

Proceedings of the meeting of the Combined Board of Studies in Zoology held on 26.10.2013 at 11.30 am in the Department of Zoology, C.C.S. University, Meerut.

In reference to the University letter no. Committee Cell (BOS-Zoology)/850 dated 17.10.2013, a meeting of the Combined Board of Studies in subject of Zoology held on 26.10.2013 at 11.30 am in the Department of Zoology, C.C.S. University, Meerut. The following members have attended the meeting :-

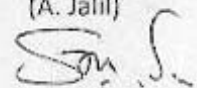
1. Prof. H.S. Singh, Dean, Faculty of Science, C.C.S. University, Meerut (Chairman)
2. Dr. Sanjay Kumar Bhardwaj, Head, Department of Zoology, C.C.S. University, Meerut (Convener-I)
3. Dr. A. Jalil, Deptt. Of Zoology, M.S. College, Saharanpur (Convener-II)
4. Dr. Pankaj Kumar Manglik, Principal & Head, Deptt. Of Zoology, I.P. College, Bulandshahr.
5. Prof. Vinod Kumar, Deptt. Of Zoology, Delhi University, Delhi.
6. Prof. S.M. Singh, Deptt. Of Zoology, M.J.P. Rohilkhand University, Bareilly.
7. Dr. M.P. Tyagi, Principal, Ch. Shiv Nath Singh Sandilya (PG) College, Machhra (Meerut).
8. Dr. A.K. Pandey, Principal Scientist, N.B.F.G.R., Lucknow.

The committee members persued the syllabus of B.Sc./M.Sc./Pre-Ph.D. Course work in the subject of Zoology prepared by the committee members earlier and discussed the same syllabus thoroughly. After perusal and discussion, the committee has decided approved as under:

- i. The committee has approved the Theory and Practical syllabus of B.Sc. (Zoology) III year to be effective from academic session 2013-14. Further, the committee has authorized the conveners for changes, if needed.
- ii. Convener-I proposed the course of chronobiology and ^{mechanisms} regulation of behaviour to be opened in M.Sc. IV Semester Specialization from 2013-14 at the C.C.S. University Campus. After discussion it was modified and approved to be forwarded for further approval.
- iii. Further, the committee discussed the syllabus of M.Sc. (Zoology) I, II, III and IVth Semester Theory + Practical Courses including the special courses as well and approved the same with slight modification in applied entomology Special Courses Code No. H-4080 & H-4081.
- iv. The committee members discussed the syllabus of Pre-Ph.D. Course in Zoology and suggested the modification to be made and finalized by Convener-I & II in consultation with Chairman.

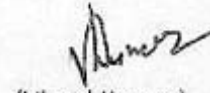
v. The conveners are authorized to submit the panel of examiners of B.Sc. and M.Sc. The committee ended with a vote of thanks to the chairman.

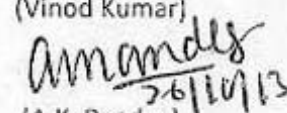

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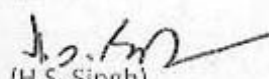

(S.M. Singh) 26.10.13

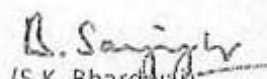

(P. K. Manglik)


(M.P. Tyagi)


(Vinod Kumar)


(A.K. Pandey) 26/10/13


(H.S. Singh)


(S.K. Bhardwaj)

B.Sc. III Zoology (Practical Syllabus)

Duration : 4 hrs

MM: 75

- | | |
|---|----------|
| 1. Dissection Major - | 12 Marks |
| • Cockroach | |
| ○ Central Nervous System | |
| ○ Alimentary Canal with Salivary glands | |
| • Wallago or any other suitable fish | |
| ○ Cranial Nerves | |
| 2. Major Dissection & Permanent Mounting - | 06 Marks |
| • Halter, wing and Antenna of Housefly | |
| • Mouth parts of Mosquito, Housefly | |
| 3. Temporary Mounting | 05 Marks |
| • From Dissecting animals or material provided | |
| 4. Identify and comment upon spots (1 - 8) | 16 Marks |
| • Entamoeba, Englena, Paramecium, Opalina, Balantidium, Nyctotherus, Trypanosoma, Fasciola, Taenia, Polystomella, Schistosoma, Ascaris, Ancylostoma, Edible fishes, Cimex, Pediculus, Larval stages of helminths, arthropods, Pest - Sugarcane leaf hopper, Gundhi Bug, Termite, Rodents etc. | |
| 5. Economic Zoology Spot (One) | 06 Marks |
| • Life cycle of Silkworm, Honeybee, Lac insect | |
| 6. Biological Tool Techniques/Spot (One) | 06 Marks |
| • As per Theory Syllabus | |
| 7. Biostat Numerical/Microbiology/Immunology Behaviour (One) | 06 Marks |
| • As per Theory Syllabus | |
| 8. Ecology/Pollution/Toxicology (One) | 06 Marks |
| • As per Theory Syllabus | |
| 9. Viva Voce | 06 Marks |
| 10. Record/Project/Collection | 06 Marks |

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M.Sc. Zoology (Syllabus)

IV Semester (Special paper) – Chronobiology and mechanisms of behavior

Paper 1: Chronobiology

Paper 2: Photoperiodism and Seasonal Breeding

Paper 3: Neuroendocrine control of behavior

Paper 4: Applied Chronobiology

PAPER 1: Chronobiology

Unit 1: Introduction to biological clocks: Temporal organization. Evolution and adaptive significance; Types of Rhythms - Ultradian, Tidal/ Lunar, Circadian and Circannual rhythms. Chronobiology in the 21st century.

Unit 2: Geophysical environment—Organisms in the cyclic environment; Proximate and Ultimate factors. Role of proximate factor in regulation of physiology and behavior.

Unit 3: Formal properties of biological clocks: Characteristics, Phase shift, phase angle difference, Phase response curve (PRC). Masking and concept of zeitgeber. Entrainment-parametric and non-parametric entrainment.

Unit 4: Clock system in prokaryotes/invertebrates: Clock in bacteria with example *Cyanobacteria*. Circadian pacemaker system in invertebrates with *Drosophila* as example.

Unit 5: Vertebrate Clock System: Suprachiasmatic nucleus (SCN), Molecular biology of the circadian pacemaker system with examples from birds and mammals.

Suggested Readings:

1. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros. Patricia J. DeCoursey (ed). 2004, Sinauer Associates, Inc. Publishers. Sunderland, MA, USA
2. Insect Clocks. D.S. Saunders, C.G.H. Steel, X., afopoulou (ed.) R.D. Lewis. (3rd Ed). 2002, Barends and Noble Inc. New York, USA

PAPER 2: Photoperiodism and Seasonal Breeding

Unit 1: Photoreception: The eye as organ of photoreception. Extra-retinal photoreception. Pineal as photoreceptive structure in non-mammalian vertebrates.

Unit 2: Seasonality: Concept of seasonality, Role of photic and non-photoc cues in regulation of seasonality; Cues- principal and supplementary cues, Seasonal migration in fishes and birds. Hibernation.

in fishes and birds. Hibernation.

Unit 3: Circannual rhythms: Circannual rhythm in regulation of seasonally breeding animals with examples from subtropical birds. Circannual rhythms in sheep. Frequency demultiplication hypothesis.

Unit 4: Photoperiodic time measurement in vertebrates: Hourglass mechanism, internal and external coincidence models. Lighting protocols to test the photoperiodic time measurement- night break, T-cycle, and resonance cycles.

Unit 5: Hormonal control of seasonal reproduction: Regulation of testicular functions. Regulation of reproductive cycle in male & females. Mechanism of action of reproductive hormones. Melatonin and seasonal reproduction.

Suggested Readings:

1. The Physiology of Reproduction, Vol 1 and 2, Ernst Knobil and Jimmy D. Neil, (ed), Raven Press.
2. Biological Rhythms: Vinod Kumar (ed 2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.

PAPER 3: Neuroendocrine control of behavior

Unit 1: Basic neurobiology: Structure and properties of neurons; Propagation of nerve impulses; Different types of synapse and synaptic transmission. Neurotransmitter and its release.

Unit 2: Hypothalamus and Pituitary gland: The hypothalamus and hypothalamic hormones: an overview of releasing and release inhibiting hormones. Structure and development of pituitary gland.

Unit 3: The hypothalamo-hypophyseal control of hormone secretion: Hypothalamo-hypophyseal axis. Regulation of thyroid, adrenal and gonadal secretion. Regulation of oxytocin and vasopressin. Concepts of feed-back in regulation of hormone secretion.

Unit 4: Neuroendocrine regulation of behaviors: Regulation of motivational system. Control of feeding and drinking. Hormonal influence of activity behaviour.

Unit 5: Principles and application of techniques in Neuro endocrinology: Electrophysiology, immunocytochemistry, *in situ* hybridization, autoradiography.

Suggested Readings:

1. An Introduction to Neuroendocrinology, Brown R., (1994), Cambridge University Press, Cambridge, UK
2. Psychoneuroimmunology, Ader R, Felten D.L. and edited by Nicholas C. (4th Ed., 2007), Academic Press, UK

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PAPER 4: Applied Chronobiology

Unit 1: Methods for the study of rhythms in humans: Measurement of rhythms in physiology and metabolism (e.g. heartbeat), blood pressure, body temperature, liver metabolism.

Unit 2: Circadian clock in humans: Organization of clock system in humans. Central and peripheral clock.

Unit 3: Clocks and metabolism: Clock regulation of metabolism. Disruption of clocks and diseases viz. Diabetes, Cardiovascular diseases. Ageing and sleep disorders.

Unit 4: Melatonin and human physiology : Bio-synthesis and regulation of melatonin, role of melatonin in regulation of diseases. Sleep and diseases in human.

Unit 5: Biological clocks in human welfare - Clock and Human health, Chronopharmacology, Chronomedicine and Chronotherapy.

Suggested Readings:

1. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
2. Biologic Rhythms in Clinical and Laboratory Medicine. Touitou, Yvan; Haus, Erhard (Eds.) Springer-Verlag, 1992

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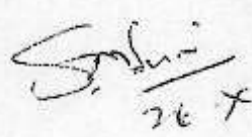
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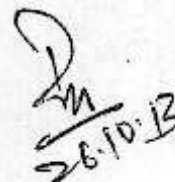
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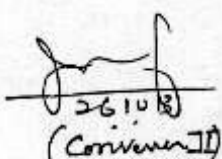
PRACTICALS:


1. To study the phototaxis and geotaxis behaviour of earthworm.
2. Demonstration of methods of recording activity rhythms in fishes/birds/ mammals.
3. Assay of daily activity in human.
4. Ambulatory blood pressure monitoring and circadian rhythm analysis.
5. Quantifying oscillations from sample recorded data: phase, period and amplitude.
6. Recording of body temperature (Tb) of human.
7. Human chronotypes- MCTQ questionnaire and analysis.



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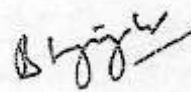

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Interaction Host plant selection by phytophagous Insects.

Course XVI E: Applied Entomology II - H4081

c. Common Western U.P.

- Unit I - Insects/Pest of Crops. Pest of Sugar cane, Pest of Cotton, Pest of Paddy, Pest of fruits & Vegetables, Pest of stored grains, Pest of Forest.
- Unit II - insects injurious to man and livestock - Importance, appearance, life cycle, control measures.
- Unit III - Insects control measures: Natural control, applied control, Integrated pest management, Different phase of pest control.
- Unit IV - Different types of insecticides. Their chemistry action and application, insecticide resistance.
- Unit V - Insect hormone and its role, insects Pheromones and its role.

Sm. Sini
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Don
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Amandes
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Prof
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(Convener II)

V. S. Sini

Prof

Brigitte

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M.Sc. (IV Semester) – Zoology
PRACTICAL SYLLABUS

Duration 5 Hrs.

Specialize Course Entomology (Code H-862 P)

- 1. Major Dissection** Study of Anatomy including Central Nervous System by Dissection of Cockroach, Grass Hopper, Wasp, Honey Bee, House Fly, Mosquito, Bug, Beetle and Lepidopterous larvae etc.
- 2. Minor Dissection** Sting apparatus of Honey bee, wasp, Arista and Halteres of House Fly, Alimentary canal of some common insects, Tentorium and Spiracle of Grasshopper etc.
- 3. Permanent mounting** of suitable materials from insects specified for dissection such as wings, halteres, antennae, legs and mouth parts or material provided.
- 4. Taxonomic identifications** upto families specified in theory syllabus.
- 5. Spotting** Study of insects of Economic Importance, life stages, mode of damage, control of important pests and useful insects, study of Permanent slides of W.M. and sections of various organs etc. of insects.
Study of Insecticides, their use, insecticide poisoning & antidotes.
- 6. Insect Collection & practical record**

MARKS DISTRIBUTION

Duration : 5 hours

Max.Marks : 100

Exercises	Max. Marks
1. Major Dissection	20
2. Minor Dissection	08
3. Mounting	07
4. Taxonomic Identification of two insects	15
5. Spotting (10)	20
6. Viva Voce	10
7. Record and collection	20

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M.Sc. Zoology (Practical Syllabus)

Duration – 5 hrs

Ist Semester

MM: 100

- | | |
|---|----------|
| 1. Major Dissection - | 20 Marks |
| • Earthworm Reproductive System | |
| • Prawn/Squilla | |
| • Sepia/Loligo/Octopus | |
| 2. Minor Dissection- | 10 Marks |
| • Prawn | |
| ◦ Statocyst, Hastate Plate | |
| • Earthworm | |
| ◦ Nerve ring, Ovary, Septal Nephridia, Pharyngeal Nephridia | |
| • Sea-urchin | |
| ◦ Aristotl lantern | |
| • Mouth parts of Mosquito, Housefly | |
| 3. Permanent Mounting | 10 Marks |
| • Material provided or material from dissected animal | |
| 4. Cytological exercises | 10 Marks |
| • Mitosis | |
| ◦ Onion root tip Squash Technique | |
| • Giant Chromosome | |
| ◦ Chironomous larva | |
| 5. Spotting | 20 Marks |
| • Economic Zoology | |
| • Evolutionary biology | |
| • Nonchordata | |
| ◦ Specimen & Slides | |
| (Representation of the units in various courses of theory syllabus of M.Sc. I Semester) | |
| 6. Viva Voce | 10 Marks |
| 7. Records & Collection | 20 Marks |

M.Sc. Zoology (Practical Syllabus)

Duration – 5 hrs

IInd Semester

MM: 100

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|---|----------|
| 1. Enumeration of the number of RBC/WBC by Haemocytometer | 20 Marks |
| Estimation of % of haemoglobin by Haemometer | |
| 2. Numerical Problems (02) from Biostatistics | 10 Marks |
| 3. Numerical Problems (02) from Genetics | 10 Marks |
| 4. Biochemical tests from Proteins, Carbohydrates Lipids & Enzymes | 10 Marks |
| 5. Spotting (1-10) (representing each unit from theory course of II Sem.) | 20 Marks |
| 6. Viva Voce | 10 Marks |
| 7. Records & Collection | 20 Marks |

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M.Sc. Zoology (Practical Syllabus)

Duration – 5 hrs

IIIrd Semester

MM: 100

1. Major Dissection - 15 Marks
 - Wallago/Mystus/any other Edible fish – Cranial Nerves
2. Minor Dissection– 10 Marks
 - Velum, pharyngeal wall, wheel organ of Amphioxus etc.
3. Permanent Mounting 10 Marks
 - From Dissected animal/provided material
4. Spot from Ecology (One) 05 Marks
5. Spots from Animal behaviour (One) 05 Marks
6. Spots from Embryology (One) 05 Marks
7. Spots (1-10) 20 Marks
 - Specimen, Slides & Osteology of Chordata (as per representative of theory Syllabus)
8. Viva Voce 10 Marks
9. Records 20 Marks

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(Convenor II)

V. K.

B. J. J.

J. J. J.

V. K.

M.Sc. Zoology (Practical Syllabus)

Duration – 5 hrs

Special IVth Semester (Cytology & Cytogenetics)

MM: 100

1. Plasmolysis	10 Marks
2. Electrophoresis of protein	10 Marks
3. Centrifugation	10 Marks
4. DNA staining	10 Marks
5. Cytology Different stages of mitosis	05 Marks
6. Instrumentation	05 Marks
7. Spotting	20 Marks
8. Viva	10 Marks
9. Records	20 Marks

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M.Sc. Zoology (Practical Syllabus)

Duration – 5 hrs

IVth Semester (Fish & Fisheries)

MM: 100

1. Major Dissection - 10 Marks
 - Cranial nerves of Wallago
 - Cranial nerves of Mystus
 - Cranial nerves of Labeo
 - Cranial nerves of Sting ray
2. Minor dissections - 10 Marks
 - Accessory respiratory organs of
 - Clarias
 - Heteropneustis
 - Anabas
 - Electric organs of Torpedo
 - Weberian Ossicle of Wallago
 - Internal ear of Scoliodon
 - Pituitary
 - Biometry of a local fish
3. Mounting - 10 Marks
 - Placoid scales
 - Cteniod scales
 - Cycloid scales
 - Rhomboid scales
 - Scale showing lateral line
 - Preparation of blood film
 - Chromatophore
4. Water analysis - 10 Marks
 - pH, turbidity, salinity, DO, TDS
5. Spotting (4 specimens + 4 slides + 2 bones) 20 Marks
6. Identification (1 Cyprinid + 1 Silurid) 10 Marks
7. Viva 10 Marks
8. Records 20 Marks

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M.Sc. (IV Semester) – Zoology
PRACTICAL SYLLABUS

Duration 5 Hrs.

Specialize Course Entomology (Code H-862 P)

1. **Major Dissection** Study of Anatomy including Central Nervous System by Dissection of Cockroach, Grass Hopper, Wasp, Honey Bee, House Fly, Mosquito, Bug, Beetle and Lepidopterous larvae etc.
2. **Minor Dissection** Sting apparatus of Honey bee, wasp, Arista and Halteres of House Fly, Alimentary canal of some common insects, Tentorium and Spiracle of Grasshopper etc.
3. **Permanent mounting** of suitable materials from insects specified for dissection such as wings, halteres, antennae, legs and mouth parts or material provided.
4. **Taxonomic identifications** upto families specified in theory syllabus.
5. **Spotting** Study of insects of Economic Importance, life stages, mode of damage, control of important pests and useful insects, study of Permanent slides of W.M. and sections of various organs etc. of insects.
Study of Insecticides, their use, insecticide poisoning & antidotes.
6. **Insect Collection & practical record**

MARKS DISTRIBUTION

Duration : 5 hours

Max.Marks : 100

Exercises	Max. Marks
1. Major Dissection	20
2. Minor Dissection	08
3. Mounting	07
4. Taxonomic Identification of two insects	15
5. Spotting (10)	20
6. Viva Voce	10
7. Record and collection	20

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