Annexure – 36

Bhagat Phool Singh Mahila Vishwavidyalaya Khanpur Kalan

Scheme and Syllabus of Zoology Subject for 4 Year UG Programme
Bachelor of Life Science (Multidisciplinary)
w.e.f. Academic session 2025-26

Scheme of Examination for 3rd Semester:

Second year: Third semester												
Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-301	DSC	Diversity of Non-Chordates -II	3	2	0	3 +1=4	20	10	50	20	100
2	B-ZOO-302	MIC 3	Entomology	3	2	0	3+1=4	20	10	50	20	100
3	B-ZOO-303	MDC-III	Vermiculture	2	2	0	2+1=3	15	10	35	15	75

Scheme of Examination for 4th Semester:

Second year: Fourth semester												
Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-401	DSC	Diversity of Chordates-I	3	2	0	3 +1=4	20	10	50	20	100
2	B-ZOO-402	MIC4 [VOC]	Economic Zoology	3	2	0	3+1=4	20	10	50	20	100

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1605

Scheme of Examination for 5th Semester:

Third year: Fifth semester												
Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-501	DSC	Diversity of Chordates-II	3	2	0	3 +1=4	20	10	50	20	100
2	B-ZOO-502	MIC5 [VOC]	Ethology	3	2	0	3+1=4	20	10	50	20	100

Scheme of Examination for 6th Semester:

Third year: Sixth semester												
Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-601	DSC	Mammalian Physiology	3	2	0	3 +1=4	20	10	50	20	100
2	B-ZOO-602	MIC6	Fundamentals of Epidemiology	3	2	0	3+1=4	20	10	50	20	100
3	B-ZOO-603	MIC7 [VOC]	Biodiversity conservation and wildlife management	3	2	0	3+1=4	20	10	50	20	100

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Diversity of Non-Chordates – II

B-ZOO-301

Total Credits: 4
L-T-P
3-0-2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course Outcomes (CO):

CO1. Students will be able to understand, classify, identify, and diversity of lower animals.

CO2 Knowing this he or she may engage themselves as a protector, preserver and Promoter of life.

CO3. Students will be well equipped to become very competent in research or teaching fields.

CO4. To discusses the basic concept of the diversity of non-chordates.

UNIT-I

Arthropoda - General characters and Classification up to Orders with examples.
Type study - Periplaneta,
Social organization in Insects Honey Bee and Termites Life-cycle of Anopheles and Culex, Economic importance of insects.

UNIT-II

Mollusca - General characters and Classification upto Orders with examples
Type study - Pila
Natural history, Morphology, Histology, Pallial complex, Digestive system, Respiratory system, Excretory system, Nervous system, Reproductive system, Circulatory system, Torsion and Detorsion in Gastropod

UNIT -III

Echinodermata - General characters and classification upto Orders with examples
Type study- Asterias.
Larval forms in Echinodermata, Phylogeny and Affinities of Echinodermata. - Asterias.

UNIT -IV

Hemichordata - General characters and Classification up to Orders with examples.
Type study- Balanoglossus.
Habitat and Habits, External characters, Body wall, Coelom, Skeleton, Digestive system, Circulatory system, Respiratory system, Excretory system, Nervous system, Reproductive system, Affinities, Aristotle's Lantern.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. L Dhami, P.S. & Dhami, J.K, Invertebrates, R. Chand & Co., New Delhi, 2001

2.Barnes, R.D. Invertebrates Zoology, W.B. Saunders, Philadelphia, 1999

3 Rotpal, R.L., Invertebrates, Rastogi Pab. Meerut.

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Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course outcome (CO):
CO1. Students will be well equipped to become very competent in research or teaching fields.
CO2. Students will be well equipped to become very competent in research or teaching fields

1. Study of museum specimen -

A. Arthropoda ;-*Periplaneta, Palaemon, Lobster, Cancer, Sacculina, Eupagurus, Lepas, Balanus, Cyclops, Daphnia, Lapisma, Schistocerca, Poecilocerus, Gryllus, Mantis, Cicada, Forficula, Dragonfly, Termite queen, Bug, Moth, Beetle, Polistes, Apis, Bombyx, Pediculus, Millipede, Centipede, Palamnaeus, Aranea, Limulus*
. B. Mollusca ;- *Mytilus, Ostrea, Cardium, Pholas, Solen, Pecten, Haliotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus shell, Chiton and Dentalium.*
C. Echinodermata;- *Asterias, Echinus, Ophiothrix, Antedon, Cucumaria, Astrophyton.*
D. Hemichordata;-*Balanoglossus.*

2. Study of the following permanent stained preparations
a. Insect trachea, mouthparts of Periplaneta. e, Coridium larva
b. Radula and osphradium of Pila.
c. T.S. Starfish. d. T.S. Balanoglossus

3. Preparation of following slides
a. Mouth parts and trachea of Grasshopper/ Cockroach
b. Permanent slides of mosquito larva.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weight age will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Entomology
B-ZOO-302

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time allowed: 3 hrs

Course Outcomes (CO):

CO1. Student learn about insect biology, including morphology, physiology, biodiversity and systematic
CO2. Student develop an appreciation for insects in society and human affair
CO3. Expertise in the identification, life history and ecology of insect pests and predators.
CO4. To conduct studies related all aspects of ecology related to insect borne diseases.

Unit-I

Classification and diagnostic features of insects.
Insect Predation and parasitism
Insect societies: Sub sociality in insect
Eusociality in insects (Colony and Castes in Hymenoptera and Isoptera) Evolution of Eusociality. Insect defense.

Unit-II

Metamorphosis: Types and Hormonal control
Diapause: diagnosis, ecological causes and its role
Mounting of insects

Unit-III

Digestive system: Alimentary canal: Digestion (Including unusual food materials);
Absorption: Nutrition. Circulatory system: Circulatory organs;
Hemolymph; circulation of blood; Immune system Respiratory system: Tracheal system, Spiracles; Gaseous exchange; Respiration in aquatic and end parasitic insects.

Unit-IV

Excretory system: Malpighian tubules; Nitrogenous excretion; Urine production; fat body and other haemocoelic tissues. Reproductive system: male and female reproductive organs; Spermatozoa and sperm transfer; ovulation and fertilization; types of reproduction. Nervous system: Central nervous system (brain in brief); sympathetic nervous system; Controlling behaviour.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. Ayer, L.V. R. 1936. Hand book of Economic Entomology for South India. Narendra Publishing House. New Delhi, pp- 528.
2. Vasantharaj David, B. and V.V. Ramamurthy. 2016. Elements of Economic Entomology, Eighth Edition, Brillion Publishing, New York, pp-400.
3. Ross. H.H. 1965. A Text Book of Entomology, John Wiley & Sons Inc., New York, pp-746.
Recommended texts
4. Chapman, R.F., S.J. Simpsonand A.E.Douglas. 2012. The Insects: Structure and Function, Fifth Edition, Cambridge University Press, pp-959.
5. Imms, A.D., O.W.Richards and R.G. Davies (Eds.) IMMS' General Textbook of Entomology, Volume.

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Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course outcomes (CO):

CO1. Expertise in the identification, life history and ecology of insect pests and predators.

CO2. To conduct studies related all aspects of ecology related to insect borne diseases.

Practical:

1. Identification of insect preserved insects.

2. Observation of insect life cycles stages (e.g- egg, larva, pupa, and adult) of species like Butterflies and moths.

3. Study of Phototactic behaviour (response to light) in insects.

4. Study of common pests and their identification in stored grain samples.

a) Pulse beetle,

b) Rice weevil,

c) Grain and flour moth,

d) Red flour beetle,

e) Lessor grin borer.

5. Preparation of taxonomic keys for specific insect group.

6. Study of insect legs adapted for walking, jumping, swimming, etc.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Vermiculture

B-ZOO-303

Total Credits: 3
L-T-P
2- 0 -2

External Marks: 35
Internal Marks: 15
Time Allowed: 2hrs

Course outcomes (CO):

CO1. Understand the importance of vermicompost application to the soil.
CO2. Understand the study of scopes and opportunities for vermicompost production.
CO3. Compairing and contrasting earthworm characteristics.
CO4. Understanding the potential of vermicompost as an alternative to chemical fertilizers.

UNIT-I:

Introduction to earthworms, their taxonomy and nomenclature. Distribution, ecology and the food habits of earthworms.

UNIT-II:

Vermiculture the use of earthworms and their influence on soil structure,, composition and infiltration.

UNIT-III:

Role of earthworms in agro-ecosystems, land reclamation and sustainable soil fertility.

UNIT-IV:

Methods of vermicomposting, changes during vermicomposting, chemical composition of vermicast and the economics of vermiculture.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 7 questions asking two questions of 9 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will be of 8 marks covering entire syllabus. The examinee will be required to attempt 4 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. Edwards CA & Bater JE. 1977. Biology of Earthworms. Chapman & Hall.
2. Edwards CA. 1998. Earthworm Ecology. CRC Press.
3. Sultan An Ismail. 1997. Vermicology- the Biology of Earthworms Orient Longman.

Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course outcome (CO):

CO1. Understand the importance of vermicompost application to the soil.
CO2. Understand the study the scopes and opportunities for vermicompost production .

Practical:

1. Identification different types of earthworms.
2. Study the systematic position, habitats, and habit & external character of *Eisenia fetida.*
3. Study of verms diseases & enemies.
4. Study the effects of sewage water on the development of worms.
5. Study of vermiculture, vermiwash & vermicompost &equipments, devices.
6. Comparative study on growth rate & population increase in different waste mix.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Diversity of Chordates -I

B-ZOO-401

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time Allowed: 3hrs

Course Outcomes (CO):

CO1. This field imparts knowledge regarding various chordate protochordata to amphibia and their regulatory processes to safeguard them.
CO2. Student will be understanding the taxonomy of higher animals.
CO3. Student will be Understanding ecological and behavioural patterns
CO4. Student should be able to recognise the life function of urochordates to fishes.

UNIT -I

Chordate General characters and classification up to order level with examples.
1. Origin and evolutionary tree of chordates.
2. Urochordate General characters and classification up to order level with examples. .
Type study of Herdmania (Urocordate);
Systematic position, Natural history, External characters, Digestive system, Blood vascular system, Respiratory system, Nervous system and sense organs, Excretion, Reproductive system, Larva, Adaptations.

UNIT-II

Cephalochordata: General characters and classification up to Orders with examples;-
Type study - Amphioxus.
Cyclostomes: General characters and classification up to Orders with examples
Type study - Petromyzone.
Systematic position, Natural history, External characters, Body wall, Coelom, Digestive system Respiratory system, Circulatory system, Nervous system, Reproductive system, Excretory system, Ammocetoes larva.

UNIT-III

Pisces: General characters and classification up to Orders with examples;-
Type study of Labeo
Systematic position, Natural history, Morphology, Digestive system, Respiratory system, Circulatory system, Nervous system, Reproductive system, Excretory system, Scales & fins of fishes, Parental care in fish, Fish Migration

UNIT -IV

Amphibia; General characters and classification upto Orders with examples
Type study of frog (Rana Tigrana)
. Systematic position, Natural history, Morphology, Digestive system, Respiratory system, Circulatory system, Nervous system, Reproductive system, Excretory system, Sense organs. Adaptations

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. Colbert, E.H., Evolution of vertebrates, II Edition Wiley Ltd. 1989.
2. Dhami,P.S. and Dhami, J.K., Vertebrates, R. Chand and Co, New Delhi, 1997.
3. Kotpal's vertebrates.

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1612

Practical

External Marks:-20

Internal Marks:-10

Time Allowed:-2hrs

Course outcome (CO):

CO1.This field imparts knowledge regarding various chordates Protochordata to amphibian and their regulatory processes to safeguard them.

CO2. Student should be able to recognise the life function of Urochordate to fishes.

Study of Museum Specimens

Protochordata:

Branchiostoma, Balanoglossus, Herdmania and a colonial Urochordata

Fishes: *Petromyzon, Pristis, Zygaena, Ophiocephalus Clarius. Labeo, Mystis, Anguila, Syngnathus, Tetraodon, Ostacodon, Solea, Exocoetus.*

Amphibia: *Salamander, Necturus, Hyla, Rhacophorus, Bufo, limbless amphibian.*

Skeleton: Labeo and Frog.

Temporary mounts: Placoid, cycloid and ctenoid scales. Wheel organ of amphioxus.

Dissection: Herdmania: General Anatomy Labeo: Digestive System, Reproductive system and Excretory System. (Demonstration only)

Slides: Study of permanent slides of WM of chick and frog embryo (13-18h, 24-36h, 36-48h, 48-72h)

Window preparation and identification of development in chick eggs

Project: Based on theory papers.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Economic Zoology

B-ZOO-402

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course Outcomes (CO):

CO1. Knowledge in this field can be used in research by knowing the life cycle of pests and their eradication methods by using Chemicals or by genetic modification.
CO2. It is a vast field of research having great career opportunities.
CO3. Student will understand the methods of preservation and collection pattern of pest.
CO4. Student will learn all the biochemical nomenclature which is added into pest preservation

UNIT-I

Study importance of insect pests of crops with their systemic position, habit and nature of damage caused

Crops: 1-**Sugarcane**

a) Sugarcane leaf hopper (*Pyrilla perpusilla*)
b) Sugarcane white fly (*Aleurolobus barodensis*)
c) Sugarcane top borer (*Scirpophaga nivella*)
d) Sugarcane root borer (*Emmalocera depressella*)
e) Gurdaspur borer (*Bissetia Steniellus*)
Life cycle and control of *Pyrilla perpusilla* only.

2- **Cotton:**

f) Pink bollworm (*Pectinophora gossypiella)*
g) Red cotton bug *(Dysdercus koenigii)*
h) Cotton grey weevil *(Myllocerus undecimpustulatus*)
i) Cotton jassid (*Empoasca devastans)*
ii) Life cycle of control of *Pectinophora gossypiella*

3- Paddy

a. Gundhi bug (*Leptocorisa varicormus)*
b. Rice grasshopper *(Hieroglyphus banian)*
C. Rice stem borer *(Scirpophaga incertulas)*
d. Rice hispa *(Hispa armigera)*
Life cycle and control of *Leptocorisa varicormus.*

UNIT-II

Study of importance of insect pests of crops and vegetables, with their systematic position, habit and nature of damage caused

Wheat-

Wheat stems borer- Sesamia inferens, with systematic position, habit, nature of damage caused, and life cycle.

Vegetables pests

a) *Raphidopalpa foveicollis*-The red pumpkin beetle.
b) *Dacus cucurbitae*-The red pumpkin fruit fly.
c) *Tetarnychus telarius*-The vegetable mite.
d) *Epilachna* -The Hadda beetle Life cycle & control of Aulacophora foveicollis

Pests of stored grains:-

a) Pulse beetle (*Callosobruchus maculatus)*
b) Rice weevil *(Sitophilus oryzae)*
c) Wheat weevil *(Trogoderma granarium)*
d) Lesser grain borer *(Rhyzopertha Dominica)*
e) Grain and flour moth *(Sitotroga cerealell)*

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Khanpur Kalan (Sonepat)

UNIT-III

Pest Control:-

1) Physical Control
ii) Chemical Control; history, categories of pesticides, from each category of pest against which they can used, insect repellent and attractant
iii) Biological Control; History, requirement and precautions, a feasibility of biological agent for control

iv) Hormonal Control; Mechanical control, physical control, cultural methods, sterilization, pheromones, allelochemicals- allomones, kairomones, synomones.
v) Legal Control. Integrated pest management

UNIT-IV

Some Useful insects:-
Honey Bee - systematic position, general appearance, social organization, products, composition and uses of honey and other by-products of apiculture, life cycle.
Lac insect - systematic position, general appearance, culture, composition and uses of lac, life cycle.
Silk moth - systematic position, general appearance, culture, types of silk, composition and uses of silk, life cycle

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:
1. Perry A.S Yamamoto, I.I shaay and R.Perry , Insectides in Agriculture and Environment-Narora Publishing House.
2. B.S Parmer && S.S Tomar Pesctides formulation CBS Publishers and distributors, New Delhi.
3. R.Wade, M.Dekker, Pesticide Formulation.
4. G. Shukla G.S Upadhay V.B Rastogi publications Meerut.
5 Mcden's Zoology

Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course Outcomes (CO):
CO1. It is a vast field of research having great career opportunities.
CO2. Student will understand the methods of preservation and collection pattern of pest.
List of Practicals:

1. External morphology, identification marks, nature of damage and host of the Following pests

Sugarcane –
a) Sugarcane leaf hopper,
b) sugarcane white fly,
c) sugarcane top borer,
d) Sugarcane root borer,
e) Gurdaspur borer

Cotton –
f) Red cotton bug.

Wheat –

g) Wheat stem borer.

Paddy-
h) Gundhi bug,
i) Rice grasshopper,
j) Rice stem borer,
k) Rice hispa.

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Vegetable-

(l) Aulacophora faviecollis,

(m) Dacus cucurbitas,

(n)Tetranychus tecarious,

(o) Epilachna.

Stored grains – 1. Pulse beetle, rice weevil, grain and flour moth, red flour beetle, lessor grin borer.
2. Stages of life history of silk moth and honey bee.
3. Demonstration of law of segregation, independent assortment and epistasis. Numerical for segregation and independent assortment.
4. Segregation demonstration in preserved material.
5. Inheritance other human characterstics, ability to test PTC, thiourea.
6. Study of polytene chromosomes of Chironomous / Drosophila through permanent Slide.
7. Dermatography - Palm print taking and finger ip patterns. 8. Collection and identification of pest.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Diversity of Chordates -II
B-ZOO-501

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course outcomes (CO):

CO1. Students will be able to understand, classify and identify diversity of animals from reptilia to Mammals.
CO2. Studying this student may become a protector, preserver and Promoter of life.
CO3. They get employment in Forestry, museum and zoological parks.
CO4. Student will be able to understand the chordates taxonomy.

UNIT -I

Reptila: General characters and classification up to orders with examples
Type study - Lizard
Natural history, external characters, digestive system, respiratory system, circulatory system, nervous system, sense organs, excretory system, adaptations, systematic position Reptilia- Origin, Evolutionary tree, extinct reptiles.
Poisonous and non-poisonous snakes, Poison apparatus in snake

UNIT-II

Aves: General characters and classification up to orders with examples.
Type study of Pigeon,
Systematic position, Natural history, external characters, digestive system, respiratory system, circulatory system, nervous system, sense organs, excretory system, reproductive system, adaptations.
Flight adaptations, Aerodynamics in birds, Migration in birds.

UNIT -III

Mammals: General characters and classification up to orders with examples.
Type study - Rat
Systematic position, natural history, external characters, digestive system, respiratory system, circulatory system, nervous system, sense organs, excretory system, reproduction and gestation, adaptations.

UNIT-IV

Dentition- Structure of tooth, types of teeth dental formula of man. rat, cow. horse, pig, elephant
Stomach of ruminants Adaptive Radiation in prototheria, metatheria and cuthena.
Skin and its Derivatives: hair, nail, horns

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question

Suggested reading:

1. Dhami, P.S. and Dhami, J.K., Chordate Zoology, Pradeep Pub, Jalandhar, India
2. Jorden, E.L., and VERMA, P.S. Chordate Zoology

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Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course Outcomes (CO):
CO1. By studying this student may become a protector, preserver and promoter of life.
CO2. They get employment in Forestry, museum and zoological parks.
Practical:
Study of museum specimens -
Reptilia Specimen:
Chelone Testudo, Trionyx. Hemidactylus, Calots, Varanu5 Uromastix, Ophiosaurus, Chamaeleon, Draco, Python, Eryx. Natrix Piyas, Bungarus, Naja, Hydrus, Enhydrina Viper, Crocodilus. Osteology; Skeleton of Varanus

Aves Specimen:
Casuarius, Arden, Anas, Milvis, Pavo, Eudynamis. Tyto. Alerdo, Halcyon. Temporary mounts- barbs, study of a dozen common birds of Haryana, types of feathers.
Ostology; skeleton of fowl, different types of palate in birds
Mammalian Specimen:
Ornithorynchus, Pteropus, Echidna, Macropus, Didelphisnnis, Loris, Oryctolagus, Funambulus, Herpestes, Capra, Cat, Langur, Macacca, Hedgehog Shrew, Insectivorous bat.
Osteology: skeleton of rabbit.
Permanent Slides;- Mammalian skin, salivary glands, oesophagus, stomach, duodenum, ileum, rectum, liver, pancreas, spleen, trachea, lung, kidney, cartilage, Bone, pituitary, adrenal, thyroid, parathyroid, ovary and testis.
Report on field trip to zoological park, national museum of natural history or a Wildlife sanctuary and national park.
Instructions for External Practical Paper Setter/Examiner:
The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Ethology
B-ZOO-502

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course outcomes (CO):

CO1. To investigation of behaviour with the methods used in the natural sciences
CO2. Students will learn about animal behaviour.
CO3. Understand the correlation between Mammalian Nervous system and behaviour.
CO4. Assess Methods of studying brain and behaviour.

Unit I

Approaches and Methods in Study of Behavior; Proximate and Ultimate Causation; Altruism and Evolution-Group Selection, Kin Selection, Reciprocal Altruism; Concept Of Learning, Memory, Cognition, Sleep And Arousal; Biological Clock.

Unit II

Development of Behaviour, Social Communication, Social Dominance; Territoriality; Mating Systems, Parental Care, Aggressive Behaviour, Migration, Orientation And Navigation; Domestication and Behavioural Changes

Unit III

Definition and basic concepts of biosystematics and taxonomy, Principles and theories of biological classification, hierarchy of categories. Taxonomic procedures- collections, preservation, and curetting process of identification. Taxonomic characters: different kinds and their significance, Taxonomic keys-different kinds of taxonomic keys, their merits and demerits. Chemotaxonomy, Cytotaxonomy,

Unit IV

International code of Zoological Nomenclature (ICZN) - its operative principles, interpretation and application of important rules, Zoological nomenclature; formation of scientific names of various taxa. Systematic publications: - different kinds of publications.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. G.G. Simpson. Principle of animal taxonomy, Oxford IBH Publishing Company
2. E. Mayer. Elements of Taxonomy.
3. E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northern & Co.
4. B.K. Tikadar. Threatened Animals of India, ZSI Publication, Calcutta.
5. Mechanism of Animal Behaviour, Peter Marler and J. Hamilton; John Wiley & Sons, USA
6. Animal Behaviour, David McFarland, Pitman Publishing Limited, London, UK
7. Animal Behaviour, John Alcock, Sinauer Associate Inc., USA

Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course Outcomes (CO):

CO1. Students will learn about animal behaviour.
CO2. Understand the correlation between Mammalian Nervous system and behaviour.

Practical:

1. Study the animal behaviour (Interspecies and Intraspecies).
2. Study how predator and prey species interact.
3. Study the migration habits of animals.
4. Study how environmental factors (such as weather, habitat, or time of day) affect animal behaviour.
5. Analyse the social dynamics and hierarchy within a group of animals.
6. Study mutualistic relationships between species.
7. Study the reproductive behaviour and strategies in different species.
8. Study how animals use mimicry or camouflage to avoid predators or capture

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Faculty of Science
B.P.S. Mahila Vishwavidyalaya
Khanpur Kalan (Sonepat)

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental result

Mammalian Physiology
B-ZOO-601

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course Outcomes (CO):

CO1. Students can make their career in developing vaccines and other pharmaceuticals that affect their body by knowing the fundamental processes like digestion circulation respiration excretion chemical control and coordination etc.

CO2. They can make their career in forensic science Labs.

CO3. Student will have enhanced knowledge and appreciation of mammalian physiology.

CO4. Student will understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems.

UNIT -I

Digestion-Nutritional components; Proteins, carbohydrates, vitamins , minerals types of nutrition and feeding digestion and dietary constituents, viz. Lipids, proteins, carbohydrates, nucleic acids, symbiotic digestion absorption. Control of enzyme secretion.

UNIT-II

Circulation- Origin, conduction and regulation of heart beat, cardiac cycle, electrocardiogram, cardiac output, fluid pressure and flow pressure in closed and open circulatory system, composition and functions of blood and lymph, mechanism of coagulation factors, anticoagulants, haemopoiesis.

UNIT -III

Respiration - Exchange of respiratory gases, transport of gases, lung air volumes, oxygen dissociation curve of haemoglobin, Bohr's effect, hamburger phenomenon, control of respiration. Control and Coordination. Nervous integration and chemical integration of endocrinology, nature, origin, propagation of nerve impulse, structure and mechanism of hormone action, physiology of pituitary, thyroid, parathyroid, adrenal, pancreas, gonads.

UNIT-IV

Excretion- Patterns of excretory products viz, ammonotelic, ureotelic, uricotelic; ornithine cycle, urine formation, counter-current mechanism, osmoregulation, micturition Reproduction-Gametogenesis, structure of gametes, ovulation, capacitation, fertilization, gestation, parturition

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. Dhami, P.S. and Dhami, J.K., Zoology-Biochemistry and animal physiology, Pradeep Pub, Jalandhar, India.
2. Eckert and Randall, Animal Physiology.

Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course Outcomes (CO):

CO1. Students can make their career in developing vaccines and other pharmaceuticals that affect their body by knowing the fundamental processes like digestion circulation respiration excretion chemical control and coordination etc.

CO2. They can make their career in forensic science Labs.

Practical:

1. Effects of isotonic, hypotonic, hypertonic solution on erythrocytes.
2. Enumeration of red blood cells using haemocytometer
3. Enumeration of total and different types of white blood cells.
4. Estimation of haemoglobin n content of blood using Sahli's haemometer
5. Preparation of haemin crystals. Blood Grouping; Recording of blood pressure by using a sphygmomanometer.

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Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 or 3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

1620

Fundamentals of Epidemiology
B-ZOO-602

Total Credits: 4
L-T-P
3- 0 -2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course outcomes (CO):

CO1. An advanced understanding of epidemiology theory and its role and contribution in health - related disciplines.

CO2. Students will be able to define epidemiology, explain its scope, and understand its role in public health. They will gain insight into basic concepts such as disease distribution, determinants, and patterns of health-related events.

CO3. Students will be able to define risk factors and determinants (biological, behavioural, environmental, and social) that contribute to the onset and progression of diseases, and how these factors are measured in epidemiological.

CO4. Students will be able to analyze global health issues, including pandemics, emerging diseases, and health disparities, and apply epidemiological principles to develop strategies for addressing these challenges at a global level.

UNIT- I

Epidemiology of Infectious Diseases 12 hrs Modes of infections with suitable examples. Overview of cause, extent, prevention, treatment and control of the diseases: Respiratory infections, Intestinal infections, Arthropod-borne infections, Zoonosis and Surface infections.

UNIT- II

Understanding Epidemiological Data 8 hrs Understanding incidence, mortality (rates, ratios and proportions); Components of epidemiology: disease frequency, distribution and determinants of diseases. Epidemiological approach and measurements- vital statistics, health indicator parameters (morbidity, mortality and fertility rates); Analysis of data from National Cancer Registry Program (NCRP) and Covid-19 data.

UNIT- III

Epidemiologic Methods and Survey 6 hrs outlining the parameters for ethical issues in a study. Determining the target and control populations; Designing of questionnaires; Data collection: Strength of observation (descriptive and analytical) and experimental studies.

UNIT-IV

Epidemiology study designs- case control and cohort studies (prospective and retrospective), procedures of sampling and matching, sources of bias.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. Glantz, S. (2011) Primer of Biostatistics, 7th edition, McGraw-Hill Medical. ISBN-13: 978-0071781503.
2. Park, K.(2011) Park's Textbook of Preventive and Social Medicine, 21st edition, M/s BanarsiDas Bhanot Publishers.
3. Bonita, R., Beaglehole, R., TordKjellstrèom, (2006) Basic epidemiology, 2nd edition (2006), Contributor; World Health Organization, illustrated, Publisher: World Health Organization.
4. Pagano, M. and Gauvrean, K. (2000) Principles of Biostatistics, 2nd edition, Thompson learning

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Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course outcomes:

CO1. Students will gain an understanding of the ethical principles involved in conducting epidemiological research, including informed consent, confidentiality, and the protection of vulnerable populations.

CO2. Students will demonstrate the ability to apply epidemiological methods to investigate public health problems, including outbreak investigations, surveillance, and data collection techniques for assessing health outcomes and trends.

Practical:

1. To design and conduct a cross-sectional study to assess the prevalence of a health condition or risk factor in a specific population.\ diagnosis health of a community.
2. Risk factor identification for diseases (cardiovascular, cancer)
3. To determine the best treatment approaches for diseases (Cardiovascular, cancer)
4. To evaluate the effectiveness of health services.
5. To study the diseases trends overtime.
6. To study the distribution and frequency of Dengue.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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Biodiversity Conservation & Wildlife management
B-ZOO -603

Total Credits: 4
L-T-P
3-0-2

External Marks: 50
Internal Marks: 20
Time allowed: 3hrs

Course outcomes (CO):

CO1. To understand the importance of biodiversity and its protection for the sustainable development in the society.

CO2. To understands the basic principles and doctrines of biodiversity.

CO3. Students will be able to analyze ecological interactions within an ecosystem (e.g., predator-prey, competition, and symbiosis) and how these relationships contribute to ecosystem stability and biodiversity.

CO4. Students will learn about the importance of keystone species and ecosystem engineers in maintaining biodiversity and understand their critical role in ecosystem functioning.

Unit-I

Wildlife: Definition, significance and wildlife zones of the world and India, Protected Area Systems, Present status of National PA-Systems.

Unit-II

Theory and Practice of Biosphere Reserves of the world: Biosphere Reserves of India. Natural Heritage sites, Wildlife and livelihood; Wildlife and illegal trade & control.

Unit-III

Wildlife Damage, electric fences for wildlife damage control, Basic electric fence design, Trench design, line trapping, Mist netting, Rocket netting Chemical capture: Equipment, Drugs, Plan of operation. Poaching: Its implications, conducting anti-poaching operations.

Unit-IV

Wildlife conservation techniques, role of WWF, IUCN, UNEP, Red Data Book; Categories of Endangered Wildlife Species. National Projects: Project Tiger, Project elephant, Project Rhinoceros, Project Crocodiles

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain ten parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Suggested reading:

1. Techniques for Wildlife Census in India by W.A. Rogers (A field manual); Wildlife Institute of India, Dehradun.
2. Wildlife Wealth of India by T.C. Majupuria; Tecpress Services, L.P., 487/42-SOL Wattenslip, Pratunam Bangkok, 10400, Thailand
3. Ali, S. Ripley S.D. Handbook of Birds of India, Pakistan 10-Vols. Oxford University Press, Bombay.
4. The Book of Indian Animals by S.H. Prater, BNHS-Publication, Bombay.
5. Wildlife in India by V.B. Saharia Natraj Publishers, Dehradun.
6. E.P. Gee, the Wildlife of Indias

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Practical

External Marks:-20
Internal Marks:-10
Time Allowed:-2hrs

Course outcome (CO):

CO1. Students will be able to define biodiversity, understand its components (species, genetic, and ecosystem diversity), and explain its significance in maintaining healthy ecosystems.

CO2. Students will develop the ability to identify various species of plants, animals, and microorganisms in their local environment, categorize them into broader groups, and understand their role in the ecosystem.

Practical:

1. Study and record the different species of plants and animals in a specific habitat (park, forest, and field).
2. Understand the role of insects in pollination and biodiversity.
3. Investigate the diversity of bird species and their behaviours.
4. Understand the importance of protected areas (national parks, wildlife reserves) in biodiversity conservation.
5. Model a basic ecosystem to understand species interactions and biodiversity.
6. Investigate the concept of keystone species and their impact on ecosystems.
7. Understand how human activities impact local wildlife and create solutions to reduce harm.
8. Study the migration patterns of local bird species and understand their conservation needs.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2/3 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to the Experiments. The evaluation will be done on the basis of practical record, viva-voice, write up and experimental results.

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