

Drafted
Zoology
Syllabus



VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

Jnana Sagara Campus, Vinayaka Nagara, BALLARI- 583104

DRAFTED ZOOLOGY SYLLABUS

SEMESTER	PAPER No/TITLE	Teaching Hrs/Week	Theory Examination Marks	Internal Assessment Marks	Practical's/ Week	Practical Examination Marks	Practical I.A Marks
FIRST	Z:1 Biology of Non-chordates	4	80	20	2X3=6	40	10
SECOND	Z:2 Biology of Chordates & Comparative Anatomy	4	80	20	2X3=6	40	10
THIRD	Z:3 Economic Zoology and Histology	4	80	20	2X3=6	40	10
FOURTH	Z:4 Physiology & Bio-chemistry	4	80	20	2X3=6	40	10
FIFTH	Z:5.1 Cell Biology & Developmental Biology	3	80	20	1X3=3	40	10
FIFTH	Z:5.2 Environmental Biology, Wild life Zoology & Zoogeography	3	80	20	1X3=3	40	10
SIXTH	Z:6.1 Genetics, Molecular Biology & Biotechnology	3	80	20	1X3=3	40	10
SIXTH	Z:6.2 Ethology, Evolution & Paleontology	3	80	20	1X3=3	40	10

FIRST SEMESTER THEORY (Z:1)

BIOLOGY OF NON-CHORDATA

64 hrs

1. Introduction to classification of organisms.

5 hrs

- Bio,systematic (Taxonomy): Linnanean Hierarchy (phylum, class, order, family, genus, species).
- Types of classification (Phylogenetic, Artificial, Natural).
- Binomial nomenclature.

2. Phylum : Protozoa

10 hrs

- General Characters and classification up to classes with examples.
- Type study : Life cycle of Malarial Parasite (*Plasmodium vivax*).
- Locomotion in Amoeba.
- Reproduction in Protozoa.

3. Phylum : Porifera

5 hrs

- General characters and classification up to classes with examples.
- Canal system, histology of sponges, skeletal elements.

4. Phylum : *Coelenterata*

8 hrs

- General characters and classification up to classes with examples.
- Life cycle & morphology of Obelia.
- Corals reefs, types & their significance.

5. Phylum : Platyhelminthes

6 hrs

- General characters and classification up to classes with examples.
- Morphology and life cycle of *Taenia solium*.
- Parasitic adaptations.

5. Phylum : Aschelminthes **3 hrs**

- General characters.
- Key characters of Ascaris & Wucheraria bancrofti.

5. Phylum : Annelida **4 hrs**

- General characters and classification up to classes with examples.
- Vermicompost & its significance.

5. Phylum : Arthropoda **10 hrs**

- General characters and classification up to classes with examples.
- Prawn : Study of appendages, digestive system and nervous system and reproductive system.

5. Phylum : Mollusca **7 hrs**

- General characters and classification up to classes with examples .
- Pila : Study of digestive system, nervous system, structure of heart and sensory organs (eye and statocyst).
- Economic importance of Mollusca.

5. Phylum : Echinodermata **6 hrs**

- General characters and classification up to classes with examples.
- Water vascular system in Star fish.
- Larval forms and their significance.

PRACTICAL ZP-1
BASED ON SEMESTER -1 PAPER Z-1 : BIOLOGY OF NON -CHORDATA

A. MUSEUM SPECIMENS AND SLIDES : Commonly available specimens cited in the list of examples for theory are to be selected.

- 1. Protozoa** : **Rhizopoda** : Amoeba, Entamoeba histolytica, Noctiluca
Mastigophora : Euglena, Trypanosoma
Ciliata : Paramecium, Opalina, Balantidium, Nyctotherus
Sporozoa : Plasmodium, Nosema bombycis

- 2. Porifera** : **Calcarea** : Sycon, Leucosolenia, Grantia
Hexactinellida : Hyalonema, Euplectella
Demospongia : Euspongia, Spongilla

- 3. Coelenterata** : **Hydrozoa** : Hydra, Obelia, Physalia
Scyphozoa : Aurelia, Rhizostoma
Anthozoa : Metridium, meandrina, fungia, Pennatula, Tubipora, Astrea, Gorgonia (Sea fan)

- 4. Platyhelminthes** : **Turbellaria** : Planaria, Convoluta
Trematoda : Fasciola hepatica, Blood fluke, lung fluke
Cestoda : Taenia solium

- 5. Aschelminthes** : Ascaris lumbricoides (male & female), Wuchereria bancrofti (filarial worm), Dracunculus medinensis (guinea worm)

- 6. Annelida** : **Polychaeta** : Neries, Heteroneries, Aphrodite, Chaetopterus
Oligochaeta : Pheretima posthuma (Earth worm), Tubifex
Hirudinea : Leech, Acanthobdella

- 7.Arthropoda** : **Onychophora** : Peripatus (Living fossil)
Crustacea : Crab, Prawn, Apus, Daphnia
Insecta : Butter fly, Silk moth ,Beetle, Honey bees , Mosquito, termites, Gross hopper, Cricket
Arachnida : Scorpion, Limulus, Spider
Myriapoda : Scolopendra, Millepede
- 8.Mollusca** **Monoplacophora** : Neopilina galathea
Polyplacophora : Chiton
Scaphopoda : Dentalium
Gastropoda : Pila, Nautilus, Patella, Trochus, Murex,Cypraea
Pelecypoda : Unio, Oyster, Mytilus
Octopoda : Octopus, Sepia, Loligo
- 9.Echinodermata** : **Asteroidea** : Star fish, Astopectin
Ophiuroidea : Ophiothrix (Brittle star), Ophioderma
Echinoidea : Echinus (Sea urchin)
Holothuroidea : Sea cucumber(Cucumaria)
Crinoidea : Antedon (Sea lily or feather star)

B. DISSECTIONS

- 1. Earhworm** : Digestive system, Nervous system
Mountings : Setae, Spematheca

OR

- Leech** : Digestive system, Reproductive system
Mountings : Jaws, nephridia

- 2. Cockroach** : Digestive system, Nervous system
Mountings : Mouth parts

OR

- Prawn** : Digestive system, Nervous system
Mountings : Appendages

FORMAT OF QUESTION PAPER FOR PRACTICAL (Z-P- 1)
BIOLOGY OF NON- CHORDATA

Maximum marks : 40

Q.1 Museum Specimens and Slides	10X2=20
Q.2. Dissections	10
Q.3. Mounting	05
Q.4. Record Book	05

SECOND SEMESTER THEORY (Z:2)

BIOLOGY OF CHORDATES AND COMPARATIVE ANATOMY

64 hrs

1. General characters and organization of chordate and brief classification up to classes 2 hrs

2 Protochordata

4 hrs

- Features of Hemichordata.
- Features of Urochordata.
- Features of Cephalochordata.
- Retrogressive metamorphosis and significance in Ascidia.

3. General characters of Cyclostomes

3 hrs

4. Class : Pisces

9 hrs

- General characters and classification up to sub classes (Osteichthyes) with examples.
- Type study – Scoliodon : Morphology, digestive system, circulatory system, and urinogenital system.
- Scales in fishes.
- A brief note (Characters and distribution) on lung fishes.

5. Class : Amphibia

8 hrs

- General characters and classification up to orders with examples.
- Type study- Frog : vertebral column (division of vertebral column , atlas , typical 8th, 9th & 10th).
- Appedicular skeleton : Girdles & limbs.

6. Class : Reptilia

6 hrs

- General characters and classification up to orders (living orders) with examples.
- Identification of poisonous and non poisonous snakes.

7. Class : Aves

9 hrs

- General characters with classification up to orders mentioned.
- Archaeornithes
- Neornithes :
 - a) Paleognathae : (Stuthiformes, Casauriformes, Apterygiformes.
 - b) Neo-gnathae : (Falconiformes, Columbiformes, Cuculiformes, Psittaciformes, Strigiformes, Coraciformes, Passeriformes).
- Flight adaptation in Birds.

8. Class : Mammalia

9 hrs

- General characters with classification up to sub classes (Prototheria, Theria- metatheria & eutheria).
- Orders : Insectivora, Chiroptera, Primates, Foliodata, Rodentia, Cetacea, Carnivora, Perissidactyla, Proboscida.
- **Detailed study of Rat** : Morphology and anatomy (excluding skeletal system).

9. Comparative anatomy

14 hrs

- General structure of integument and its functions.
Comparison of the digestive systems of Scoliodon, Frog, Calotes, Pigeon & Rabbit.
- Comparison of heart and aortic arches in chordates (Scoliodon, Frog, Calotes, Pigeon and Rabbit).
Comparison of Brain of chordates from Pisces to Mammalia.

PRACTICAL ZP-2
BASED ON PAPER Z-2 :
BIOLOGY OF CHORDATA AND COMPARATIVE ANATOMY

1. Protochordata

- Hemichordata : Balanoglossus
- Urochordata : Herdmania, Ascidia
- Cephalochordata : Amphioxus

2. Cyclostomata : Petromyzon/Myxine

4. Class : Pisces : **Chondrichthyes** - Scoliodon, Torpedo(Electric ray), Trygon (sting ray), Sphyrna(Zygaenaor Hammer headed fish), Pristis(saw fish), Rhinabaus.

: **Osteichthyes** - Mystus, catla, Labeo rohitha, Wallago attu, Anguilla, Exocoetus, Hippocampus(sea horse), Channa(ophiocephalus).

5. Class : Amphibia : **Anura** – Rana, Hyla(tree frog), Rhacophorous(flying frog)

: **Urodela** - Salamander, Newt, Necturus, Axolotl

: **Apoda** - Ichthyophis, Uraeotyphlus

6. Class : Reptilia : **Lacertilia** – Hemidactylus (house lizard), Draco(flying lizard), Calotes, Varanus ,Chaemeleon.

: **Ophidia** – Cobra, Rat snake, Viper, Hydrophis, Python.

: **Chelonia** - Testudo(land tortoise), Chelone(green turtle), Terrapin(tortoise or soft river terrapin).

: **Crocodylia** – Crocodile, Alligator (Charts may be used)

\

- 7.Class : Aves** : **Archaeornithes** – Archaeopteryx
: **Neornithes** – Crow, Pigeon, Owl, King fisher, Jacana, Wood Pecker (Charts may be used)
- 8.Class : Mammalia** : **Prototheria** – Echidna(Tachyglossus), Platypus (Ornithorynchus)
: **Metatheria** – Kangaroo(macropus)
: **Eutheria** – Squirrel, Rabbit, Bat, Manis(Pangoline), Loris
- 9.Dissections** : **Scoliodon** : Digestive system, Cranial nerves (5th,7th,9th and 10th)
Arterial system – (Affarent and efferent)

Mounting : Placoid scales

10.Comparative anatomy :

- Demonstration/ charts of digestive system of fish to mammals
- Demonstration/ charts of heart, aortic arches of fish to mammals
- Demonstration /charts of Brain of fish to mammals
- Study of skeletal system of frog as per theory syllabus

11. FIELD ORIENTED ACTIVITIES

1. Visit to nearby garden/ forest land/crop/grass land/river/stream/sea/sanctuaries/national parks to study the animal diversity .
2. Bird watching and preparation of check list of birds of college campus.
3. Collect of local edible fishes.
4. Listing and identifying local butterflies.
5. Listing and identifying common spiders.
6. Listing and identifying terrestrial and fresh water molluscs in the surrounding of college/village.

FORMAT OF QUESTION PAPER FOR PRACTICAL (Z-P- 2)
BIOLOGY OF CHORDATA AND COMPARATIVE ANATOMY

Maximum marks : 40

Q.1 .Museum Specimens and Slides	6X2=12
Q.2. Dissection of Shark	08
Q.3. Comparative anatomy	5X2=10
Q.3. Mounting	05
Q.4. Record Book	05

THIRD SEMESTER THEORY (Z.3)
ECONOMIC ZOOLOGY AND HISTOLOGY

64 hrs

A. Economic Zoology:

1 . POULTRY

08 hrs

Aim and scope of poultry, poultry farm management , poultry breeds in India ,poultry feed and its composition , broiler and layers , rearing , nutritive value of egg and meat , a note on diseases and their control .

2. DAIRY FARMING

12 hrs

Importance , scope and management of farm animals . Breeds of cows and buffalos , nutrition requirements , milk and milk byproducts, processing , preservation and marketing of milk , breeding techniques, artificial insemination , breeding programs to improve local breeds.

3. SERICULTURE- (AGROBASED INDUSTRY)

12 hrs

Components of sericulture : Moriculture –different species of mulberry , cultivation methods , silkworm rearing , life cycle and morphology of Bombyx mori environmental condition needed for rearing , modern rearing house; rearing equipments , chawki worm and adult worm rearing methods, non mulberry silkworm , pest and predators , a note on silkworm diseases – perbrine, musacardine, flacherie and grasserie, types of silk, importance of sericulture and byproducts of sericulture .

4. AQUACULTURE

08 hrs

Principle, scope, techniques and importance of culturing, economically important aquatic organism, brief account of culturing of Indian major exotics corps and fresh water prawn ,induced breeding of major carps and seed fish , pearl – culture (brief note) composite fish culture (polyculture).

5. APICULTURE

10 hrs

Honeybee morphology , structural adaptation of mouth parts , honey sac, wax glands and sting apparatus , social life , different species and races , management of bee keeping (modern methods) , economic importance of honey ,wax pollen venom and bee pollination , a note on production of honey , its chemical composition and honey bee disease.

B.HISTOLOGY

14 hrs

Study of Histological structure and functions of following Mammalian organs.

- Tongue (C.S) With reference to mucosa papillae and taste buds .
- Alimentary canal : Basic histological organization with reference to : stomach(T.S), small intestine(T.S)
- Glands associated with digestive system: Liver(C.S) and Pancreas(C.S) including both exocrine and endocrine components.
- Kidney : Structure of nephron, T.S of kidney passing through cortex and medulla.
- Reproductive organs: A) Testis(T.S) with reference to seminiferous tubules and ce3lls of leydig.B) Ovary (C.S) –Primary. secondary and matured (Graffian follicle), corpus luteum and corpus albicans.
- **Histology of endocrine glands** : 1)Pituitory 2) Thyroid and 3) Adrenal

Reference Books :

1. Bailey TextBook of Histology,1971,16th edn.Wilfred M.Copenhaver Richard P.Bung & Mary
2. Jhingram.V.G Fish and fisheries of India . Hindustan Publishing Corporation , New Delhi.
3. Koveleve , P . A. Silkworm breeding stocks , Central silk board , marine drive , Bombay .
4. Roger , A. Morse . The ABC and XYZ OF bee culture .A.I.Root and Medina. Ohio 44256.
5. Harbnas Sings and Earl . N. Moore, Livestock and poultry production .prentice hall of india ,New Delhi .
6. Milk Dick, Aquarium Fish , D.K.Publishing Book , New York – 10016
7. Bal ,D .V. & K. V .Rao , Marine Fisheries Tata McGraw Publishing Co ., Ltd., New Delhi - 110051

PRACTICAL ZP-3
BASED ON PAPER Z-3 :
ECONOMIC ZOOLOGY AND HISTOLOGY

A) ECONOMIC ZOOLOGY :

1. Food fishes: Catla, Mrigala, Anabas, Mackeral, Sardine, Rohu, Channa
2. Study of mouth parts and sting apparatus of honey bee, nature and use of bee hive, bee wax and honey.
3. Life cycle of Bombyx mori including externals, mulberry and non-mulberry, cocoons.
4. Byproducts of fisheries, poultry, dairy and sericulture: fish oil, milk powder, egg powder, fowl excreta, dry cocoons and silkworm excreta, Bee wax and honey.
5. Study of poultry breed (indigenous and exotic breeds of fowls) i.e Layers and Broilers.
6. Study of mulching breeds (indigenous and exotic)
7. Study of MOET-Explanation with chart(IVF &ET charts).
8. Visit to Poultry farm.
9. Visit to dairy farm.
10. Visit to Veterinary hospital.
11. Visit to silk rearing centre.
12. Visit to Aquaculture farm.

NOTE: A brief report of any two above mentioned farms and study tour is COMPULSORY.

B) HISTOLOGY:

1. Microscopic study of histological organs (Cross sections) as per theory syllabus.
2. Procedure for the preparation of staining of paraffin section.

FORMAT OF QUESTION PAPER FOR PRACTICAL: (ZP-3)

ECONOMIC ZOOLOGY AND HISTOLOGY

Time - 3hrs

Max marks=40

- Q1. Identification and comment on A B & C
(Poultry, fisheries and dairy) 3X3=09
- Q2. Identification and comment on different products of (poultry, fisheries, sericulture and dairy apiculture) 5X2=10
- Q3. Identification of mouth parts / sting of Honey bee 3X1=03
- Q4. Staining & identification of given paraffin section with labeled diagram 07
- Q5. Histology-identification 3X2=06
1. Identify & describe
2. Identify & describe
3. Identify & sketch & label
- Q6. Record Book 05

III Semester Theory Question paper format VSKU

Title of the paper :-ECONOMIC ZOOLOGY & HISTOLOGY

Time:3 hrs

Max marks:80

Section A

Q1. Answer any 5 of the following 5X2=10
question no (1-7)
[four questions from Economic zoology and 3 questions from histology]

Section B

Q2. A) Answer any five of the following 5*5=25
question no(8-13)
(6 question s from Economic zoology)

B) Answer any one of the following 1*5=5
question no(14,15)
(2 questions from Histology)

Section C

Q 3 A)Answer any 3 of the following 3X10=30
question no(16-19)
(4 questions from Econoic zoology)

B)Answer any one of the following 1X10=10
question no(20,21)
(2 questions from Histology)

FOURTH SEMESTER THEORY (Z.4)
PHYSIOLOGY AND BIOCHEMISTRY

64 hrs

A. PHYSIOLOGY

41 hrs

1. Physiology of Digestion :

06 hrs

- Definition of digestion and types of digestion –mechanical and chemical.
- Digestion of carbohydrates ,proteins , and lipids .
- Absorption and assimilation of digested food materials.
- Gastrointestinal hormones.

2. Physiology of respiration :

06 hrs

- Types of respiration- external and internal respiration .
- Structure of mammalian lungs and gaseous exchange .
- Transport of oxygen-formation of oxyhaemoglobin and affinity of haemoglobin for oxygen dissociation curves.
- Transport of carbon dioxide-chloride shift , Bohr effect.

3. Physiology of Circulation :

07 hrs

- Open and closed circulation.
- Structure of mammalian heart and its working mechanism –Heart beat and cardiac cycle. Myogenic and neurogenic hearts.
- Origin and conduction of heartbeat.

4. Physiology of Excretion :

06 hrs

- Definition of excretion.
- Forms of nitrogenous waste materials and their formation ; classification of animals on the basis of excretory products.
- Structure of Nephron and physiology of urine formation .

5. Physiology of Muscle Contraction :

05 hrs

- General structure and types of muscles.
- Ultra structure of skeletal muscle .muscle proteins.
- Sliding filament mechanism of muscle contraction.
- Chemical change during muscle contraction-role of calcium,ATP utilization and its replenishment.

6. Physiology of Nerve impulse :

05 hrs

- Structure of nerve cell (multipolar nerve cell)
- Nature of nerve impulse- definition ,physiology and conduction of nerve impulse . Resting potential and action potential
- Properties of nerve impulse –threshold value, refractory period , all or none response.
- Conduction of nerve impulse along an axon-local circuit theory and salutatory conduction theory.
- Structure of synapse, mechanism of synaptic transmission – electrical and chemical transmission. Neurotransmitters.

7. Physiology of Endocrine system:

06 hrs

- Relation between hypothalamus and pituitary gland .
- Hormones of hypothalamus.
- Hormones of adenohypophysis and Neurohypophysis.
- Endocrine control of mammalian reproduction –male and female hormones placenta.

B. BIO-CHEMISTRY

23 hrs

1 Bio molecules : Carbohydrates ,proteins , and lipids.

05 hrs

2.Enzymes :

05 hrs

- Classification and properties
- Enzyme specificity
- Mechanism of Enzyme action(Lock & Key)
- Factors affecting enzyme activity –enzyme concentration ,substrate concentration, p H ,temp, activators and inhibitors, allosteric enzymes and their co-operative behavior , holo enzyme , apo enzyme , prosthetic group , coenzyme, Immobilize enzyme Iso enzyme , cofactors , clinical significance of enzymes.

3.Vitamins :

05 hrs

- Introduction , study with reference to occurrence , chemical nature , function and deficiency of vitamins. Classification of vitamins : Fat soluble vitamins- A,D,E,K; Water soluble vitamins- B1,B2,B6,B12,nicotinic acid , folic acid , lipolic acid , biotin , pantothenic acid ,ascorbic acid . Hypo & Hyper vitaminosis .

4. Minerals : with reference to source , biological functions and deficiency : Na, K , Ca, Mg & Fe. **03 hrs**

5. Bio-energetics : - Glycolysis, Kreb's cycle and Electron Transport system

05 hrs

REFERENCE

1. Animal physiology : P.S Verma.& V.K.Agrwal
2. Animal physiology : P.K.Saxena.
3. Animal physiology : A.K.Berry.
4. Essentials of animal physiology : S.C.Rastogi.
5. Animal physiology : ROGER Eckert and David Randall.
6. Fundamentals of Bio chemistry : J.L. Jain, Sanjay jain, Nitin jain.
- 7.Principles of Biochemistry : Lehninger, David L. Nelson , Michael M. Cox.

FORMAT OF QUESTION PAPER FOR PRACTICAL (Z-P- 4)
PHYSIOLOGY AND BIOCHEMISTRY

Maximum marks : 40

Q.1 .Qualitative test for carbohydrates, proteins and fats	05
Q.2. Detection of normal/abnormal constituents of urine	05
Q.3. Preparation of blood smear slides and counts for DC/TC of RBC/WBC	10
Q.4. Estimation of haemoglobin/preparation of hematin crystals in human blood	05
Q.5.Detection of activity of salivary amylase enzyme	05
Q.6.Record Book	05
Q.7.Viva voce	05

FIFTH SEMESTER THEORY (Z-5.1)

CELL BIOLOGY AND DEVELOPMENTAL BIOLOGY

48 hrs

A) CELL BIOLOGY :

24 hrs

1.Introduction to cell biology :

02 hrs

- Definition and scope.
- Generalized prokaryotic and eukaryotic cell : cell, size, shape and structure.

2.Plasma membrane :

03 hrs

- Unit membrane concept.
- Models.
- Functions of plasma membrane.

3.Endoplasmic reticulum :

02 hrs

- Discovery, occurrence and morphology.
- Types : smooth and rough.
- Functions.

4.Golgi complex :

02 hrs

- Occurrence and morphology.
- Ultra structure and functions.

5.Lysosomes :

02 hrs

- Occurrence and morphology.
- Types and functions.

- 6.Mitochondria :** **02 hrs**
- Origin, Occurrence.
 - structure and functions.
- 7. Nucleus :** **02 hrs**
- Size, shape, number, position structure and functions.
 - Nucleolus : General organization and functions.
- 8.Centrioles :** **01 hrs**
- Microtubules : Ultra structure, biochemical composition and functions.
- 9.Cell cycle and cell division :** **05 hrs**
- Interphase – The G₁, S and G₂ Phases.
 - Amitosis, Mitosis and meiosis .
 - Significance of mitosis and meiosis.
- 10. Cancer Biology :** **03 hrs**
- Definition and types of cancer.
 - Characteristics of cancer cell.
 - Carcinogen : Physical, chemical and biological carcinogen.

Reference

- 1.Cell and molecular biology, 1988, De Robertis EDP and De Robertis EME, Molt Saunders Inc.
- 2.Cell biology, 1986, C.B.Pawar, Himalaya Publication.House
3. Cell biology, 1986,Avers C.J.Addison Wesley Pub. Co. New York & London.
4. Cell and molecular biology, 1996, G.Car John Waley, USA.
5. Cell biology, 1993, David E. Sadava Johnes and Bartlett Publi. London.

B) DEVELOPMENTAL BIOLOGY: 24 hrs

1.Introduction : 01 hrs

- Branches and Scope of Embryology.

2.Gametogenesis : 03 hrs

- **Spermatogenesis** : Formation of spermatids, Spermiogenesis, Structure of mature spermatozoan.
- **Oogenesis** : Previtellogenesis and vitellogenesis, Comparison between spermatogenesis and oogenesis.
- **Types of eggs** : based on amount and distribution of yolk.

3.Fertilization : 03 hrs

- Kinds of fertilization :-Apporximation of gametes- fertilizin and antifertilizin, Acrosome reaction, cortical reaction and amphimixis. monospermic and polyspermic fertilization, significance of fertilization.

4.Cleavage : 02 hrs

- Types of cleavage : hloblastic, meroblastic, radial and spiral types with examples, Planes of cleavage- meridional, vertical, latitudinal, equational , Importance of cleavage.

5.Early development of frog : 03 hrs

- Structure of Ovum, Cleavage, blastula, fate maps of blastula, blastulation, Gastrulation - mesogenesis, notogenesis and neurulation.

6.Parthenogenesis : 02 hrs

- Kinds of parthenogenesis (Natural- Arrhenotoky, Thelytoky and Cyclical with examples)
- Artificial parthenogenesis, Significance of parthenogenesis.

7. Early development of Chick : 05 hrs

- Structure of hen's egg, cleavage, blastulation, Gastrulation : origin and structure of primitive streak.
- Study of structure of 18hrs, 24 hrs and 48 hrs of chick embryos(whole mount).

8.Extra embryonic membranes of chick : 02 hrs

- Development : Structure and function of yolk-sac, Amnion, Chorion and Allantois

9.Placenta: 02 hrs

- Yolk sac placenta : Allantoic placenta – Structure and functions of placenta.
- Morphological and histological, classification of placenta with examples.

7.Modern trends in reproduction : 01 hrs

- IVF technique, Sperm bank and Surrogate mother.

SYLLABUS FOR PRACTICAL- ZP-5.1
BASED ON PAPER ZP-5.1

CELL BIOLOGY AND DEVELOPMENTAL BIOLOGY

A) CELL BIOLOGY :

1. Preparation of fixative : Formaldehyde (6%),Alcohol (10% to 90%), Carnoy's fluid, Bouin's fluid.
2. Preparation of stains : Borax carmine (Aqueous & alcoholic), Eosin (aqueous & alcoholic), Delafield's haematoxylene, acetocarmine, aceto-orcein, Schiff's reagent (Feulgen method), Giemsa stain.
3. Study of ultra structure of cell organelles (using charts)
4. Observation of permanent slides of onion root tip to study all stages of mitosis.
5. Observation of permanent slides of grass hopper testes to study various stages of meiosis.
6. Observation of permanent slides of salivary gland chromosome of drosophila/chironomous larvae.
7. Squash preparation of onion root tip to study the stages of mitosis.
8. Squash preparation of flower buds on onion/grass hopper testes to study the stages of meiosis.

B) DEVELOPMENTAL BIOLOGY :

9. Stages of development of frog : The study of cleavage stages, Blastula, Gastrula and Neurula (sections) and various stages of tadpole.
10. Study of permanent slides of chick embryos : 18 hrs, 24 hrs, 36 hrs, 48 hrs (whole mounts).
11. Study of permanent slides of chick embryos : T.S of 18 hrs, 24 hrs.
12. Preparation of chick embryo mount.

FORMAT QUESTION PAPER FOR PRACTICAL (Z.P- 5.1)
CELL BIOLOGY AND DEVELOPMENTAL BIOLOGY

Maximum marks : 40

Q.1 .Preparation of one fixative and one stain.	2X2=04
Q.2 .Identification of cell organelles (from the charts : 2-cell organelles, 1- mitosis, and 1-meiosis/salivary gland chromosome)	4X2=08
Q.3. Squash Preparation of onion root tip/grass hopper testis/flower bud of onion.	05
Q.4. Identification of embryological slides (2-frag,1-chick WM,1-chick TS)	4X2=08
Q.5.Mounting of Chick embryo	10
Q.6.Record Book	05

Key Note to the Examiners:

1. If the Embryo is not developed in egg, the students are asked to identify the given Permanent slide and write Characters with neat labeled diagram.
2. Charts may be used for identification of cell organelles.

FIFTH SEMESTER THEORY (Z-5.2)

ENVIRONMENTAL BIOLOGY, WILD LIFE ZOOLOGY & ZOO- GEOGRAPHY:

48 hrs

A) ENVIRONMENTAL BIOLOGY

1. **Environmental Biology :** **02 hrs**
Introduction, definition, basic concepts, sub divisions of ecology and scope.
2. **Abiotic factors :** **08 hrs**
LIGHT :-Light intensity, Effect of light on metabolism,
Diurnal migration
TEMPERATURE :- Thermal stratification, extreme temperature, cyclomorphosis.
Adaptations to extreme temperatures.
Biotic relationships : Commensalism, mutualism, parasitism, ammensalism,
predation and competition with relevant examples.
3. **Habitats :** **08 hrs**
Marine habitat- Zonation of sea, ecological classification of marine biota, **costal ecology- estuarine ecology** and mangroves. **Fresh water habitat-** lentic and lotic systems. Ecological classification of fresh water animals. **Terrestrial habitat** – A brief account of forest, desert biomes. Ecological adaptations to marine, fresh water and terrestrial habitats.
4. **Population ecology :-** **03 hrs**
Population density, natality, mortality. Biotic potential- Allee's principle and Gause's principle.
5. **Ecosysem :** **06 hrs**
Definition, Tropical pond as an ecosystem - Abiotic components, producers consumers and decomposers. Interation between abiotic and biotic components.
Types of ecosystems : **Natural ecosystem** (fresh water ex. Pond water, forest)
Artificial ecosystem : Crop land.
6. **Food chains and energy flow :** **03 hrs**
Types of food chains with examples. Food webs with examples. Ecological pyramids with examples, energy flow.

7. Environmental pollution : **04 hrs**

Definition and types of pollution,

Types of pollution – Air pollution: definition, sources, effects and control measures of air pollution.

Water pollution : definition, sources, effects and control measures of water pollution. A brief note on **noise pollution** and **plastic pollution**.

8. Green house effect : **01 hr**

Definition, causes, effects, and preventive measures.

B. WILD LIFE ZOOLOGY : **07 hrs**

1. Wildlife : **01 hr**

Introduction and definition.

2. Wildlife problems : **02 hrs**

Hunting, over harvesting, habitat destruction due to over population, degradation, habitat shrinkage, possibilities of climatic changes, transgenic changes.

3. Wildlife conservations : **04 hrs**

Need for wild life conservation, types of conservations, Agencies involved in wild life conservation in India. Government. and Non Government organizations (NGO's). Wild life protection Act 1972. CITES(Conservation on International Trade in Endangered Species of wild life flora and fauna) , endangered animals of India, Red data book, blue date book and Green data book.

C. ZOO-GEOGRAPHY : **06 hrs**

1. **Realms** and their characteristic fauna with special reference to Indian fauna distribution- Continuous, discontinuous, isolated, bipolar with examples.

2. **Barriers of dispersal-** (Factors affecting distribution)-Topographic, climatic and biological means of dispersal.

SYLLABUS FOR PRACTICAL- ZP-5.2
BASED ON PAPER ZP-5.2

**ENVIRONMENTAL BIOLOGY, WILD LIFE ZOOLOGY & ZOO-
GEOGRAPHY**

A) ENVIRONMENTAL BIOLOGY :

1. Study of tropical pond as an ecosystem : Study of fauna & flora.
2. Study of aquarium as an ecosystem : Study of fauna & flora.
3. Study of community : By quadrat methods to determine frequency, density, and abundance of different species present in the community.
4. Estimation of dissolved oxygen, carbon dioxide and hardness of water, chloride.
5. Study of ecological adaptations and morphological peculiarities: Hermit crab, Stick insect, Glow worm, Sting bug, Puffer fish, Angler fish, Exocoetus, Phrynosoma, Draco, Chameleon and Bat.
6. Study of biotic relationship : Leguminous plants, Liver fluke, Tapeworm, Sucker fish, Insectivorous plants.

B) WILD LIFE ZOOLOGY

1. Study of threatened animals of India (By models, pictures, charts) : Tiger, Lion, Single horned Rhinoceros, Gaur, Hangul(Kashmir stag) Golden langur, Lion tailed monkey, Musk deer, Great Indian Bustard and Indian Rock Python.
2. Location of species of zoological interest on the Indian and world map. Flightless birds, Tiger, Lions, Gorilla, Hippopotamus, Rhinoceros, Dipnoi and Peripatus.
3. Location of Tiger reserves, National parks.

A) ZOO-GEOGRAPHY :

Mapping of landscapes with animals

FORMAT QUESTION PAPER FOR PRACTICAL

Z.P- 5.2 BASED ON PAPER Z-5.2

ENVIRONMENTAL BIOLOGY, WILD LIFE ZOOLOGY & ZOO-GEOGRAPHY

Maximum marks : 40

Q.1 .Estimation of Oxygen/Carbon dioxide/Chloride/Hardness.	1X10=10
Q.2 Ecological adaptations : (1-morphological, /parasitic, 1- Biotic relationship).	2X2=04
Q.3.Identification of endangered species (Any three)	3X2=06
Q.4.Mapping of landscape with animals	2X2=04
Q.5. Record Book	05
Q.6. Viva voce	05
Q.7. Project Report	06

Key Note to the Examiners:

- For Question no.2 and 3 Models or Charts may be Used
- For Question No.4 Mapping of
 - a) Distribution of Endangered animals.
 - b) Distribution of Lung fishes and flightless birds.
 - c) Mapping of National parks in India.

SIXTH SEMESTER THEORY (Z-6.1)

Z 6.1 GENETICS AND BIOTECHNOLOGY

48 Marks

A. GENETICS :

36 hrs

1. INTRODUCTION TO GENETICS:

05 hrs

- Mendelian genetics and its practical applications, Mendelian laws, Test cross, Back cross.

2. MULTIPLE ALLELES :

04 hrs

- Concept of multiple alleles, coat color in rabbit, ABO and Rh factor blood group system. Concept of multiple genes (polygenic inheritance) with reference to skin color in man.

3. GENE INTERACTION:

08 hrs

- Concept of gene interaction, co-dominance and incomplete dominance. Complementary factors (9:7), Supplementary factors (9:3:4), Inhibitory factors (13:3), Duplicate dominant factors (15:1), Lethal genes (dominant and recessive), Epistasis : dominant and recessive

4. CHROMOSOMES:

05 hrs

- Introduction to morphology, composition and classification based on centromeric position, types of chromosomes autosomes & allosomes. Giant chromosomes-polytene and lampbrush chromosomes.

5. SEX DETERMINATION :

04 hrs

- Chromosomal : XX-XY ,ZZ-ZW ,XX-XO methods, Haploid, Diploid, parthenogenesis, Gynandromorphy. Environmental- Sex determination in Bonellia

6. HUMAN GENETICS:

05 hrs

- Syndromes - autosomal abnormalities: Down's (Mongolism), Cri-du-chat syndrome. Sex chromosomal abnormalities in man: Klinefelter's and Turner's syndrome. Inborn errors of metabolism: albinism, phenylketonuria and alkaptonuria.

7. SEX LINKED INHERITANCE IN MAN :

05 hrs

- Colour-blindness, Haemophilia and hypertrichosis. Sex -influenced genes- Pattern baldness in human.

B. MOLECULAR BIOLOGY & BIOTECHNOLOGY **12 hrs**

1. NUCLEICACIDS: **04 hrs**

- Structure of DNA (Watson and Crick model), Types of RNA and its functions. Differences between DNA & RNA. DNA as genetic material (Griffith's expt.). RNA as genetic material in viruses

2. CENTRAL DOGMA OF MOLECULOAR BIOLOGY: **04 hrs**

- DNA replication, in prokaryotes, eukaryotes. Types of replication, Components of protein biosynthesis, mechanism of protein biosynthesis. Genetic code, properties of genetic code, wobble hypothesis.

3. Genetic engineering : **04 hrs**

- Tools used in r-DNA technology. Applications of genetic engineering in medicine and agriculture.

References

1. Molecular biology of cell, 3rd, 4th edition, Alberts B.D. Lewis J. Raff M. Roberts K. And Watson.
2. Gene, Vol. V, VI, VII, VIII and IX, Lewis B., Oxford University Press, Oxford.
3. Molecular biology of the genes, 1993, Watson J. Hopkins, Roberts Steitz & Weiner, Benjamin Cummings.
4. Cell and molecular biology, 1996, G. Karp, John Wiley & Sons, U.S.A. Text Book of Molecular Biology, 1994, K. Sivarama sastry G. Padmanabhan and C. Subramanyam : Macmillan, India

SYLLABUS FOR PRACTICAL ZP 6.1
BASED ON PAPER Z – 6.1
GENETICS, MOLECULAR BIOLOGY & BIOTECHNOLOGY

1. Genetic problems: Monohybrid inheritance
2. Genetic problems: Dihybrid inheritance
3. Genetic problems: Multiple alleles-ABO blood group in human
4. Detection of A, B and O blood groups and Rh factors; explain the inheritance.
5. Sex-linked inheritance in Drosophila.
6. Interaction of genes (two problems).
7. Sex-linked inheritance in humans
8. Calculation of allele frequency-ABO blood group in humans, Rh factor and calculating frequency of occurrence.
9. General morphology of Drosophila and identification of different mutants in drosophila (dominant mutation, recessive, pleiotropic mutation and bar eye
10. Preparation of salivary gland chromosomes of Drosophila/ Chironomus larvae

FORMAT OF QUESTION PAPER FOR

PRACTICAL Z-P.6.1 :

GENETICS, MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Maximum Marks : 40

1. Squash preparation of salivary gland chromosome of
Drosophila/ 1X10=10

Chironomous larvae

2. Detection of blood group (A,B,O) and Rh-factor. Give the genetic Significance 5X1=5
3. Genetic problem (monohybrid- 2 problema) 05
4. Genetic problem (dihybrid/multiple alleles -Any 1 problem) 05
5. problem on sex-linked inheritance 05
6. Vivavoce 05
7. Record Book 05

Key note to the Examiners:

1) For Question no 1-in case of lack material in the college, the candidates are asked to write the characters of salivary gland chromosome with a neat labelled diagram and also to write the Procedure and staining of Salivary gland chromosome of chironomous larvae.

SIXTH SEMESTER THEORY (Z-6.2)

ETHOLOGY, EVOLUTION AND PAEONTOLOGY

A. ETHOLOGY	48 hrs
1.ANIMAL BEHAVIOUR	25 HRS
<ul style="list-style-type: none">• Definition and types of animal behavior:- Innate behavior taxes, reflexes, instincts and motivation. Learned behaviour - habituation, imprinting and conditioned reflexes.	03hrs
2.SOCIAL ORGANIZATION	03 hrs
<ul style="list-style-type: none">• Features of social organization. Social behaviour in Honey bee & Termites	
3. PARENTALCARE :	06hrs
<ul style="list-style-type: none">• Parental care in fishes & amphibians.	
3.MIGRATORY BEHAVIOUR	04 hrs
<ul style="list-style-type: none">• Migration in fishes : Anadromous and catadromous migration with Hilsa and Anguilla.• Migration in birds : Origin of migration, types of migration, advantages of migration with suitable examples.	
4.COURTSHIP BEHAVIOUR	03 hrs
<ul style="list-style-type: none">• General principles and significance. Courtship behavior in amphibians and birds	
5.NEST AND NESTING BEHAVIOUR	03 hrs
<ul style="list-style-type: none">• Nest and nesting behaviour in birds with special reference to baya birds	

6.COLOURATION AND MIMICRY **03 hrs**

- Definition classification of mimicry- A) Aggressive, protective and warning. B) Batesian and Mullerian mimicry with suitable examples.

B. ORGANIC EVOLUTION **18 HRS**

1.INTRODUCTION **03 hrs**

- Origin of life -Abiogenesis, biogenesis. Chemical evolution of life, Stanley Miller's experiment.

2.EVIDENCES IN FAVOUR OF ORGANIC EVOLUTION **03 hrs**

- Evidences from anatomy, embryology .

3.THEORIES OF ORGANIC EVOLUTION **06 hrs**

- Lamarckism ,Darwinism, Mutation theory, Neo-Darwinism- gene mutation ,gene flow, genetic drift , natural selection and isolation, Hardy-Weinberg Equilibrium.

4.SPECIATION **06 hrs**

- Types of speciation(allopatric and sympatric), mechanism of speciation.
- Microevolution and Macroevolution.

C. PAEONTOLOGY **05 hrs**

- Fossils and fossilization . Origin and evolution of man.

SYLLABUS FOR PRACTICAL ZP-6.2

(BASED ON PAPER Z-6.2:)

ETHOLOGY, EVOLUTION PAEONTOLOGY &]

- 1.Winking of eyes, knee jerks and spider web experiments to explain innate and learned behaviour.
- 2.Observation of bee hive, ant colony from curtain and pagoda nests and termite mound.
- 3Observation of migratory in birds
- 4Observation of courtship behaviour in birds (sparrows, fowl, Peacock, pigeon).
- 5Observation of parental care in the animals as studied in the theory (pisces: Hippocampus,Arius, Amphibian:Ichthyophis, Birds:Myna,Jacana).
- 6.Observation of nesting behaviour in the birds .
- 7.Observation of butterflies,Stick insects, leaf insects & Chamelion for the coloration & mimicry.
- 8.Study of homologous organs- Forelimbs of Frog & bird; mouth parts of cockroach & mosquito, serial homology in crustacea(appendages).
- 9.Study of analogous organs- vertebrae & cephalopod eye, wing of bird & insect.
- 10.Study of vestigial organs-appendix, coccyx & molar teeth in man.
- 11.Study of Archeopteryx.
- 12.Study of models of Dinosaur. (Ichthyosaurus, Tyrranosaurus, Brontosaurus, Stegosaurus & Triceratops).

- 13.Study of models of fossil man. (Any 4 available models).
- 14.Field oriented projects:
 1. Study of nesting and roosting places in birds.
 2. Local treks for nature study: Study of termite mounds & identification of castes/ bee colonies/ ant colonies/ Monkey troops, etc for behavioral study.
 3. Observation of mimicry / coloration in local animals

FORMATION OF QUESTION PAPER FOR

PRACTICAL-ZP.6.2

(BASED ON SEMISTER-IV: PAPER-Z.6.2:

ETHOLOGY, EVOLUTION & PAEONTOLOGY)

Maximum Marks : 40

1. Evolution: 3 spots 3 x 3 = 9

(a. Homologous, b. Analogous, c. Vestigial)

2. Paleontology: 3 spots (a. Models of dinosaurs, b. Study of 3 x 3 = 9

Archeopteryx, c. Models of fossil man).

3. Parental care: 2 spots + 1 - social organization 3 x 2 = 6

4. Spotting of 1 - Mimicry, 1 - migration, 1 - coloration 3 x 2 = 6

5. Project Report 05

6. Record Book 05

Key Note to the Examiners:

1) Charts or Models may be used where ever necessary.
