

# **VBS Purvanchal University Jaunpur**

## **Department of Zoology Post Graduate Syllabus : W.E.F. M.Sc. [Final]**

The examination shall comprise six theory papers (Three compulsory papers and 3 Optional in each Special group) and two practical (one general group and one special group). Each paper will be of 3 hours duration carrying 75 marks. Candidate shall have to pass in the aggregate of theory papers as well as the practical separately. The minimum percentage of marks will be 60, 48,36 for I, II and III division respectively, with a minimum of 30% marks in one paper in aggregate.

There shall be two separate practical namely Part 'A' and 'B' each conducted by different board of internal and external examiners. Part 'A' will include practical based on theory paper I to III and Part 'b' from paper IV to VI. Each practical will be of 6 hours duration carrying 75 marks.

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Paper	Theory	M.M.
	<b>Compulsory</b>	
I.	Comparative Anatomy of vertebrates	75
II.	Gamete Biology	75
III.	General Endocrinology and Animal behavior	75
	<b>Special Paper (A/B/C)</b>	<b>225</b>
	<b>A. Fishery Biology</b>	
.IVa.	Taxonomy and Morphology	75
Va.	Applied Ichthyology and Development	75
Via.	Physiology and Ecology	75
		<b>225</b>
	<b>B. Entomology</b>	
IVb.	Morphology, Physiology, Development and Ecology	75
Vb.	Evolution and taxonomy	75
VIb	Economic Entomology	75
		<b>225</b>
	<b>C. Cell Biology</b>	
IVc.	Cytological Techniques	75
Vc.	Ultrastructure and Morphodynamics of cells	75
Vic.	Cell Regulation and Principles of Biotechnology	75
	<b>Practical</b>	
	Part – A General : 75	
	Part – B General : 75	
		<b>150</b>

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## **Zoology : Paper – I** **Comparative Anatomy of Vertebrates**

### **Unit I**

- 1.0 Origin of Chordate
- 2.0 The nature of Vertebrates morphology

### **Unit II**

- 3.0 Origin and classification of Vertebrates
- 4.0 General plan of circulation in various group

### **Unit III**

- 5.0 Respiratory system
- 6.0 Skeletal system

### **Unit IV**

- 7.0 Evolution of Urinogenital system in Vertebrates series
- 8.0 Sense organs
  - 8.1 Organs of olfaction and taste
  - 8.2 Lateral line system

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## **Zoology : Paper – II** **Gamete Biology**

### **Unit I**

- 1.0 Heterogamy in eukaryotes
- 2.0 Comparative account of differentiation of gonads in a mammal and an invertebrate
- 3.0 Leydig cell
  - 3.1 Morphology
  - 3.2 Differentiation
  - 3.3 Function and regulation

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- 4.0 Spermatogenesis
  - 4.1 Morphological basis in Rodents

## Unit II

- 5.0 Biochemistry of Semen
  - 5.1 Semen composition and formation
  - 5.2 Assessment of sperm function
  - 5.3 Y –specific probes
- 6.0 Fertilization
  - 6.1 Pre-fertilization events
  - 6.2 Biochemistry of fertilization
- 7.0 Collection and cryopreservation of gametes and embryos

## Unit III

- 8.0 Ovarian follicular growth and differentiation
  - 8.1 morphology
  - 8.2 Endocrinology
  - 8.3 Oogenesis and vitellogenesis
  - 8.4 ovulation and ovum transport in mammals
- 9.0 Biology of sex-determination and sex-differentiation a Comparative account
- 10.0 Multiple ovulation and embryo transfer technology (MOET)
  - 10.1 In vitro oocyte maturation
  - 10.2 Superovulation
  - 10.3 In vitro fertilization

## Unit IV

- 11.0 Transgenic animal and knock –outs
- 12.0 Care and breeding of experimental animal including bioethics
- 13.0 Immunocontraception
  - 13.1 Gamete specific antigens
  - 13.2 Antibody mediated fertilization block and termination of gestation.
  - 13.3 Other contraceptive technologies
  - 13.4 Surgical methods
  - 13.5 Hormonal methods

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- 13.6 Physical methods
- 13.7 ICD
- 14.0 Hormones. Growth and Development
- 15.0 Hormones and Reproduction
  - 15.1 Seasonal breeders
  - 15.2 Continuous breeders
- 16. Evolution of sex and reproduction strategies.
- 17. Sperm competition.

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## **Zoology : Paper – III**

### **General Endocrinology and Animal Behavior**

#### **Unit I**

- 1.0 Aims and scope of endocrinology
  - 1.0 Hormones as messengers
  - 2.0 Hormones and eukaryotic metabolic regulation
  - 3.0 Classification of hormones
  - 4.0 Discovery of hormones
- 2.0 Phylogeny of endocrine glands (pituitary, pancreas, adrenal, thyroid, Gonad)
- 3.0 Neuroendocrine system and neurosecretion

#### **Unit II**

- 4.0 General principles of hormone action
  - 4.1 Nature Hormones action
  - 4.2 Hormones receptors – physico – chemical preparation.
  - 4.3 Hormones receptors – signal transduction mechanisms.
  - 4.4 Hormones regulation of carbohydrate, nitrogen and lipid metabolism
- 5.0 Biosynthesis and secretion of Hormones
  - 5.1 Biosynthesis of steroid hormones de novo.

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- 5.2 Biosynthesis and amino acid derived small size hormones  
(e.g. : T4, Epinephrine)
- 6.0 Hormones and Behavior

## Unit III

- 7.0 Introduction
  - 7.1 Ethology as a branch of biology
- 8.0 Innate behavior
- 9.0 Perception of the environment
  - 9.1 Mechanical
  - 9.2 Electrical
  - 9.3 Chemical
  - 9.4 Olfactory
  - 9.5 Auditory
  - 9.6 Visual
- 10.0 Communication
  - 10.1 Chemical
  - 10.2 Visual
  - 10.3 Light
  - 10.4 Audio
  - 10.5 Species specificity of songs

## Unit IV

- 11.0 Social behaviour
  - 11.1 Aggregations-schooling in fishes, flocking in birds, herding in mammals
  - 11.2 Group selection, kin selection, altruism, reciprocal altruism inclusive fitness.
  - 11.3 Social organization in insects and primates.
- 12.0 Reproductive behaviour
  - 12.1 Mating systems
  - 12.2 Courtship
  - 12.3 Sexual selection
  - 12.4 Parental care
- 13.0 Biological rhythms
  - 13.1 Circadian and circannual rhythms
  - 13.2 Orientation and navigation
  - 13.3 Migration of fish, turtles and birds

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- 14.0 Learning and memory
  - 14.1 Conditioning
  - 14.2 Reasoning
  - 14.3 Cognitive skills

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## Special Fishery Biology IV-A Taxonomy & Morphology

### Unit I

#### Taxonomy

- 1.0 Classification of fish upto orders as proposed by L. S. Berg(1940)
- 2.0 Systematics/Taxonomy study of marine and freshwater fishes with special reference to identification of local forms(upto their families)

#### **A : marine fishes –**

- 1- Order Clupeiformes Family – Clupeid eg. *Sardinella fimbriatus* (oil sardine)
- 2- Order - Perciformes
  - Family 1. Scombridae eg. *Rastrelliger kanagurita* (Mackeral fish)
  - 2. Stromateidae eg. *Stromateus argenteus* (Pomfrets)
- 3- order- scopeiformes family- harpodonetidae eg harpodon nehereus (bombbay duck)

### Unit II

#### B- Freshwater fishes-

- 1- Order- Clupeiformes. Families- *Clupeidae* *Notopteroidae*.

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- 2- Order- Beloniformes. Families – *Belonidae Hemiramphidae*
  - 3- Order – Masacembeliformes Family - *Mastacembelidae*.
  - 4- Order – Mugiliformes family - Mugilidae
- 2.0 Study and preparation of identification key of the fish of following order with suitable diagrams, fin formula, local and biological names,
- 1- Ophiocephaliformes
  - 2- Cypriniformes
  - 3- Perciformes

## Unit II

- 3.0 Study of differentiation characters of pair of fish from the orders of fresh water fishes given in to (Ophiocephaliformes, Cypriniformes Perciformes) with special reference to fin formula suitable diagrams local and biological names.

## Unit III

### Morphology

- 3.0 Specialized organs (electric organs poison glands sound producing organs and light producing organs and sense organs)
- 4.0 Endocrine glands (Pineal, hypophysis, thyroid, adrenal, ultimobranchial body, conpuscles of stannous and urophysis).
- 5.0 Morphology of reproductive system.

## V-A

### Applied Ichthyology and development

#### Unit I

Marine fresh water estuarine and cold water fisheries of India.

Fish Farming- Type of fish farming fish ponds construction of fish pond, physioco chemical and biological characteristics of ponds, control of weed predators.

Fertilization and management of fishery pond(spawning, hatcheries, reusing, stocking, transport, mortality of fish fry composite culture and cage culture)

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## Unit II

Principal and importance of fish preservation, traditional and advanced methods of fish preservation – sun –drying, salt-wring, pickling, smoking, chilling, frying and canning etc.  
Processing and preservation of fish production and by products like oil, fish sauce, fish glue etc.

## Unit III

Application of genetics in aquaculture – sex manipulation, chromosomal manipulation, gene engineering.  
Transgenic fishes  
Production of monosex and sterile fishes and their  
Significance in aquaculture.  
Induced breeding

## Unit IV

### Development :

Gastrulation.  
Neurulation .  
Organ formation.  
Larval development.  
Metamorphosis.

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## VI-A . Physiology and Ecology

### Unit I

1. Nutrition -  
Alimentary canal, associated glands  
Food and feeding habits, digestion, energy  
Utilization.

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2. Excretion - Kidney structure and modifications, nitrogenous excretory and products, urine formation.
3. Osmoregulation - Definition, osmoregulation in freshwater and marine fishes.  
Osmoregulation in migratory fishes.

## Unit II

4. Respiration - Structure and function of gills.  
Gill rakers and their uses.  
Fish blood, process of respiration in a typical fish accessory respiratory organs.
5. Circulatory System - Heart structure  
Blood vessels  
Arterial and venous system

## Unit III

6. Reproduction - Gonads structure, spermatogenesis, Oogenesis, gonadal steroids, endocrine control of reproduction.
7. Common enemies and symptoms, etiology and treatment of disease of food fishes.

## Unit IV

### Ecology :

Abiotic factors : Density; Pressure; Temperature; salt content in water; Light; Sound; Electric currents; Bottom deposits; Particles suspended in water.

Biotic factors : interspecific interrelationship among fishes and with other organisms; Intraspecific relationship among fishes.

Pollutants affecting fishery water with special reference to oil

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spills, domestic pollutants, industrial water, radioactive wastes and sewage fed fisheries.  
Plankton in relation to fish production.

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## Entomology

### IV B

## Morphology, Physiology, Development and Ecology

### Unit I

#### Morphology

Structure and nature of integument.  
Morphology of head (antenne and mouth parts),  
thorax (lege, wings, venation and coupling mechanism)  
and abdomen (external genitalia).  
Neervous system and sense organs.  
Bioluminescence.

### Unit II

#### Physiology

Anatomy of digestive system and nutritional physiology  
(nutritional requirement, feeding behaviour and food  
utilization).  
Circulatory system and components of hemolymph.  
Excretory organs and physiology of excretion.  
Respiratory organs, physiology of respiration and  
respiratory adaptations of aquatic and endoparasitic insects.  
  
Reproductive organs and different modes of development.

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## Unit III

### Development

Postembryonic development, different type of larvae and pupae and hormones control of diapause

## Unit IV

### Ecology

Role of temperature, humidity and light in development and metamorphosis.

Origin and evolution of apterygotes and pterygotes and their interrelationships

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## V B

### Evolution and Taxonomy

#### Unit I

Origin and evolution of apterygotes and pterygotes and their interrelationships

#### Unit II

Thysanura	:	Machilidae; Lepismatidae
Dictyoptera	:	Blattidae; Mantodea
Orthoptera	:	Tettigoniidae; Acrididae; Gryllidae; Gryllotalpidae
Isoptera	:	Termitidae; Kalotermitidae
Siphunculata	:	Pediculidae; Haematopinidae
Hemiptera	:	Cicadidae; Jassidae; Lacciferidae; Coccidae; Cimidae; Pyrrhocoridae; Belostomatidae

#### Unit III

Lepidoptera	:	Pyralidae; Saturniidae; Bombycidae; Pieridae; Papilionidae; Lymantriidae
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Diptera : Culicidae; Simuliidae; Chironomidae; Tabanidae;  
Drosophilidae Tachinidae; Muscidae;  
Hippoboscidae.

## Unit IV

Hymenoptera : Ichneumonidae; Aphidiidae; Formicidae;  
Vespididae; Apidae; Bombycidae

Coleopteran : Cicindellidae; Carabidae; Hydrophilidae;  
Scarabeidae; Lampyridae; Tenebrionidae;  
Meloidae; Chrysomelidae; Curulionidae.

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## VI B

### Economic Entomology

#### Unit I

Pasts of stored grains : *Sitophilus oryzae*; *Tribolium castaneum*;  
*challosobruchus chinensis*; *Corcyra cephalonica*

Pasts of cotton : *Dysdercus spp*; *Earias vitella*; *Pectinophora*  
*Gosaypiella*

Pasts of cereal – crops ; *heliolithis armigera*; *Chilozonellus*; *Leptocorysa*  
*Varicornis*; *Hieroglyphus spp*.

#### Unit II

Pasts of fruits : *idiocerus atkinsoni*; *Dacus cucurbitae*; *Papilio*  
*Demoleus*

Pasts of oil-seeds : *Bagrada cruciferarum*; *Athalia proxima*; *Lipaphis*  
*Erysimi*

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## **Unit III**

Different methods of insect management : Cultural; Mechanical; Biological chemical.

Integratied, pest management (IPM).

Properties, formulations, methods of application and mode of action of insecticides.

Physiology of insect resistance to insecticides.

## **Unit IV**

Life – history of beneficial insects.

Life – history and biology of silk – worm and its products.

Life – history and biology of honey – bee and its products.

Life – history and biology of lac – insect and its products.

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## **Cell Biology**

### **IV C**

## **Cytological Techniques**

### **Unit I**

Elementary principals of phase interference, polarization, electron and scanning microscope.

### **Unit II**

Theory and application of freeze – drying x-ray diffraction, radioautography, fluorescent antibody techniques and differential centrifugation.

Methods of tissue culture.

### **Unit III**

Theoretical basis of colorimetric and biochemical estimations of nucleic acid, proteins.

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## **Unit IV**

Chemical basis of fixation and cytochemical localization of proteins, lipids, glycogen, RNA, DNA, phosphatases, esterases and oxidases.

Biosynthesis of proteins and Nucleic Acids

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## **V C**

### **Ultrastructure and Morphodynamics of Cell**

#### **Unit I**

Morphodynamics of Cell.

Ultrastructure and functions of the following :

Cell membrane

Nuclear membrane

#### **Unit II**

Mitochondria.

Golgi complex.

Endoplasmic reticulum.

Ribosomes.

Lysosomes.

#### **Unit III**

Morphodynamics of chromosomes and the achromatic apparatus

In cell division.

Mechanism of chiasma formation.

#### **Unit IV**

Physiology of a dividing cell .

Chromosomal changes caused by ultraviolet and ionizing radiations

Carcinogenesis : Cytopathology; Possible somatic and viral causes

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## **Paper – VI C**

### **Cell Regulation and Principles of Biotechnology**

#### **Unit I**

1. Regulation of cellular function; Hormone action : Hormone receptor interaction; Membrane receptors; Steroid thyroid and epinephrine receptors; Second messengers(cyclic AMP : Cyclic GMP); Interferon.

#### **Unit II**

2. Genetic code
3. Genetic recombination, transformation, conjugation and transduction

#### **Unit III**

4. Application of genetic engineering and its prospects
5. Microbes and human welfare

#### **Unit IV**

6. Thermodynamic principles and study-state conditions of living organisms  
Organization and methods to study metabolism
7. Degradation of glucose and nucleotides in animals.
8. Energy metabolism and high energy compounds.  
Redox potentials  
Mitochondrial electron transport chain  
Oxidative phosphorylation
- 9.0 Nature of enzymes
  - 9.1 Classification and nomenclature of enzymes.
  - 9.2 Kinetic analysis of enzyme catalysed reactions

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