INDEX

SYLLABUS FOR B.SC. (CBCS)

SUBJECT: ZOOLOGY
I SEMESTER: ZOOLOGY

DSC 1A: Animal Diversity-1 4 hr/ week X 16=64 hrs

Note*: Salient features should be elaborated while giving general characteristics of each group.Local examples with common and scientific names from all groups to be mentioned. Some of the examples not found in India can be included because of taxonomic/phylogenic or other significance.*

UNIT I **2hr**

Nonchordata-outlines of animalclassification.
five kingdom concept, Binomial nomenclature, Definition of species

UNIT II **8hr**

Protozoa: General characters and classification up to classes with examples; Locomotion (amoeboid, flagellar and ciliary- excluding theories) and reproduction (fission and conjugation); Plasmodium: Morphology, life cycle, pathogenicity and preventive measures of *Plasmodium vivax*.

UNIT III **8 hr**

Concept of Metazoa; Levels of organization - Cell, tissue, organ, organ system (Definition with examples);
Porifera: General characters with classification up to classes with examples; Sponge spicules, canal system (Ascon, Sycon, leucon, rhagon) and larvae - amphiblastula and parenchymula.

UNIT IV **8 hr**

Cnidaria: General characters and classification up to classes with examples;
Polymorphism in cnidaria- Obelia and Halistemma, Structure of corallite, types of coral reefs,importance of corals.
Acnidaria: Salient features and systematic position of Ctenophora.

UNIT V **8 hr**

Concept of coelom:Acoelom, Pseudocoelom, Eucoelom (Definition with examples).
Helminthes:
Platyhelminthes: General characters and classification up to classes with examples; *Taeniasolium*- Life cycle, pathogenicity and preventive measures.

Aschelminthes: General characters and examples; morphology, transmission, pathogenicity and preventive measures of ***Ascaris*** **and*****Wucheraria***.

Parasitic adaptations in helminthes.

UNIT VI **8hrs**

Annelida: General characters and classification up to classes with examples.
Type study: i) Pheretima- Morphology, setae, digestive, circulatory, excretory (nephridium), nervous and reproductive systems, Trochophore larva and its significance; ii). Leech- Morphology and parasitic adaptations; iii) Tubiculous wormstubiculous adaptations in *Nereis* and *chaetopterus*.

UNIT VII **8hr**

Onychophora: Salient features of *Peripatus* and systematic position of Onychophora.
Arthropoda : General characters and classification up to classes with examples, Type study: Cockroach- Morphology, digestive, respiratory and nervous systems; harmful and beneficiary insects- brief general account with examples; social organization in insects (Termite).

UNIT VIII **6 hr**

Mollusca: General characters and classification with examples; Type study: Fresh water Mussel- morphology, digestive, respiratory and nervous systems; foot in mollusca, Diversity in Molluscan shells.

UNIT IX **6hr**

Echinodermata: General characters and classification with examples; Type study: Star fishmorphology
and water-vascular system; echinoderm larvae and their phylogenetic significance.

UNIT X **2 hr**

Regenerative ability in invertebrates, Symmetry in invertebrates (Cell aggregates, blind sac,tube within tube).

I SEMESTER: ZOOLOGY

DSC 1A: I SEMESTER: ZOOLOGY

4 hrs/week x16= 64 hrs

1.A) Study of Microsope.

B) Study of permanent slides of protozoa: Amoeba, Entamoeba, Polystomella. Euglena, Balantidum,Vorticella.

2 .Preparation of protozoan culture by students and observation of protozoan culture

3. Porifera: Study of slides/specimens –Sycon, Spongilla, Euspongia,Sponge, gemmule, Monaxon spicules.

4&5: Cnidaria: Hydra, Physalia, Aurelia, Ephyra larva, Metridium, Gorgonia, Madrepora Pennatula,Fungia,Favia,Meandrina

6. Helminthes: Planaria, Fasciola, Taenia, Ascaris-male and female,ScolexofTaenia, T.S. of Taenia and Ascaris (male or female)

7. Annelida: Pheritima, Nereis, Chaetopterus, Aphrodite. Leech, T.S of Nereis and Leech

8. Temporary slide preparation of whole mounts of coelenterate colonies: Obelia, Sertularia,Bougainvillea, companularia , pennaria(any three)/Observation of permanent slides(any three).

9. Onychophora: Peripatus,
Arthropoda :Panaeus, Nauplius larva, Mysis larva. Scolopendra, Spirostreptus, Palamnaeus, Aranea,

10. Field study: Observation of Arthropods in and around the college campus, identifying and recording in the practical record (Minimum five insects).

11. Taxonomic study of insects up to orders giving key for identification, selecting any five locally availableCommon examples and recording them.

12. Study of Arthropodan pests: Periplaneta, Rhinocerous beetle, Termite and Weevil.
Study of Arthropodan vectors: mosquito (culex/aedes/ anopheles)and house fly.

13. Study of mouth parts of insects: Cockroach, female mosquito, house fly, and honey bee (permanent slides).

14. Cockroach: Study of digestive system and nervous system.
15. Mollusca: Chiton, Dentallium shell, Xancus shell, Aplysia, Unio, Octopus.

16. Echinodermata: - Astropecten, Ophiothrix, Salmacis, Holothuria.
Echinodermata: Antedon, Bipinnaria larva, Pluteus larva, Pedicellaria of sea urchin.
(Note: All exercise except Sl.No. 2,10,11,14 include study of specimens/ slides)

PRACTCAL ANIMAL DIVERSITY -1

SCHEME OF PRACTICAL EXAMINATION

Time: 3 hrs **Max. Marks: 40**

1. Identify with reasons, any one of the protozoan in the culture provided. Write the Procedure for preparing the protozoan culture. 9

2. Identify with reasons the specimen/ slides A to E 3 X 4= 12

3. Identify with a labeled diagram the material provided
(one coelenterate colonies and one mouth parts of insects) 3X 2=6

4. Identify the give insect up to order using key 05

5. Identify the vector/pest and comment 03

6. Class Records 05

PRACTICAL ANIMAL DIVERSITY -1

SCHEME OF VALUATION FOR PRACTICAL

1. Procedure & labeled diagram- 5 identification - 2, reasons- 2

2. Identification with classification (up to classes) - 1, labeled diagram-1, reasons- 1

3. Identification- 1, labeled diagram- 1, reasons-1

4. Identification -1, preparation of key – 1

5. Identification - 1, comments-2

6. Class Records - 5

II SEMESTER :ZOOLOGY

DSC 1B: ANIMAL DIVERSITY **2 4hr/week=64hr**

UNIT-I **6hr**

Chordata- General characters and classification up to classes with examples;concept of protochordata.
Hemichordata- General characters, Balanoglossus- externals, proboscis complex, Tornaria larva; Affinities of Hemichordata with Annelida, Echinodermata and Chordata.

UNIT II **8hr**

.Cephalochordata- Amphioxus- externals, feeding mechanism, digestive and circulatory system;
Urochordata- Ascidia- externals and brief description of internal morphology, larva and metamorphosis.
Cyclostomata: Salient features of Petromyzon, Ammocoetes larva and its significance.

UNIT III **7hr**

Vertebrata**:** General characters and classification with examples
Pisces – General characteristics of fishes; Differences between Chondrichthyes and Osteichthyes; Type study: *Scoliodon*- Morophology, respiratory and lateral line systems; Scales in fishes, Salient features and discontinuous distribution of Dipnoi.

UNIT IV **10hr**

Amphibia**:** General characters and classification up to orders, distinguishing features of living amphibians with suitable examples; Type study-Frog: Externals,digestive, respiratory, circulatory and urinogenital systems.
Reptilia: General characters and classification up to orders with suitable examples; Temporal fossae and arcades in reptiles and their significance; Indian snakes - poisonous and nonpoisonous, poison apparatus, key for identification of nonpoisonous and poisonous snakes.

UNIT V **08hr**

Aves: General characters and classification up to sub classes, *Archaeopteryx* evolutionary significance,
Distinctive features of Archaeornithes and Neornithes -
Palaeognathae, Impennae and Neognathae with suitable examples; Flight

Adaptations in birds - morphological, anatomical and physiological; Bird migrationpreparation, causes, pattern, navigation, mechanics, orientation and advantages.

UNIT VI **08hr**

Mammalia: General characters and classification up to subclasses; Distinctive features Of prototheria, metatheria and eutheria with important examples; Affinities of prototheria;.

Type study: Rabbit-Externals, digestive, respiratory, circulatory and urinogenital systems.

UNIT VII **08 hr**

Important characters and distribution with examples – Primates, Chiroptera, Cetacea, Perissodactyla, Artiodactyla, Carnivora, Rodentia and Proboscidia; Dentition in mammals – tooth structure, types, specialization and dental formula in Carnivora (cat, dog), Rodentia (rat), Proboscidia (elephant), Artiodactyla (Horse), Perissodactyla (cow) and Primates (man and monkey).

UNIT VIII **09 hr**

Comparative anatomy: Comparative anatomy of heart-Pisces (Shark),Amphibia (frog),Reptilia (Garden lizard) ,Aves (pigeon), Mammalia (man); Evolution of brain in vertebrates - shark, frog, varanus, pigeon and man; Evolution of kidney in vertebrates - pronephros (Pisces –shark), mesonephros (Amphibia- frog), Metanephros (Reptilia - garden lizard), (Aves-pigeon) and (Mammalia -man); Aortic arches in vertebrates.

II SEMESTER :ZOOLOGY

DSC 1B: PRACTICAL ANIMAL DIVERSITY 2

4hr/weekx16=64hr

1.Hemichordata: Balanoglossus, T.S. through proboscis, collar, branchio-genital region.
Urochordata: Ascidia
Cephalochordata: Amphioxus, T.S. through pharynx and intestine.

2.Cyclostomata: Petromyzon, Ammocoetes larva, Myxine.

3.Fishes: Scoliodon, Zygaena, Pristis, Narcin, Trygon.: Echeinis, Hippocampus, Anguilla.

4.Slide preparation :placoid, cycloid and ctenoid scales.

5.Amphibia: Ichthyophis. Salamander, Axolotl larva, Rana,

6.Reptilia: Varanus, Chelone, cobra, Viper, Krait,, sea snake, Rat snake.

7.Aves: Kingfisher, Parakeet, Woodpecker, Crow, Owl, Duck. Structure of a quill feather.

8.Mammalia: Rabbit, Rat, Bat, Loris.

9.Osteology: Skulls of shark, Frog and Crocodile.

10.Osteology: Skulls of Pigeon and Rabbit.

11.Osteology: Vertebrae (atlas, pro, amphi, and acoelous) of frog, Pigeon (heterocoelous And synsacrum) and Rabbit (atlas, axis and thoracic)

12.Osteology: Pectoral girdles and forelimb skeletons of Frog, Pigeon and Rabbit
.
Pelvic girdles and hindlimbs of Frog, Pigeon and Rabbit.

13. Bird watching: Preparation and submission of checklist of birds in the campus/ nearby places.

14, 15, 16. Study of internal systems (digestive, circulatory, nervous and excretory) of Frog/ rat.

PRACTICAL ANIMAL DIVERSITY 2

SCHEME OF PRACTICAL EXAMINATION

Time 3hr Max,marks 40

1. Mount and identify the scale of given edible fish. 08

2. Identify with reasons the specimens A to E 3 X 4=12

3. Identify and draw diagram of skeletons D and E 4 X 2 =8
(Axial skeleton and appendicular skeleton)

4. Report on bird watching /field study 07

5. Class Records 05

PRACTICAL ANIMAL DIVERSITY 2

SCHEME OF EVALUATION FOR PRACTICAL III

1. Mounting- 5, Identification – 1.diagram 2

2. Identification with classification up to classes- 1, labeled diagram-1, reasons- 1

3. Identification- 2, labeled diagram- 1, reasons- 1

4. Field report- 07

5. Class Records - 5

COMPULSORY STUDY TOUR: A study tour, accompanied by teachers should be arranged after for on the spot study of the bio-diversity in sanctuaries/ National parks/ seashores. T. A. and D. A. for accompanying staff should be borne by the college from E.C. funds or other heads.

III SEMESTER: ZOOLOGY
DSC 1C : ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY
4hr /week X 16=64 hr

ANIMAL PHYSIOLOGY

UNIT I **07hr**

Homeostasis:Definition and significance, water, glucose and salt balance.
Osmoregulation: Osmoconformers and osmoregulators, osmoregulation in shark,marine and freshwater
teleosts, terrestrial mammals (Kangaroo rat and Camel).
Thermoregulation: Effects of temperature change- Q 10 effect, Causes of thermaldeaths;Definition
of ectotherm, endotherms, poikilotherms, and homeotherms, Heterotherms;
Temperature compensation in poikilotherms and homeotherms; A note on
aestivation and hibernation.

UNIT II **08hr**

Digestion:Hunger and apetite; digestion and absorption of carbohydrates, proteins and Lipids.
Respiration**:** Physiology of respiration–exchange of gases; Transport of oxygen,oxygen dissociation curve-Bohr's effect, Transport of carbon dioxide – chloride shift,
Respiratory quotient; Cellular respiration: Glycolysis, Kreb's cycle, oxidative phosphorylation, energy budget.

UNIT III **08 hr**

Circulation: Structure and functions of human heart, regulation of heart beat, blood pressure, Mechanism of blood clotting.
Nitrogen Excretion: Types of nitrogen excretion- Definition and examples ofammonotelism, ureotelism, uricotelism and gaunotelism; Ornithine cycle, nitrogen
excretion in relation to water economy, physiology of urine formation in man.

UNIT-IV **08hr**

Neurophysiology: Structure of multipolar neuron,Types of neurons and neuro-synapses, Membrane potentials (restingand action), Axonic and synaptic transmission
of nerve impulses.

Muscle Physiology: Types of muscles- Morphological (Striated and non-striated) andfunctional (voluntary and involuntary); Structure and mechanism of contraction of
skeletal muscle (Initiation, contractile and regulatory proteins, sliding
filament theory, energy for contraction), neuro-muscular junction.

DEVELOPMENTAL BIOLOGY

UNIT **07hr**

Gametogenesis: Spermatogenesis–formation of spermatids, spermiogenesis. Oogenesis, type of eggs – based on quantity and distribution of yolk with examples.Egg membranes.

Fertilization: Details of the process with reference to sea urchin–approach of gametes, Role of fertilizin and antifertilizin, gamones and their role, activation, penetration, reaction of the egg and amphimixis, monospermy and polyspermy (physiological and pathological), significance of fertilization.

UNIT II **5hr**

Parthenogenesis: Cytology of natural parthenogenesis–arrhenotoky, thelytoky (amictic and apomictic) and cyclical parthenogenesis with examples,; Artificial parthenogenesis – Loeb's and Bataillon's experiments, Significance of parthenogenesis, a brief note on cloning.

UNIT III **7hrs**

Cleavage: Types of cleavage–holoblastic, meroblastic, radial, spiral and superficial types with examples; Planes of cleavage – meridonal, vertical, equatorial and latitudinal.

Development of frog: Cleavage, blastula, gastrulation, neurulation, fatemaps; Organizer phenomenon–definition, Experiment of Spemann and Mangold, Potencies of the dorsal lip of the blastopore of amphibian gastrula; Definitions of competence, determination and differentiation.

UNIT IV **7 hr**

Development of chick: Structure of hen's egg, cleavae, blastula, gastrulation –origin and developmentof primitive streak;

Foetal Membranes: Development, structure and functions of amnion, chorion, yolk sac and allantois.

Placenta: Histological and morphological classification with examples. Placental hormones.

UNIT V **7 hr**

Human Development: Structure of mature spermatozoan, Graafian follicle, ovulation, fertilization,morula, blastocyst, implantation, gastrulation;

Organogenesis – outlines of derivatives of different germ layers.

III SEMESTER: ZOOLOGY
DSC 1C : PRACTICAL ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY
4hr /week X 16=64 hr

1. Salivary amylase activity assay.

2. Dehydrogenase activity assay in milk.

3. Estimation of proteins by colorimetric method- Biuret method.

4. Detection of nitrogenous excretory wastes in the given samples: Ammonia- Nessler's reagent test, Urea- Urease test and Uric acid- Folin's test.

5. Detection of abnormal excretion of glucose, albumin and creatinine in human urine.

Glucose- Benedict's test, albumin- Heller's ring test, Creatinine- Jaffe's test.

6. Blood typing- A, B, AB, O and Rh factors in given human blood samples using antisera
.
7. Preparation of haematin crystals.

8. Analysis of amino acids by Paper chromatography- demonstration.

9. Total RBC count, differential count of WBC, Hb count, clotting time- Demonstration.

10. Electrophoresis- demonstration.

11. Identification of the sources of different fat soluble and water-soluble vitamins, their role and deficiency diseases (Sources have to be specified, avoiding overlapping ones).

12. Study of different types of eggs – Graafian follicle, frog's egg, hen's egg and insect egg. Studyof grasshopper, frog and mammalian sperms.

13. Frog: cleavage stages, blastula (section), gastrula (yolk plug stage) and neurula (sections).

14. Chick embryo: 18 hrs. 24 hrs. 36 hrs. and 48 hrs (WM and sections).

15. Study of development - Hen's egg – window technique.

16. Study of Developmental stages in *Drosophila* – egg, larva and pupa.

Note : Significance of physiology tests (macromolecules/ constituents) to be explained.

DSC 1C:PRACTICAL ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY

SCHEME OF PRACTICAL EXAMINATION

Time: 3Hrs **Max. Marks: 40**

1. Any two-physiology experiments (by lots from Pr. 1-6).	12X1=12
2. Identification and writing comments on spotters A and B (from pr 11)	3X2=6
3. Identification and writing comments on C-G (one each from pr 12-16)	4 X 4=16
4. Class Records	05

DSC 1C:PRACTICAL ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY

SCHEME OF EVALUATION FOR PRACTICAL IV

1. Principle and procedure =6, Reults and comments =6 per experiment**.**

2. Identification- 1, comments and importance- 2.

3. Identification 1, comments 2.

4. Class Records - 5

IV SEMESTER : ZOOLOGY

DSC 1D: CELL BIOLOGY AND GENETICS **4hr/week x16=64hr**

Unit I

1. The Cell: Ultrastructure of an animal cell. 6hr
2. Membrane system:

Plasma membrane: Ultrastructure – fluid mosaic model, functions.
Endoplasmic reticulum: Ultrastructure, types, origin and functions.
Golgi complex: Occurrence, morphology, origin and functions.
Lysosome: Occurrence, structure, enzymes, polymorphism, functions.

UNIT II **6 hrs**

1. Mitochondria: Morphology, distribution, ultrastructure and functions; Mitochondria as semi-autonomous organelles.
2. Ribosomes: Occurrence, distribution, types, chemical composition, dissociation and reconstitution.

UNIT III **8 hrs**

1. Nucleus: Ultrastructure of nucleus, nuclear membrane, nucleoplasm and chromatin fibres; Ultrastructure and functions of nucleolus.
2. Chromosome: Morphology and ultrastructure (nucleosome model) and chemical composition, number, size; Karyotype and idiogram; euchromatin and heterochromatin; types of heterochromatin; Giant chromosomes-polytene and lampbrush chromosomes; Chromosomal aberrations – deletion, duplication, inversion and translocation.

UNIT IV **7hrs**

1.Cell division: Mitosis: Cell cycle, mitotic stages, ultrastructure of centriole spindle fibre and its role in chromosome movements. Significance of mitosis, mitotic inhibitors; Meiosis: Stages of meiosis. Synaptonemal complex, chiasma formation, mechanism of crossing over.

UNIT V **7 hrs**

1.Gene and Protein synthesis: Gene concept: cistron, recon and muton – definitions' Jumping genes or transposable genes – Barbara McClintock's work on maize, Characteristics of jumping genes, Split genes; Control of gene expression – Lac Operon; Genetic code: properties of genetic code,
Transcription in prokaryotes – RNA polymerase, binding, initiation, elongation and termination; Post-transcriptional modification of mRNA – addition of cap, tail and RNA splicing – introns, exons and ribozymes; Translation in prokaryotes – aminoacylation of tRNA, elongation, termination

UNIT VI **7hr**

Nature and Nurture: Definition. Experiments on Potentillaglandulosa, Himalayan albino rabbit

andHuman twins; Definition of norm of reaction, genetic homeostasis, phenocopy, penetrance andexpressivity with examples – Huntington's chorea, PTC; Mendel's laws, Mono and dihybrid crosses.
Incomplete dominance – flower colour inheritance in *Mirabilis jalapa*, Cytoplasmic (maternal) inheritance – shell coiling in Limnaea.

UNIT V II **7hr**

Interaction of genes: Supplementary factors–9:3:3:1(comb pattern in fowls)
Dominant epistasis – 13:3 (plumagecolour in Leghorn and Wyandotte)
Complimentary factors – 9:7 (flower colour in sweet peas)
Multiple factors/ polygenic inheritance – (skin colour in man)
Lethal genes – yellow coat colour in mice; Multiple Alleles: ABO blood groups in man;
Isoalleles (Lozenze eye in *Drosophila*), pseudoalleles (Rh factor) and position effect (aristopedia in *Drosophila*.);Pleiotropism (Phenylketoneuria in Man and vestigial wing in *Drosophila*).

UNIT VIII **9 hr**

Linkage and crossing over: complete and incomplete linkage in*Drosophila*(grey body and vestigialwing).
Significance of crossing over;
Genetic maps of chromosomes: construction of chromosome maps, three-point test cross in Drosophila(sc,ec,cv):
Sex linked inheritance: Sex linked inheritance in *Drosophila* and man, Haemophiliaandcolour blindness in
man. Sex linkage in poultry. Y-linked genes;
Sex determination: Chromosomal basis of sex determination, Non-disjunction:primary and secondary, Genic balance theory. Gynandromorphs and intersexes in *Drosophila*, Klinefelter's and
Turner's Syndromes. Environmental effect (Bonellia) and hormonal effects (Free Martin in cattles) on determination of sex.

UNIT IX **7hr**

1.Gene mutation : Point mutation –definition with example of sickle cell anemia, Types of mutations,direction magnitude of phenotypic effect.
Disorders due to mutant genes in man: Sickle cell anemia, thalassemia. Inborn errors of metabolism;
phenylketonuria, alkaptoneuria, albinism.
Mutagens, CIB technique for detection of sex-linked mutations, Practical application and significance.
2.Human Genetics: Eugenics, euthenics and euphenics;
Human genomics – definition and brief account on its usefulness to mankind.

IV SEMESTER ZOOLOGY

DSC 1D: PRACTICAL CELL BIOLOGY AND GENETICS

4 hr/week x16=64 hr

1. Micrometry: Use of ocular and stage micrometers to measure cell and nuclear dimensions.

2. Study of permanent slides of different stages of mitosis in onion root tip.

3. Squash preparation of onion root tip to study stages of mitosis.

4. &5. Study of permanent slides of various stages of meiosis in grasshopper testis.

6.Demonstration of squash preparation of grasshopper testis to study stages of meiosis.

7.&8. Study of permanent slides of salivary gland chromosomes of *Drosophila.*
Squash preparation of salivary gland chromosomes of *Drosophila* / Chironomous larva.

9. Study of permanent slide/ karyotype and idiogram of man.

10. Preparation of karyotype from the given metaphase plate of *Drosophila* / Grasshopper.
11&12. Genetics problems
a)Monohybrid inheritance – 1 animal (*Drosophila*) example.
b)Dihybrid inheritance – 1 animal (*Drosophila*) example.
c)Complementary genes – flower colour in Sweet pea
d)Supplementary genes – comb pattern in Fowls.
e)Epistatic (inhibitory) genes – plumage colour in Flowls.
f) Multiple genes – Skin colour in Man.

13 a)Multiple alleles – ABO blood group in Humans (1 problem)
b)Sex-linked inheritance in *Drosophila* (2) and in humans (2).
c) Chromosomal abnormalities in Humans – Turner's, Klinefelter's and Down's syndromes (Chromosomal compliments and photos)

14. Construction of 3-point test cross linkage map (2 problems).

15. General morphology of *Drosophila* and mounting of sex comb and wing.

16. Identification of wild (male and female) and different types of mutants in *Drosophila* – white eye, bar eye, sepia eye, vestigial wing and yellow body

IV SEMESTER : ZOOLOGY
DSC 1D: PRACTICAL CELL BIOLOGY AND GENETICS

SCHEME OF PRACTICAL EXAMINATION

Time 3hr **Max.Marks40**

1.Mounting of sex comb/ wing of *Drosophila*/Prepare the karyotype 03

2.Identify with reasons A and B (Mutants/ wild fly – male / female) 3 X 2=06

3. Make a temporary squash preparation of the given material and demonstrate a stage of cell division. Write the procedure and comment on the stage with a diagram 09

4. Measure the cell and nuclear diameter of the given material in the slide and report. 05

5. Identify with reasons the slides and karyotype C & D 3X2=06
(2 from mitosis , meiosis and Salivary gland chromosomes and from chromosome abnormality)

6. 2 Genetics problems (Pr 11- 14). 7 X 2=14

7. Class Records 5

DSC 1D: PRACTICAL CELL BIOLOGY AND GENETICS

SCHEME OF VALUATION

1. Mounting & labeled diagram -3

2. Identification -1, diagram -1 description/comment -1

3. Procedure -3, preparation -3 and report with diagram -3

4. Calibration-2, procedure-2, diagram and report - 1

5. Identification – 1, diagram 1, and reason –1

6. Genetics problem -3

7. Class Records - 5

V SEM ZOOLOGY
DSE 1A: BIOCHEMISTRY AND APPLIED ZOOLOGY (ELECTIVE 1)
4hr/weekX16=64 hr

BIOCHEMISTRY

UNIT I 12hr

1.Carbohydrates: Definition and classification: biological importance of monosaccharaides(glucose, fructose, ribose, deoxyribose), disachharides (sucrose, lactose, maltose), and polysachharides (homopolysaccharidesstarch, glycogen, dextrin)and heteropolysachharides-heparin, chondrotinsulphate, hyaluronic acid, glucoronic acid).

2.Proteins: Elementary classification of amino acids: Simple and conjugated proteins withexamples; Primary, secondary, tertiary and quaternary structure of proteins with haemoglobin as example, Biological importance of proteins.

3.**Lipids:**Definition and classification; biological importance of phospholipids, neutral lipids and Glycolipids; Clinical importance of lipids- lipid profile of blood.

UNIT-II **12hr**

1.Nucleic Acids: Classification and structure of DNA and RNA. Watson and Crick model of DNA, cloverleaf model of t-RNA.
2.Enzymes: Classification, properties, mechanism of enzyme action- induced fit theory;factors affecting enzyme action**,** Co enzymes and inhibitors**,** biological importance of enzymes.
3.Vitamins: Classification; Source, importance, daily recommended dosage and deficiency diseases of fat soluble and water soluble vitamins.

APPLIED ZOOLOGY

UNIT I **12hrs**

Purposes and definitions of poultry, dairy, piggery, fishery, vermiculture, apiculture, pearl culture and aquaculture
Sericulture: Morphology and life cycle of*Bombyxmori*, rearing up to cocoon stage, nonmulberrysilkworms.
Vermiculture**:** Types of vermiculture**,** Different species of earthworms used for vermiculture. Composition of vermicompostandits importance.
Culture practice of Indian major carps, Pearl formation.

UNIT II

Parasites and Vectors 10hr

1. Insects as pests – on food (cereals, pulses, coffee,) and vegetable (Cauli flower) crops . (One example for each with description of part of the plant affected and economic loss)

2.Parasitic protozoa (entamoeba), nematodesAnclyostoma), helminthes(tape worm) and their human diseases (symptoms of diseases, mode of transmission, control measures)

3.Vectors: Mosquitoes, ticks, mites, cockroaches, rat and their human diseases. (vector species, mode of transmission, control measures)

UNIT III. **10hr**

Wild life

a. Uniqueness of Indian wildlife**,** Important fauna of Indian forests**;**

b. Endangered, threatened, vulnerable, rare and extinct species (definitions with examples), Red data book, green data book.

c. Biodiversity hotspots- meaning, Salient features of biodiversity hotspots of India (number of plant and animal species, endemic species to be highlighted)

UNIT IV **8hr**

Biostatistics

Introduction – Tabulation of data. Bar diagram, Histogram. Frequency distribution – mean, median and mode. Standard deviation and standard error. Chi-square test with problems.

V SEM ZOOLOGY

DSE 1A: PRACTICAL BIOCHEMISTRY AND APPLIED ZOOLOGY (ELECTIVE 1) 4hr/weekx16=64 hr

1. Qualitative tests to detect carbohydrates in the given test samples- Molisch's test, Iodine test, Fehling's test and Picric acid test.

2. Qualitative tests to detect proteins in the given test samples- Biuret test, Ninhydrin test, Millon's test and Xanthoproteic test.

3. Qualitative tests to detect lipids in the given test samples- Acrolin test, Sudan 3 test, Salkowasky test.

4. Detection of normal and abnormal constituents of urine.

5. Demonstration of Vermiculture in the laboratory or college campus.

6. Morphology and life history of *Bombyxmori*.

7. Identification and uses of different equipment in silkworm rearing.

8. Morphology of different species of locally available honey bee species and enlisting their Foraging plants

9. Identification of different local food fishes (any five).

10 &11: Collection of data such as height, weight, blood groups, etc. among students and calculation– mean, standard deviation and errors,. Construction of graph, histograms and bar diagrams using data obtained. (A minimum of two sets of data for each of statistical calculation)

12-16: Field oriented projects – to be changed every year:
Visit to Vermiculture farm/silkworm rearing center /Fish farm/ Dairy/ Poultry/ Zoo/ Wildlife sanctuary for on the spot study of culture practice and a report to be submitted.

DSE 1A: PRACTICAL BIOCHEMISTRY AND APPLIED ZOOLOGY (ELECTIVE 1)
SCHEME OF PRACTICAL EXAMINATION

Time 3 hr **Max marks :40**

1. Identify and give the importance of A,B, C, D and E 3 X 5 = 15
(One from each practical 5-9)
(Vermicompost/ silkworm egg sheet/ larvae/ cocoons/ rearing equipment/honey bee/ fish)

2.Computation of mean, mode median and standard deviation of the given data/preparation of Histogram of the given data. 5

3. Report on the field work 5

4. Demonstration of the presence or absence of proteins/ carbohydrates/ lipids/normal or Abnormal constituent of urine byconducting 3 tests. Presenting the results and 5 X 2= 10
Writing the procedure (2 compounds by lots from Pr. 1 – 4).

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DSE 1A: PRACTICAL BIOCHEMISTRY AND APPLIED ZOOLOGY (ELECTIVE 1)
SCHEME OF VALUATION

1. Identification-1, diagram -1, comment -1

2. Calculation procedure, results histogram - 5

3. Field report-5

4. Detection-3, principle and procedure 2 per compound,

5. Class Record - 5

V SEM ZOOLOGY
DSE 1A: ENDOCRINOLOGY AND REPRODUCTION (ELECTIVE 2)
4hr/weekx16=64 hr

UNIT I: 12hr

Human Endocrine System:
Concepts of autocrine, paracrine, and endocrine secretions, types of hormones, role of hormones in
homeostasis,
Morphology, hormones and their actions of pituitary, thyroid, parathyroid, adrenals, pancreas and
pinealglands; Neuro-hormones – hypothalamic releasing factors and their actions. Types of hormone receptors.

UNIT II 6hr

Types of hormone receptors, outlines of mechanism of hormone action (cAMP pathway and genomic action)

UNIT III 10hr

Human endocrine disorders- Causes and symptoms of Gigantism, dwarfism, acromegaly, diabetesInsipidus, cretinism, Grave's disease, Goiter, diabetes mellitus, Cushing's syndrome, Adison's disease

UNIT III 12 hr.

Reproductive physiology**:** Functional morphology of mammalian testis and ovary, gonadal hormones, brief description of male and female accessory reproductive organs and their role in reproductive process.
Hormonal Control of Reproduction**:**,actions of male (testosterone) and female gonadal(estrogen and
progesterone) hormones; Human menstrual cycle, Role of hormones in menstrual cycle. Brief account of early onset of puberty vs food and lifestyle in both sexes.

UNIT III 12hr

Modern trends in human reproduction:
a)Fertility control: Population explosion: meaning and causes, Need for birth control,Contraception – rhythm method, pills, diaphragm, IUD, condoms, coitus interruptus, sterilization.

b)Assisted Reproductive Technology:*Invitro*fertilization, Test tube baby, artificial insemination,
GIFT, ZI FT,sperm banks. Ethical issues of test tube baby.

Unit VII 12hr

Histology
Primary tissues (Epithelium, connective)**,** Histological organization of liver, stomach, intestine,pancreas (exocrine) and kidney.

V SEM ZOOLOGY

DSE 1: PRACTICAL ENDOCRINOLOGY AND REPRODUCTION
4hr/week/16=64 hr

1. Study of permanent slides of mammalian endocrine glands – Pituitary,Thyroid, adrenal, and pancreas.

2 and 3. Study of permanent histology slides of mammals (Rat/ Rabbit / Sheep): Intestine, stomach, liver,Pancreas, kidney, testes and ovary .

4, and 5: Microtomy:demonstration of Preparation of paraffin sections of 5 organs – intestine, liver, Pancreas, kidney, testis/ ovary of a mammal (Slaughterhouse specimen- Sheep)

6and 7: Staining of paraffin sections of different organs.

8 and 9: Histometry: Measurement of diameter of the thyroid follicles, adrenal cortex, and seminiferous tubules

10. Collection of Indian population, data based on census records and plotting a graph to show growth rate.

11 and 12: Identification of various family planning devices, their mode of application and understanding Underlying principle

13 & 14 Visit to fertility clinic/IVF centers and preparation of report on types of fertility problems and their remedies.

15, 16 Visit to Veterinary hospitals to study artificial insemination and preparation of report

SCHEME OF PRACTICAL EXAMINATION

Time: 3 Hrs. **Max. Marks:40**

1. Identify with reasons the slide A to E (Pr.1, 2,3,4,5)	3 X 5 = 15
2. Identify and comment on F (Pr. 11 and 12)	3 X 1= 03
3. Stain, mount and identify with reasons the paraffin sections provided.	10
4. Measurement of the diameter of the thyroid follicle/seminferous tubule/adrenal cortex	07
5. One report on field study	05

SCHEME OF VALUATION FOR PRACTICAL VI

1 Identification -1, diagram- 1, reason -1
2 Identification -1, comments-2
3 Identification -2, diagram -3, staining -5
4 Procedure including calibration -5, results- 2,
5 Field report-5.

VI SEMESTER : ZOOLOGY
DSE 1B : MOLECULAR CELL BIOLOGY,EVOLUTION AND ETHOLOGY
(ELECTIVE 1)
4hr/weekX16=64 hr

UNIT I **10hr**

Molecular Biology

Replication of DNA in prokaryotes; Structure and types of RNA (r RNA, mRNA,tRNA) and functions; regulation of gene expression in prokaryotes-lac operon

Genetic engineering: History, restriction endonucleases, ligases, vectors (pBR322,T-DNA), cDNA library,cloning,PCR, Bioinformatics

Biotechnology: Transgenic animals, monoclonal antibodies, gene therapy, Human genome project

UNIT II: **10hr**

Cancer Biology

Cell cycle, Cell division, Concept of cancer, Types of tumors- Benign and Malignant and their Characteristics, characteristics of cancer cell, types of cancers, oncogenes, carcinogenic agents (physical,
chemical and biological), cancer therapy.

UNIT III **10 hr**

Immunology:

Natural and artificial immunity, Humoral and cell mediated immunity,structure of immunoglobulin(IGg)
and types; B and T- lymphocytes and the immune response – precipitation of soluble antigens, agglutination, complement fixation, clonal selection theory, immunological memory, major histocompatiability complexes (MHC) – antigen and immune response, auto-immune diseases – Sedormid
purpurea, Systemic Leupus Erythematosus (SLE), Rheumatoid arthritis (RA)

EVOLUTIONARY BIOLOGY

UNIT IV

Organic Evolution and Population Genetics: **12 hr**

Concept of organic evolution, Evidences for organic evolution: Indirect evidences from comparative
morphology, anatomy, connecting links (Peripatus, Neoceratodus, Archeopteryx), homology (ex: vertebrate
forelimb skeleton), analogy (wings of insect and bird), vestigial organs (human examples), physiology and
biochemistry – enzymes, hormonal, excretory product analysis and embryology; Direct evidences from
palaeontology – nature and types of fossils; Brief account of Dinosaurs.

Lamarckism, Darwinism and modern synthetic theory.

Mendelian population, gene pool and gene frequency, Hardy-Weinberg law – genetic equilibrium, factors

influencing allele frequency – natural selection – directional, aritificial, mutation, meiotic drive, migration
pressure, random genetic drift, founder principle, bottle neck phenomenon.
Geological time scale, mentioning the dominant groups of animals of each period.

UNIT V **12hr**

1. Speciation:
Definition, types – instantaneous – polyploidy, gradual – allopatric and sympatric speciation.
Isolation – types – geographical and reproductive isolation, role of isolating mechanism in speciation.

2. Evolutionary history of man

3. Adaptations: Aquatic adaptations: primary (Shark) and secondary (Turtle); Volant adaptations; active (Bat) and passive flights (Draco); Arboreal adaptations – chameleon; Desert adaptations; Phrynosoma,camel; Deepsea adaptations. Colouration – types and Mimicry – Batsian, Mullerian,

ETHOLOGY

UNIT VI **10hrs**

Animal Behaviour: Definition with examples: Innate behaviour–taxes, reflexes, instincts and motivation.
Learned behavior – habituation, imprinting, conditioned reflexes and insight learning, Pheromones in insects.

Biological clock: Definition and examples of Circadian, circannual and circalunar rhythms, entrainment, Zeitgebers, Role of pineal and hypothalamus in rhythms

Parental care: definition and significance, types of parental care with examples

VI SEMESTER: ZOOLOGY
DSE 1B: PRACTICAL MOLECULAR CELL BIOLOGY, ETHOLOGY AND EVOLUTIONARY BIOLOGY
4hr/weekx16=32 hr

1. Micrometry: Use of ocular and stage micrometers to measure cell and nuclear dimensions.
2. Isolation of DNA from animal / plant tissues (Mulberry leaf / Coconut endosperm)-Demonstration
3. Estimation of RNA by Orcinol method-demonstration.
4. Calculation of allele frequency – PTC, tongue rolling, attached ear lobes in human.
5. Calculation of allele frequency. ABO blood group in humans.
6. Homologous organs: Serial homology in Crustacea – Appendages of Prawn.
7. Homologous organs: Mouth parts of insects and forelimbs of vertebrates.
8. Analogous organs: Wings of insects and birds
9. Study of aquatic adaptations;Shark,frog,turtle,duck,whale
10. Study of arboreal adaptations – Chameleon, Loris, sloth,Rhacophores
11. Study of Volant adaptations - Dragon fly, Pigeon, Bat, Exocoetes and Draco.
12. Coloration and mimicry-leaf insect, stick insect,Geomatridcaterpillar,rat snake
13. Deep sea and desert adaptations: Antennarius, Flat fish, Phrynosoma, Kangaroo rat

14,15,16: Field study to collect data on different genetic traits (tongue role, attached ear lobe, ABO blood
Group,thumb, and calculation of allelic frequency and submission of report)

SCHEME OF PRACTICAL EXAMINATION

Time: 3 Hrs. **Max. Marks:40**

1. Measurement of cell/nuclear diameter and calculating	06
2. Calculation of allelic frequency(from practical 4 and 5)	05
3. Identification and comments on significance on A to C(from pr 6-8)	3x3=09
4. Identify and comment on adaptive significance of D to H (from 9-13)	3X5=15
5. Report on field study (one)	05

SCHEME OF VALUATION

1. Procedure &,calibration 5 and results 1
2. Procedure result 5
3. Procedure 5, result 5
4. Identification 1, diagram 1, comments 1
5. Class record & Field report 05

V I SEM ZOOLOGY

DSE 1B: ENVIRONMENTAL BIOLOGY (ELECTIVE 2)

4hr/weekX16=64 hr

UNIT I **12hr.**

Ecology – Definition, sub-divisions and scope; **Environment** – Types: composition and strata of Atmosphere, hydrosphere and lithosphere; **Ecological factors**: Abiotic and biotic; **Abiotic factors** – light, temperature (thermal stratification), topographic(latitudes and altitudes); **Biotic factors** – Animal relationships with relevant examples: Intra specific- co-action, aggregation and competition,
Gause's principle; Interspecific: positive interaction – mutualism, commensalism, proto cooperation; negative interactions – parasitism, predation, and competition.

UNIT II **14hr.**

1. Biogeochemical Cycles and Food chain
Definition, complete and incomplete cycles, Nitrogen and phosphorous cycles
Food chains: types of food chains with examples and food web with examples. Ecological pyramids (number,
biomass and energy) with examples.
Energy – energy flow and laws of thermodynamics.

2. Population and Community Ecology:
Population ecology – Density – Natality and Mortality, age distribution. Community ecology – types of
communities and community structure, bio-indicators of aquatic ecosystem, ecotone and edge effect.
Ecological succession – basic types - primary and secondary, climax community.

UNIT III **12 Hrs.**
Ecosystem
Concept, types and structure of ecosystem, natural, human engineered and micro –ecosystems. **Fresh**
water ecosystem –physico-chemical nature of fresh water. Lentic and lotic ecosystems
withexamples. The tropical pond as an ecosystem – abiotic components, producers, consumers and
decomposers, interaction between components.
Terrestrial ecosystem –physico-chemical nature, soil profile, classification, biomes: forest, grassland**,**
desert, and characteristic fauna.

UNIT IV **14hr**

Environmental Pollution

Definition and types – air, water, soil and sound pollutions.

Sources, effects and control of air, and water pollution with special mention of greenhouse effect, ozone

depletion, photochemical smog, acid rain, stone leprosy. Ganga river pollution, mass death of fishes in lakes,;

Legislation for environment protection in India, Pollution control board in Karnataka-functions

UNIT V **12hr**

Zoogeography and Wild life conservation

Zoogeographical realms and their characteristic fauna. Detailed account of fauna of oriental region, a brief account of Wallace's line.

Wildlife Depletion: Hunting, over-harvesting, developmental activities

Wildlife Conservation: conservation strategies (*in situ*and*ex situ*), agencies engaged in wildlife conservation,

Government organizations and non-government organizations (NGOs). Wildlife (Protection) Act 1972, CITES

(Convention on International Trade in Endangered Species of wildlife flora and fauna), Endangered fauna of India, Red data book.

V I SEM ZOOLOGY
DSE 1B: PRACTICAL ENVIRONMENTAL BIOLOGY (ELECTIVE 2)
4hr/week x16 = 64 hr

1&2.: Collection of water samples from different sources (pond, river, ground water, etc.) and recording color, odour,pH and temperature.
3. Estimation of dissolved oxygen in two water samples.
4. Estimation of BOD in two water samples (sewage and tapwater/river water)
5. Estimation of dissolved carbon dioxide in two water samples.
6. Estimation of chloride content in two water samples.
7. Estimation of hardness of two water samples.
8. and 9. Study of pond ecosystem – observation of various constituents, plankton, fauna and flora.
10. Study of artificial ecosystem-aquarium
11. and 12: Study of garden soil fauna using Berlesse funnel apparatus.
13. Positive animal interactions: Mutualism – Termite and Trichonympha,Commensalism – Echeineis and Shark, Proto co-operation – Hermit crab and Sea anemone.
14. Negative animal interactions: Parasitism – Head louse, Bedbug, Female mosquito, Ticks and mites. Predation – Snake and Frog.
15.&16: Field visits to assess the pollution status of water bodies based onodour, water colour, release of sewage etc. Solid waste accumulation and disposal status /collection of data on air pollution from different agencies and preparation of report.

DSE 1B: PRACTICAL ENVIRONMENTAL BIOLOGY (ELECTIVE 2)
SCHEME OF PRACTICAL EXAMINATION

Time: 3hr **40 marks**

1.Estimation of the biological sample, any two estimations (from practical 3-7)	9X2=18
2.Comment on spot A (from practical 10, 11, 12)	5X1=05
3.Identify and comment on B-E (two each from practicals13&14)	3 X 4=12
4. Report on field visit	05

SCHEME OF VALUATION

1. Principle and procedure, results, comments -9 per estimation
2. Identification-2, diagram -3, comments - 5
3.Identification-1,diagram -1, comments-3
4. Field report- 5

SKILL ENHANCEMENT COURSES
V SEM ZOOLOGY
SEC 1: APICULTURE
2hr/week X 16 = 32

Unit 1: Biology of Bees 5hr

History, classification and biology of honeybees.
Social organization of bee colony, honeybee foraging plants.

Unit 2: Rearing of Bees 12hr

Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth Bee
Pasturage
Selection of Bee species for Apiculture
Bee keeping equipment.
Methods of extraction of honey (Indigenous and Modern).

Unit 3: Diseases and Enemies 5hr

Bee diseases and enemies.
Control and preventive measures

Unit 4: Bee economy 4hr

Products of Apiculture industry and its uses (honey, bee wax, propolis), pollen, etc.

Unit 5: Entrepreneurship in Apiculture 6hr

Bee keeping industry – recent efforts, modern methods in employing artificial
Bee hives for cross-pollination in horticultural gardens.

SKILL ENHANCEMENT COURSES
VI SEM ZOOLOGY
SEC 2: AQUARIUM FISH KEEPING
2hr/week X 16 = 32

Unit 1: Introduction to aquarium fish keeping 6hr

The potential scope of aquarium fish industry as a cottage industry, exotic and endemic species of aquarium fishes (List of common fishes).

Unit 2: Biology of aquarium fishes 8 hr

Common characters and sexual dimorphism of fresh water and marine aquarium fishes such as Guppy, Molly, Swordtail, Gold fish, Angelfish, Blue morph, Anemone fish and Butterfly fish.

Unit 3: Food and feeding of aquarium fishes 6 hr
Use of live fish feed organisms. Preparation and composition of formulated fish feeds.

Unit 4: Fish and transportation 6 hr
Live fish transport – fish handling, packing and forwarding techniques.

Unit 5: Maintenance of aquarium 6 hr
General aquarium maintenance – budget for setting up an aquarium fish farm as a cottage industry.

THEORY QUESTION PAPER PATTERN

FOR DSC AND DSE PAPERS

Time: 3 hours **Max. marks=70**

I. Explain or define the following: **1X5=5**

1.

2.

3.

4.

5.

II Write short notes on any FIVE (out of seven): **3X5=15**

6.

7.

8.

9.

10.

11.

12.

III Write critical notes on any FOUR (out of six): **5X4=20**

13.

14.

15.

16

17.

18.

IV Write a detailed account of any THREE (out of four): **10X3=30**

19.

20.

21.

22.

THEORY QUESTION PAPER PATTERN

FOR SEC PAPERS

Time: 3 hours **Max. marks = 50**

I. Explain or define the following: **1X3=3**

1.

2.

3.

II Write short notes on any FOUR (out of six): **3X4=12**

4.

5.

6.

7.

8.

9.

III Write critical notes on any THREE (out of five): **5X3=15**

10.

11.

12.

13.

14.

IV Write a detailed account of any TWO (out of three): **10X2=20**

15.

16.

17.

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