=15 marks); Laboratory Note Book (5 marks); Viva voce on Group – C (5 marks)]

Group - A: Histology and Statistical Analysis:

1. Tissue fixation, Embedding, Microtomy, Staining and Mounting of Histological tissue (any one) of white Rat; Demonstration of position of Endocrine glands in Rat.
2. Identification of Mammalian Histological Tissue sections (Liver, Pancreas, Thyroid, Kidney, Adrenal, Testis and Ovary) with Identifying characters.
3. Chi-square Test with concluding remarks.

Group - B: Microbiology and Parasitology:

1. Staining of Bacteria from Curd sample by Gram staining method.
2. Smear preparations and Staining of the Gut-contents of Cockroach and Seminal vesicle of Earthworm for Protozoan parasites.
3. Identification of *Entamoeba sp*., *Giardia sp., Taenia solium* , *Ascaris lumbricoides* (adult male and female), *Ancylostoma duodenale* (adult male and female), *Fasciola* sp.
4. Identification of vectors: *Anopheles, Culex, Phlebotomus*.

Group - C:

1. Visit to an Agricultural / Sericulture / Fishery / Poultry farm to study equipment and safety measures along with the process and mechanism adopted. A report should be submitted describing the nature of work done.

   OR

   Visit to a Forest ecosystem/Sea-side to study biodiversity. A report should be submitted describing the nature of work done.

2. Laboratory Note Book must be prepared on day-to-day basis and should be signed by the concerned teacher immediately after the laboratory work. The Laboratory Note Book should contain all the items in the syllabus and must be submitted on the day of examination.

Suggested readings for Practicals (Part-I, Part-II & Part- III) :

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