



पाठ्यक्रम
SYLLABUS

SCHEME OF EXAMINATION AND COURSES OF STUDY

FACULTY OF SCIENCE

M.Phil. Zoology

M.Phil Zoology Examination Semester-I, Semester-II

2010-11 से प्रभावी(w.e.f.)

सत्र 2013-14

महर्षि दयानन्द सरस्वती विश्वविद्यालय, अजमेर

NOTICE

- 1 Change in Statutes/Ordinances/Rules/Regulations/ Syllabus and Books may, from time to time, be made by amendment or remaking, and a candidate shall, except in so far as the University determines otherwise comply with any change that applies to years he has not completed at the time of change. **The decision taken by the Academic Council shall be final.**

सूचना

1. समय-समय पर संशोधन या पुनः निर्माण कर परिणियमों / अध्यादेशों / नियमों / विनियमों / पाठ्यक्रमों व पुस्तकों में परिवर्तन किया जा सकता है, तथा किसी भी परिवर्तन को छात्र को मानना होगा बशर्ते कि विश्वविद्यालय ने अन्यथा प्रकार से उनको छूट न दी हो और छात्र ने उस परिवर्तन के पूर्व वर्ष पाठ्यक्रम को पूरा न किया हो। **विद्या परिषद द्वारा लिये गये निर्णय अन्तिम होंगे।**

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**Ordinance 123 (V) relating to M. Phil Examination
According to Minimum standards and procedure for awards of
M. Phil degree as per the guidelines of U.G.C. Regulation, 2009
Scheme of Examination**

1. For starting or continuing M. Phil course in the University and its affiliated colleges, it must be ensured that at least two qualified teachers are available in that subject. A teacher who possesses Ph.D. Degree shall be eligible to teach M. Phil classes. A teacher who possesses Ph.D. Degree and three years P.G. teaching experience shall be eligible to supervise M. Phil dissertation.
2. A candidate for admission to the courses of study for the Degree of M.Phil must have obtained a Master's Degree in the concerned subject with at least 55% marks at the post graduate Examination of this University or of any other University/ Institution. A candidate with second division at post graduate examination (with less than 55% marks) shall be eligible for the M.Phil. if he/she has second division at the graduate examination. Relaxation in the eligibility will be given to SC/ST/OBC/PH etc as per rules of the University/State Government.
3. **Admission to M. Phil Programme**
 - (i) University shall issue notification regarding Eligibility test for admission to M.Phil Programme. Research Eligibility Test (RET-M.Phil) in the National/Regional news papers etc.
 - (ii) University shall conduct RET-M.Phil on the date notified once every year.
 - (iii) Candidates who have qualified the UGC/CSIR(JRF)/NET/SET/ GATE/or any equivalent examination conducted by the State/ Central government/Teacher Fellowship holder are exempted from RET.
 - (iv) The University shall prepare a merit list of the eligible candidates.
4. **Procedure for Admission to M.Phil Programme**
A merit list shall be prepared of the eligible candidates based on the weightage of percentage of the academic record such as Sr. Secondary, Graduation, Post Graduation, publication in the peer reviewed journal, presentation of paper in National/International Conference/Seminar/ Workshop shall be as follows:

1. Sr. Secondary	10% of the percentage obtained
2. Graduation	20% of the percentage obtained
3. Post graduation	60% of the percentage obtained
4. Publication	05*
5. Conference/seminar	05**

(*2.5 marks for each publication with maximum 5 Marks,

** 2.5 marks for each conference/seminar with maximum 5 marks)

The number of candidates called for interview shall be twice the availability of seats. Allocation for the candidates for the University and colleges shall be faculty wise and centralized at the University campus.

5. Students allotment Committee

The Composition of the Committee shall be as follows:

- (i) Dean P.G.Studies
- (ii) Dean Concerning Faculty
- (iii) Head of the Department/Incharge/Director of the concerning teaching Department of the University/College
- (iv) Principal or his/her nominee (in the case of College)
- (v) Director Research (Member Secretary)

6. Research Eligibility Test (RET-M.Phil)

A. Procedure

There shall be a Research Eligibility Test for M.Phil. of 200 marks comprising of two papers of 100 marks of two hours duration each. Both the papers will be held on the same day with a gap of one hour. A candidate who does not appear in paper I shall not be allowed to appear in paper II. First paper shall be of Research aptitude and the second paper shall be subject paper based on the concerned subject.

B. Syllabus

Syllabus of paper First shall be based on research aptitude and the Second paper shall be based on the common papers of syllabus of M.D.S. University, Ajmer of their post graduation of the concerned subject. (Except special/optional papers)

Paper I – Research Aptitude

The questions shall be of general nature, intended to assess the research aptitude of the candidate. It will primarily be designed to test reasoning ability, comprehension, divergent thinking, computer skills, elementary statistical methods and general awareness of the candidate. A total of 50 multiple choice questions (MCQ's) will be set. Each question shall carry 2 marks. There will be no negative marking.

Paper II – Subject Paper

There shall be only one subject paper based on the syllabus of the common papers candidate has studied at the post graduation. There will be three sections in this paper.

Section A: 20 question of multiple choice 2 marks each = 40

Section B: 10 question of short answers 3 marks each = 30

Section C: 2 question of long answers 15 marks each = 30

(All Question in Section A and B shall be compulsory. In section C there will be four questions out of which candidate shall be required to attempt any two questions.)

7. The candidate after getting admission in the M.Phil. programme will carry out the M.Phil. studies as per the scheme mentioned below.

Semester Scheme for M.Phil Courses

- (i) M.Phil. course shall be of one academic session to be run under semester scheme and credit system. There will be two semesters in the academic session. Each semester will be of about 20 weeks duration having a minimum of 90 days (16 weeks) of actual teaching, one week for preparatory leave and remaining days for the conduction of examination and other activities. The tentative schedule is as below:
First semester : July to November
Internship: >2 weeks (December)
Second semester: January to May
- (ii) There will be six (6) theory papers in one academic session divided equally into two semesters. The dissertation is in lieu of IV and VIII theory papers in Semester I and II, respectively.
- (iii) The M.Phil. Course shall be of 32 credit hours, i.e. 16 credits per semester.
- (iv) Each theory credit hour shall be designated as 1L that shall be equal to 1 hour of instruction and one dissertation credit hour shall be designated as 1 D credit that shall be equal to 1.5 hour per week. (L = Lecture; D=Dissertation)
- (v) Each theory paper shall be of 4L credits per semester with total 64 hrs of instructions. The semester shall be of about 16 weeks, 4 hrs instructions shall be given to each theory paper per week.
- (vi) The dissertation shall carry 4 D in each semester with total 96 hours of instruction hours per semester. Since a semester shall be of about 16 weeks, 6 hrs instruction per week shall be given to dissertation.
- (vii) Each theory paper shall be of 50 marks and dissertation shall be of 50 marks. There shall be no evaluation of the dissertation at the end of first semester because the work carried out during the first semester shall be continued in the second semester. Evaluation of the dissertation shall be done at the end of the second semester.
- (viii) The distribution of credits and the examination scheme are as below:

Paper	Title	Max. Marks	Credits	Minimum hours of instruction		Minimum hours of self study	
				Per week	Per semester	Per week	Per semester
Semester I							
I	Research	50	4	4	64	4	64
	Methodology						
II	Optional Paper	50	4	4	64	4	64
III	Optional Paper	50	4	4	64	4	64
IV	Dissertation*	—	4	6	96	12	192
Semester I Total		150	16	18	288	24	384
Semester II							
V	Advance	50	4	4	64	4	64
	Research						
	Methodology						
VI	Optional Paper	50	4	4	64	4	64
VII	Optional Paper	50	4	4	64	4	64
VIII	Dissertation*	100	4	6	96	12	192
Semester II Total		250	16	18	288	24	384
Grand total of Semester I & II		400	32		576		768

There will be internship of two to three weeks between two semesters

*Dissertation will begin from semester I and shall complete at the end of the second semester.

- (ix) The total maximum marks for evaluation in M.Phil. shall be 400.
- (x) The time allotted for self study is the minimum time expected to be spent on various activities like practical, field work, library reference work, use of computer and internet and such other facilities.
- (xi) There shall be one paper-on Research Methodology (Paper-I) in Semester I and one on Advance Research Methodology in Semester II.
- (xii) Papers II, III shall be optional paper in Semester I and paper VI and VII shall be optional in II Semester.
- (xiii) Out of a maximum of 50 marks in each theory paper 15 marks (30%) shall be for the continuous sessional assessment to be done internally based on assignments (5 marks), written test (5 marks) and seminar/group discussion (5 marks). The internal assessment marks should be sent to

the University by the various Departments/Affiliated Colleges of the University before the commencement of theory examination. The theory examination will be held at the end of each semester. Each theory paper shall be assessed out of a maximum of 35 marks

- (xiv) All paper setters and examiners for the external assessment shall be external persons (i.e. those who are not working either in the M.D.S University or in any of its affiliated colleges). The Board of studies shall prepare a separate panel of Examiners for M. Phil. theory papers as well as dissertation. Appointment of the paper setters and examiners shall be made on the recommendations of the committee for selection of the examiners.
- (xv) The answer books of theory papers of external examination shall be evaluated by single examiner. After declaration of the result the student concerned if desires shall be entitled for re-evaluation in accordance with the provisions of the university. Dissertation shall be evaluated by two examiners.
- (xvi) The student will have to carry out the work of dissertation in both the semesters and shall submit the thesis for evaluation within two weeks after the last theory examination of II Semester.
- (xvii) Dissertation work shall be conducted by the candidate under the supervision of any teacher who is registered as M.Phil. Supervisor with the teaching department concerned. An M.Phil. Supervisor can normally guide five dissertations at a time. However, the maximum limit may be relaxed by the Vice-chancellor on the recommendation of the Head. The work load for dissertation shall be six hours per week per class.
- (xviii) For dissertation work the placement of every candidate under a supervisor shall be decided within one month from the last date of admission.
- (xix) The dissertation will be divided into two parts. Part I of Semester I will constitute preparation of plan of work that should be presented by the student in front of the faculty of the department, who will assess the feasibility and recommend suggestions, if any, for the improvement. The student must suitably incorporate the changes, if any, in the synopsis in consultation with the supervisor. Following this he/she must write and submit type written draft of chapters on review of literature and methodology to the supervisor. He/she may also conduct some preliminary work/experiments to understand the techniques. The supervisor shall submit a report of satisfactory progress to the Head of the Department before beginning of the theory examination. The latter shall forward it to the university along with marks for internal assessment. The dissertation shall be of 100 marks to be evaluated out of 70 marks by an external examiner. The marks obtained, shall be added to the marks obtained in the viva voce examination to be held subsequently.

- (xx) In the second part of dissertation in Semester II, the student will have to complete the work as per the aims and objectives of the study and submit a dissertation. Prior to final submission of the dissertation, the student shall make a pre-M. Phil. presentation in the department in the presence of all the faculty chaired by the Head of the Department. Suggestions, if any, may be suitably incorporated into the dissertation.
- (xxi) The candidate must give a certificate that (1) the dissertation incorporates his/her own work, (2) the work incorporated in the dissertation is not a repetition of earlier work, (3) any part of the dissertation containing information from other sources has been properly cited or has been printed after having obtained due permission from the original author, and (4) any kind of assistance or help taken during the course of work has been properly acknowledged. This certificate must be attached immediately after the title page of the dissertation. Supervisor shall give a certificate according to the prescribed format ((Annexure-I)
- (xxii) The dissertation must be hard bound and type written dissertation on A-4 size paper. Four hard copies and four soft copies in non-editable PDF format must be submitted to the Head of the Department through the Supervisor. The colour of the cover page of dissertation shall be faculty wise (Annexure-II).
- (xxiii) On receipt of satisfactory evaluation report of dissertation, i.e., minimum 50% marks M. Phil. students shall undergo a viva voce examination of 30 marks which shall also be openly defended. There will be an examination committee comprising one external examiner and one internal examiner; the later may be the supervisor of the candidate or the Head of the Department in the absence of the supervisor.
- (xxiv) Every student shall be required to undertake a compulsory internship of 2-3 weeks in between the two semesters. The internship schedule shall be decided by the concerning Head of the Department. The teaching institution may decide for the provision of stipend for the students taking internship. The students will be required to submit and present a report of the internship. The participating organization/institution will give the performance appraisal of the student's work. The concerning supervisor of the Department shall certify the satisfactory performance of the students during internship and submit the same to the examination section through the Head of the Department of the university.
- (xxv) Every candidate shall be required to attend a minimum of 75% of the lectures, tutorials, seminars and practical (taken together) held in each paper.
- (xxvi) Every student of semester I shall be promoted to the next semester at her/his own risk in case he/she qualifies in 50% of papers (2 theory papers of semester I).

- (xxvii) The student who fails in any paper of Semester Ist or IInd shall appear in the due paper in the next year along with the concerned Semester.
- (xxviii) The award list should show both, total marks of the continuous internal assessment as well as external assessment in the theory papers separately and the third column must have the aggregate marks of the two. The candidate will be considered pass on the basis of the combined total marks secured in each paper.
- (8) For a pass, a student will have to obtain (a) at least 40% marks in each paper separately and (b) a minimum of 50% marks in the aggregate of all the papers prescribed for the examination. In the marksheet, successful candidates shall be classified as under:

Pass	50% or more but less than 55% marks in the aggregate
Second Division	55% or more but less than 65% marks in the aggregate
First Division	65% or more but less than 75% marks in the aggregate
First Division with Distinction	75% or more marks in the aggregate

A candidate who fails at the examination even in one paper/dissertation shall be required to reappear at the examination in a subsequent year in all the papers/dissertation prescribed for the examination, provided that a candidate who obtains at least 50% marks in dissertation shall be exempted from submitting a fresh dissertation and the marks obtained by him shall be carried forward for working out his result.

9. **Depository with UGC**
- (i) Following the successful completion of the evaluation process and announcements of the award of M.Phil the University shall submit a soft copy of the M.Phil dissertation obtained from the candidate to the UGC, for hosting the same in INFLIBNET accessible to all Institution/Universities.
- (ii) Along with the Degree, the University, shall issue a Provisional Certificate certifying to the effect that the Degree has been awarded in accordance with the provisions to these Regulations of the UGC.

M. PHIL ZOOLOGY EXAMINATION-**Semester I**

	Marks
Paper-I Research Methodology	50 (15*+35)
Paper - II & III	
Optional : Candidate may select any one group (paper II and III) from the following groups according to feasibility / facility.	
GROUP-A	
Paper II (A) Fisheries	50 (15*+35)
Paper III (A) Limnology	50 (15*+35)
GROUP-B	
Paper - II (B) Cell Biology	50 (15*+35)
Paper- III (B) Eco-biology and conservation of Amphibians	50 (15*+35)
GROUP-C	
Paper II (C) Developmental Biology	50 (15*+35)
Paper III (C) Endocrinology and Reproductive Biology	50 (15*+35)
GROUP-D	
Paper II (D) Wild Life Management	50 (15*+35)
Paper III (D) Advanced Entomology	50 (15*+35)

Internship: Candidate has to take up internship of two to three weeks in between semester I and II

Semester II

Paper- IV Advance Research Methodology	50 (15*+35)
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Paper - V & VI

Optional : Candidate should opt paper V and VI from the same group which he/she has opted in the semester I.

GROUP-A

Paper V (A) Fisheries	50 (15*+35)
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Paper VI (A) Limnology	50 (15*+35)
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GROUP-B

Paper - V (B) Cell Biology	50 (15*+35)
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Paper- VI (B) Eco-biology and conservation of Amphibians	50 (15*+35)
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GROUP-C

Paper V(C) Developmental Biology	50 (15*+35)
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Paper VI (C) Endocrinology and Reproductive Biology	50 (15*+35)
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GROUP-D

Paper V(D) Wild Life Management	50 (15*+35)
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Paper VII (D) Advance Entomology	50 (15*+35)
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* Internal assessment

Paper VII Dissertation	100
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SYLLABUS FOR M. PHIL. (ZOOLOGY) EXAMINATION**Semester I**

3 hrs. duration Max. Marks 35
Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

PAPER I - RESEARCH METHODOLOGY

1. Killing and Fixation, Collection and preservation of biological samples.
2. PAS, Metachromasia and Feulgen Staining techniques.
3. Different types of microscopes: Bright field, darkfield, phase contrast, Fluorescence, polarizing and Electron microscopes-TEM and SEM.
4. Different types of microtomes : Rotary, Freezing microtomes, Cryotechniques (Freeze drying and freeze substitution). Fresh and fixed frozen sections and Ultratome.

5. Centrifuges, High speed centrifuge, Ultracentrifuge.
6. pH Meter.
7. Colorimeter, spectrophotometer and Flame photometer.
8. Balance types: Electric and Electronic balance.

Group A**PAPER II – FISHERIES (IIA)**

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Ecological approach to management of Fishery resources.
2. Major culturable Fin fishes and Shell fishes of India (Freshwater)
 - (a) Major carps- *Labeo rohita*, *Catla catla*, and *Cirrhinus mrigala*
 - (b) Live fishery- *Channa*, *Mystus*, and *Saccobrachus*
 - (c) Freshwater Prawns.
3. Fish farm construction and management.
4. Induced spawning - Hypophysation, Ovaprim and Ovotide technology.
5. Composite culture and integrated fish farming.
6. Freshwater weeds, Predatory and weed fishes and their control.
7. Brackish water fishes of India and their culture.
8. Biology and culture of Exotic fishes
 - (a) Common carp
 - (b) Grass carp
 - (c) Silver carp
 - (d) Tilapia
9. Hybridization and its importance in fisheries.
10. Hatching, different type of hatcheries in India.

PAPER III – LIMNOLOGY (IIIA)

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. History of freshwater ecology with special reference to India.
2. Definition, origin and classification of lakes.
3. Environments: Lotic and Lentic, classification and Zonation. major lotic and lentic ecosystems of world with special reference to India and their characteristics (abiotic and biotic)
4. Physical and chemical factors of freshwater and their influence on biota.

Physical factors. Density, viscosity, surface tension, stratification, temperature, light, waves and currents etc.

Chemical factors: Dissolved oxygen, free carbon dioxide, hydrogen sulphide, nitrogen, phosphorus, minerals organic matter, pH, hardness, chlorides etc.

Group B**PAPER II – CELL BIOLOGY (IIB)**

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Properties of Cells – Contractibility, Conductivity, secretion, Cell- cell signaling.
2. Plasma membrane structure, permeability and transport.
3. Concept of cell surface-Properties of cell surface, their roles in intercellular interaction in cell fusion and cell aggregation.
4. Structure of DNA and RNA, biosynthesis of Proteins in Prokaryotes and Eukaryotes, Posttranslational processing, Protein targeting methods of studying protein.
5. Gene isolation, sequencing, synthesis, amplification, PCR, cloning, molecular probes, CDNA and genomic library, RFLP, RAPD, Chromosome jumping and walking, gene transfer technology.

PAPER III – ECO BIOLOGY AND CONSERVATION OF AMPHIBIANS (IIIC)

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Classification origin early evolution and phylogeny of Amphibia. Nature of tetrapod diversity and evolution of early tetrapod caudate, Gymnophina, Anura
2. Biogeographical distribution of amphibian with particular reference to India and Rajasthan. Biographic Principles, Indian habitats.
3. Morphology, Integumentary systems, visceral systems, Musculo-skeletal system, Endocrine system, Nervous System and Sensory organs.
4. Cytogenetics, molecular and genomic evolution of Amphibia.

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5. Reproduction Courtship and Mating Breeding site Courtship behaviour, Fertilization and oviposition, sexual selection, evolution of mating system

Group C**PAPER II – DEVELOPMENTAL BIOLOGY (II C)**

3 hrs. duration Max. Marks 35
Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. History of embryology: Theories of development.
2. Concept of developmental biology: differentiation, morphogenesis, regeneration and aging.
3. Metamorphosis: Morphological, physiological and biochemical changes during metamorphosis in insects and in amphibians and its endocrine control.
4. Tissue culture: Culture media, design of laboratory basic requirements and methods, contributions of cell, tissue and organ culture studies to developmental biology and medicine.
5. Teratology: Developmental anomalies, teratogenic agents. (Drugs, chemicals, nutritional deficiencies, infections);

PAPER III : ENDOCRINOLOGY AND REPRODUCTIVE BIOLOGY (III C)

3 hrs. duration Max. Marks 35
Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Hormones of pituitary, thyroid, parathyroid, adrenal and pineal glands.
2. Sex differentiation, Sex determination and sexual abnormalities.
3. Reproductive cycles and factors regulating them.
4. Male reproductive system-development of the testis and male genital ducts, morphology and endocrinology of testis, structure, genesis, maturation and capacitation of mammalian sperm.
5. Female reproductive system- development of the ovary, oviducts, follicular growth, ovulation and formation of corpus luteum.

Group D**PAPER II – WILD LIFE MANAGEMENT (II D)**

3 hrs. duration Max. Marks 35
Note: Seven questions will be set in the question paper out of which student

will be required to attempt any five questions. Each question carries seven marks.

1. Introduction to wild life, classification of Mammals, Birds, Reptiles and Amphibians. Present and past distribution status, habitat food type, group size and breeding seasons of the following:
2. Desert antelopes, pigs, Rhinoceros Horses (Asiatic wild ass, Tibetan wild ass), Elephants Pangolins, Beers Primates, Hyenas and cats.
3. Pelicans, Herons, Water Flow (Swans, Gees, Ducks) Cranes, Bustards, Gulls and other birds, Snakes, Lizards, Tortoises, Turtles, Crocodilians, Grog.
4. Wild life Ecology : Habitat, Food, Water, Minerals, shelter, their effects on distribution, habitat utilization, home range, migration feeding ecology of herbivorous, carnivorous, insectivorous, and omnivorous, Food selection quality and quantity. Seasonal variations, predator -prey interactions.
Avoidance of food and shelter competition. Niche concept. Concept of forest, management in relation to wild life.

PAPER III - ADVANCE ENTOMOLOGY (III D)

3 hrs. duration Max. Marks 35
Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Taxonomy : Classification of insects up to super family level giving salient features of each order and super family.
2. Integument: Structure, chemical composition, sclerotization.
3. Nutrition: Nutritional requirement of insects. Effects of dietary deficiencies, adaptations to liquid diet. Digestion of unusual food (leaves, pollen, wood, collagen, silk, keratin and wax) . Role of micro-organisms (Bacteria, Protozoa, Fungi) in digestion.
4. Respiration: In aquatic insects and endoparasitic insects.
5. Circulation: Composition and functions of haemolymph. Types and functions of haemocytes.
6. Excretion: Cryptonephridial system; physiology of excretion.
7. Reproduction: Special mode of reproduction in insects (Viviparity, Oviparity, Parthenogenesis, Paedogenesis, Poly- embryogeny, Hermaphroditism and Castration), early development, Extra embryonic membranes. Blastokinesis. Types of larvae, pupae and metamorphosis. Diapauses.

Semester II**PAPER IV – ADVANCE RESEARCH METHODOLOGY**3 hrs. duration Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Electrophoresis: Principles of Electrophoresis, types of electrophoresis, paper and gel electrophoresis and their comparison.
2. Chromatography: Principles of chromatography, types of chromatography, TLC, two dimensional and column chromatography, GC, HPLC.
3. Electrophysiological equipment; Kymographic equipment and Oscilloscope.
4. Photomicrography.
5. Radiations: Types of radiations, Principles of Autoradiography and Scintillation and Gamma counter.
6. Principles and working system of audiovisual equipments.
7. Use of computers in Life Science: History and Generations of Computers .Fundamentals of Computer, Computer architecture, Windows and DOS environment, MS Office, Software programme for Life Sciences.
8. Immunological methods based on antigen and antibody interaction.

GROUP-A**PAPER V : FISHERIES (VA)**3 hrs. duration Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Live fish transport.
2. Domestic sewage and fish production.
3. Marine fisheries and fresh water fisheries with special reference to India.
4. Pollution in relation to fisheries.
5. Fishing crafts and gears with particular reference to the local areas.
6. Disease of fishes and their control.
7. Methods for determining age and growth in fishes.
8. Fish preservation, by-products and marketing.
9. Fish Behaviour: migration, courtship and parental care.
10. Population Dynamics.
11. Fish resources of Rajasthan.

PAPER VI : LIMNOLOGY VI (A)3 hrs. duration Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Freshwater community, classification, trophic levels and food chains.
 - (a) Plankton
 - (b) Benthos
 - (c) Nekton
 - (d) Neuston
 - (e) Periphyton
2. Productivity (Primary, secondary, tertiary) and energy flow, phenomenon of eutrophication and its control.
3. Management of ponds, lakes and rivers and conservation of their resources for human benefit.
4. Pollution: Sources and types of pollutants, effects of Pollution on freshwater biota including fisheries.

GROUP - B**PAPER V : CELL BIOLOGY (VB)**3 hrs. duration Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Cell Biology of development-Gametogenesis, fertilization.
2. Cell and Tissue Culture-Primary and established cell lines, kinetics of cell growth, natural and defined media for culture.
3. Cellular aging, Program cell death (in aging)..
4. Effects of ionizing radiations and environmental pollutants on cells.
5. Cellular origin of following diseases-Cancer, AIDS, Epilepsy.
6. Cellular Immunity- Antigens, Antibodies and their formation, Viruses, Interferons, Different cells involved in immune system, MHC, Complement, Hypersensitivity, Immunological disorders.

GROUP - B**PAPER VI ECO-BIOLOGY AND CONSERVATION OF AMPHIBIANS (VIB)**

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Vocalization, Anuran communication system, mechanism of sound production and reception, Kinds of vocalization and their functions, Abiotic factors affecting vocalization, phylogenetic implications of vocalization
2. Development- Early embryonic development and metamorphosis, Eggs, Spermatozoa, early development, larvae and metamorphosis.
3. Amphibians and their relationships with the environment, population biology, community ecology, and species diversity, food and feeding.
4. Enemies, defense, declining populations, and conservation strategies for amphibians
5. Disease, parasite, predators, evolution of defense mechanism, demography, movement and territoriality, factors regulating populations, sound based identifications of amphibians, sonotaxonomy, concept of sound based classification of amphibians.

GROUP-C**PAPER V : DEVELOPMENTAL BIOLOGY (V C)**

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Developmental genetics: role of nucleus and cytoplasm in development, nuclear transplantation, somatic cell hybridization, effect of maternal genes on development of embryo, differential gene functions.
2. Interactions of cells and tissues in development.
3. Endocrinology of gametogenesis, fertilization, implantation, delayed implantation, parturition and lactation.
4. Developmental biology and human welfare.

PAPER VI : ENDOCRINOLOGY & REPRODUCTIVE BIOLOGY (VI C)

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Physiology of fertilization, implantation, parturition and lactation.
2. Gonadal and Gonadotrophic hormones, hypothalamic pituitary gonadal interaction.
3. Effect of hormones on reproductive behaviour
4. Endocrine glands of Annelids, Arthropods and Molluscs.
5. Mechanism of hormonal action- cellular and molecular aspects.

Group-D**PAPER V: WILD LIFE MANAGEMENT V(D)**

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. Behaviour ecology : Ethology of wild life, social behaviour, hard size activity budget, Home/range territoriality, Breeding cycles, courtships, mating gestation, Birth period, caring of young ones.
2. Census Method: Population density, Population counting techniques. Direct counting of birds, drive counts, a brief counts. Water holes, baits, pug marks, kings method and modifications. Lineotn pattern index, Catch efforts/pellet groups and droppings, nests, burrows, dens and calls.
3. Conservation and Management: Present and ancient philosophies of conservation, National and world conservation strategy. Creation of IBWL Wild Life Protection act (1982) Conservation awareness, Department of environment (1981), Voluntary agencies, WWF wild life preservation society, BNHS, etc. National parks and wild life sanctuaries of Rajasthan.

PAPER VI: ADVANCED ENTOMOLOGY (VI D)

3 hrs. duration

Max. Marks 35

Note: Seven questions will be set in the question paper out of which student will be required to attempt any five questions. Each question carries seven marks.

1. **Nervous system:** Morphology and modification in nervous system. Physiological properties of nervous system.
2. **Receptors:** Mechanoreceptors, Chemoreceptors, Photoreceptors. Physiology of vision. Bioluminescence (Photogenic organs), tropism in insects.
3. **Endocrine system:** Endocrine structures, Hormonal control of pigmentation, metabolism, heart beat, diapauses, reproduction and metamorphosis.
4. **Pest control:** Principal methods of pest control. Types, chemistry and effects of insecticides. Attractants, Repellents, Chemosterilants, Systemic poisons, Insecticides of plant origin. Use of hormones and pheromones as pesticides.
5. **Evolution of insects:** Fossil insects.

PAPER VII: DISSERTATION.

Max. Marks 100

This is a compulsory paper

The candidate shall submit the dissertation on problem connected with any one disciplines of his two optional papers.

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