

SEMESTER – VI

Paper-II : Aquaculture and Pest Management-II

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. **Seed production:** Natural seed resources – its assessment, collection, Hatchery production
2. **Nutrition:** Sources of food (Natural, Artificial) and feed composition (Calorie and Chemical ingredients).
3. **Field Culture:** Ponds-running water, recycled water, cage, culture; poly culture.
4. **Culture technology:** Biotechnology, gene manipulation and cryopreservation of gametes.

SECTION-B

5. **Stored grains:**
 - (a) Pulse beetle (*Callosobruchus maculatus*)
 - (b) Rice weevil (*Sitophilus oryzae*)
 - (c) Wheat weevil (*Trogoderma granarium*)
 - (d) Rust Red Flour beetles (*Tribolium castaneum*)
 - (e) Lesser grain borer (*Rhizopertha dominica*)
 - (f) Grain & Flour moth (*Sitotroga cerealella*)

Their systematic position, habits and nature of damage caused. Life cycle and control of *Trogoderma granarium*.

6. **Insect control:** Biological control, its history, requirement and precautions and feasibility of biological agents for control.
7. **Chemical control:** History, Categories of pesticides. Important pesticides from each category to pests against which they can be used. Insect repellants and attractants.
8. Integrated pest management.
9. Important bird and rodent pests of agriculture & their management.

2. Out of remaining eight, four questions are to be set from each section A & B, possibly in them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. **Introduction to world fisheries**: Production, utilization and demand.
2. **Fresh Water fishes of India**: River system, reservoir, pond, tank fisheries; captive and culture fisheries, cold water fisheries.
3. Fishing crafts and gears.
4. Fin fishes, Crustaceans, Molluscs and their culture.

SECTION-B

Study of important insect pests of crops and vegetables:

5. **Sugercane:**
 - (a) Sugercane leaf-hopper (*Pyrilla perpusilla*)
 - (b) Sugercane Whitefly (*Aleurolobus barodensis*)
 - (c) Sugercane top borer (*Sciropophaga nivella*)
 - (d) Sugercane root borer (*Emmalocera depresella*)
 - (e) Gurdaspur borer (*Bissetia steniellus*)

With their systematic position, habits and nature of damage cause. Life cycle and control of *Pyrilla perpusilla* only.

6. **Cotton:**
 - (a) Pink bollworm (*Pectinophora gossypiolla*)
 - (b) Red cotton bug (*Dysdercus Cingulatus*)
 - (c) Cotton grey weevil (*Myloccerus undecimpustulatus*)
 - (d) Cotton Jassid (*Amrasca devastans*)

SEMESTER – V

Paper-II : Evolution and Developmental Biology

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. Origin of life.
2. Concept and evidences of organic evolution.
3. Theories of organic evolution.
4. Concept of micro, macro-and mega-evolution.
5. Concept of species
6. Phylogeny of horse.
7. Evolution of man.

SECTION-B

8. Historical perspectives, aims and scope of developmental biology.
9. Generalized structure of mammalian ovum & sperm, spermatogenesis and Oogenesis, fertilization, parthenogenesis, different types of eggs and patterns of cleavage.
10. Proces of blastulation and fate-map construction in frog and chick.
11. Gastrulation in frog and chick upto the formation of three germinal layers.
12. Elementary knowledge of primary organizers.
13. Elementary knowledge of extra embryonic membranes.
14. Concepts of competence, determination and differentiation.
15. Concept of regeneration.

SYLLABUS
B.Sc. Part-III (Semester V & VI)
SEMESTER - V

Paper-I : Environmental Biology

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question.

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. **Basic concepts of ecology:** Definition, signification, Concepts of habitat and ecological niche.
2. **Factors affecting environment:** Abiotic factors (light-intensity, quality and duration), temperature, humidity, topography; edaphic factors; Biotic factors.
3. Introduction to major ecosystem of the world.
4. **Ecosystem:** Concept, components, properties and functions; Ecological energetics and energy flow-food chain, food web, trophic structure; ecological pyramids concept of productivity.
5. **Biogeochemical cycles:** Concept, reservoir pool, gaseous cycles and sedimentary cycles.

SECTION-B

6. **Population:** Growth and regulation.
7. Concept of biodiversity and conservation of natural resources.
8. Migration in fishes and birds.
9. Parental care in animals.
10. **Population interactions:** Competition, predation, parasitism, commensalisms and mutualism.
11. **Environmental Pollution:** Air, water, soil and management strategies.

SEMESTER – IV

Paper-II : Mammalian Physiology-II

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. **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 & lymph, Mechanism of coagulation of blood, coagulation factors; anticoagulants, haemopoiesis.
2. **Respiration:** Exchange of respiratory gases, transport of gases, lung air volumes, oxygen dissociation curve of hemoglobin, Bohr's effect, Haburger's phenomenon (Chloride shift), control / regulation of respiration.
3. **Excretion:** Patterns of excretory products viz. Amonotelic, ureotelic uricotelic, ornithine cycle (Kreb's – Henseleit cycle) for urea formation in liver. Urine formation, counter-current mechanism of urine concentration, osmoregulation, micturition.

SECTION-B

4. **Neural Integration:** Nature, origin and propagation of nerve impulse alongwith meddullated & non-medullated nerve fibre, conduction of nerve impulse across synapse.
5. **Chemical integration of Endocrinology:** Structure and mechanism of hormone action; physiology of hypothalamus, pituitary, thyroid, parathyroid, adrenal, pancreas and gonads.
6. **Reproduction:** Spermatogenesis, Capacitation of spermatozoa, ovulation, formation of corpus luteum, oestrous-anoestrous cycle, Menstrual cycle in human; fertilisation and gestation.

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SEMESTER – IV

Paper-I : Life and Diversity of Chordates - II

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: *Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question*

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. **Amphibia**: Origin, Evolutionary tree. Type study of frog (*Rana tigrina*), Parental Care in Amphibia
2. **Reptilia**: Type study of Lizard (*Hemidactylus*), Origin, Evolutionary tree. Extinct reptiles; Poisonous and non-poisonous snakes; Poison apparatus in snakes.

SECTION-B

3. **Aves**: Type study of Pigeon (*Columba livia*); Flight adaptation, Principles of aerodynamics in Bird flight, migration in birds.
4. **Mammals**: Classification, type study of Rat; Adaptive radiations of mammals dentition.

Note: Type study includes detailed study of various systems of the animal.

SEMESTER – III

Paper-II : Mammalian Physiology-I

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

1. Introduction, Classification, Structure, function and general properties of proteins, carbohydrates and lipids.
2. Nomenclature, Classification and mechanisms of enzyme action.
3. Transport through biomembranes (Active and Passive), buffers

SECTION-B

4. **Nutrition:** Nutritional components; Carbohydrates, fats, lipids, Vitamins and Minerals. Types of nutrition & feeding, Digestion of dietary constituents, viz. lipids, proteins, carbohydrates & nucleic acids; symbiotic digestion. Absorption of nutrients & assimilation; control of enzyme secretion.
5. **Muscles:** Types of muscles, ultra-structure of skeletal muscle. Bio-chemical and physical events during muscle contraction; single muscle twitch, tetanus, muscle fatigue muscle, tone, oxygen debt, Cori's cycle, single unit smooth muscles, their physical and functional properties.
6. **Bones:** Structure and types, classification, bone growth and resorption, effect of ageing on Skeletal system and bone disorders.

SYLLABUS

B.Sc. Part-II (Semester III & IV)

SEMESTER III

Paper-I : Life and Diversity of Chordates - I

External Marks : 40

Internal Assessment: 10

Time allowed : 3 Hours

Note: Nine questions are to be set in all and the candidates are required to attempt five questions including the compulsory question.

1. Question 1 is compulsory consisting of 10 parts (1.5 marks each) covering the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates are required to attempt four questions, two from each section.

SECTION-A

Functional morphology of the types included with special emphasis on the adaptations to their modes of life and environment. General characters and classification of all phyla upto orders with examples emphasizing their biodiversity, economic importance and conservation measures where required.

1. **Chordates**: Origin and Evolutionary tree.
2. **Protochordates**: Systematic position, distribution, ecology, morphology and affinities
Urochordata *Herdmania* - type study
Cephalochordata, *Amphioxus* - type study

SECTION-B

3. **Cyclostomes**: Type study of *Petromyzon*.
4. **Pisces**: Scales & Fins, Parental care in fishes, fish migration.
Types study of *Labeo*

SYLLABUS

Life and Diversity from Mollusca to Hemichordata & Genetics – II

External Marks: 40

Internal Assessment : 10

Time allotted : 3 Hours

Note : *Nine questions are to be set in all and the candidate are required to attempt five questions including compulsory question.*

1. Question 1 is compulsory consisting of 10 parts (1.0 marks each) converting the entire syllabus. Answer to each part should not exceed 20 words.
2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates is required to attempt four questions, two from each section

1. **Phylum - Mollusca:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type study of - *Pila*
- iv) Torsion and detorsion in gastropoda
- v) Respiration and foot

2. **Phylum – Echinodermata :**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- vii) Type study – *Asteries* (Sea Star)
- viii) Echinoderm larvae
- ix) Aristotle's Lantern

3. **Phylum Hemichordate :** General Character; Type Study of *Ballangosus*

3. **Multiple allelism :** Eye colour in *Drosophila*; A, B, O blood group in man.

4. **Human genetics :** Human karyotype, Chromosomal abnormalities involving autosomes and sex chromosomes, monozygotic and dizygotic twins.

5. **Inborn errors of metabolism** (Alcaptonuria, Phenylketonuria, Albinism, sickle-cell anaemia).

6. **Nature and function of genetic material :** Structure and type of nucleic acids; Protein synthesis.

7. Eugenics, euthenics and euphenics; spontaneous and induced (chemical and radiations) mutations; gene mutations; chemical basis of mutations; transition, transversion, structural chromosomal aberrations (deletion, duplication, inversion and translocation); Numerical aberrations (autopolyploidy, euploidy and polyploidy in animals)

8. **Applied genetics :** genetic counseling, pre-natal diagnostics, DNA-finger printing, transgenic animals.

External Marks: 40

Internal Assessment : 10

Time allotted : 3 Hours

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2. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidates is required to attempt four questions, two from each section

1. **Phylum – Annelida :**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance of Annelida
- iii) Type study – *Pheretima* (Earthworm)
- vi) Metamerism in Annelida
- v) Trochophore larva

2. **Phylum – Arthropoda :**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance of insects
- vi) Type study – *Grasshopper*

3. Elements of **Heredity and variations,**

4. The varieties of **gene interactions**

5. **Linkage and recombination :** Coupling and repulsion hypothesis, crossing-over and chiasma formation; gene mapping.

6. **Sex determination and its mechanism :** male and female heterozygous systems, genetic balance system; role of Y-chromosome, male haploidy, cytoplasmic and environmental factors, role of hormones in sex determination.

7. **Sex linked inheritance :** Haemophilia and colour blindness in man, eye colour in *Drosophila*, Non-disjunction of sex-chromosome in *Drosophila*; Sex-linked and sex-influenced inheritance

8. **Extra chromosomal and cytoplasmic inheritance:**

- i) Kappa particles in *Paramecium*
- ii) Shell coiling in snails.
- iii) Milk factor in mice.

External Marks: 40
Internal Assessment : 10

Time allotted : 3 Hours

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3. Out of remaining eight, four questions are to be set from each section A & B, possibly splitting them in parts. Candidate is required to attempt four questions, two from each section

1. **Phylum – Coelentrata :**

- i) General characters and classification up to order level
- ii) Biodiversity, economic importance
- iii) Type Study - *Obelia*
- iv) Corals and coral reefs
- v) Polymorphism in Siphonophores

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2. **Phylum – Helminths :**

- i) General characters and classification up to order level
- ii) Biodiversity, economic importance
- iii) Type study – *Fasciola hepatica*;
- iv) Helminths parasites : Brief account of life history, mode of infection and pathogenesis of *Schistosoma*, *Ancylostoma*, *Trichinella*, *Wuchereria* and *Oxyuris*.

1. Ultrastructure and functions of Nucleus : Nuclear membrane, nuclear lamina, nucleolus, fine structure of chromosomes, nucleosome concept and role of histones, euchromatin and heterochromatin, lampbrush chromosomes and polytene chromosomes.
2. Mitosis and Meiosis (Cell reproduction)
3. Brief account of causes of cancer.
4. An elementary idea of cellular basis of Immunity.

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1. **Protozoa:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type study of *Plasmodium*;
- iv) Parasitic protozoans: Life history, mode of infection and pathogenicity of *Entamoeba*, *Trypanosoma*, *Leishmania* and *Giardia*.

2. **Porifera:**

- i) General characters and classification up to order level
- ii) Biodiversity and economic importance
- iii) Type study – *Sycon*
- iv) Canal system in sponges
- v) Spicules in sponges

1. Ultrastructure of different cell organelles of animal cell.
2. **Plasma Membrane:** Fluid mosaic model, various modes of transport across the membrane, mechanism of active and passive transport, endocytosis and exocytosis.
3. **Endoplasmic reticulum (ER) :** types, role of ER in protein synthesis and transportation in animal cell.
4. **Golgi complex:** Structure, Associated enzymes and role of golgi-complex in animal cell.
5. **Ribosomes:** Types, biogenesis and role in protein synthesis.
6. **Lysosomes:** Structure, enzyme and their role; polymorphism
7. **Mitochondria:** Mitochondrial DNA; as semiautonomous body, biogenesis, mitochondrial enzymes (only names), role of mitochondria.
8. **Cytoskeleton:** Microtubules, microfilaments, centriole and basal body.
9. Cilia and Flagella