S.Y.B.Sc Zoology

Draft Syllabus (2018-2019) for Public Criticisms and Suggestion

Suggestion to be mailed on the Email-ID given below on or before 7th Dec 2017

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UNIVERSITY OF MUMBAI

Program: S.Y.B. Sc.

Course: Zoology Proposed Syllabus

(Credit Based Semester and Grading System with effect from the academic year 2018-2019) .

Syllabus for S.Y.B.Sc.
Course – ZOOLOGY

To be implemented from Academic year 2018-19
SEMESTER – III

COURSE CODE	UNIT	TOPIC	CREDITS	LECTURES /WEEK
USZO301	I	Fundamentals of Genetics	2	1
	II	Chromosomes and Heredity		1
	III	Nucleic acids		1
USZO302	I	Study of Nutrition and Excretion	2	1
	II	Study Respiration and circulation		1
	III	Control and coordination, Locomotion and Reproduction		1
USZOE303A	I	Ethology	2	1
ELECTIVE 1	II	Parasitology		1
	III	Economic Zoology		1
USZOE303B	1	Aquarium maintenance	**2**	1
ELECTIVE 2	II	Agricultural pests and their control		1
	III	Amazing animals		1
USZOP3	Practical based on all three courses		**03**	**9**

SEMESTER IV

COURSE CODE	UNIT	TOPIC	CREDITS	LECTURES /WEEK
USZO401	I	Origin and evolution of Life	2	1
	II	Population genetics and evolution,		1
	III	Scientific Attitude methodology , writing and ethics		1
USZO402	I	Cell Biology,	2	1
	II	Endo membrane system		1
	III	Biomolecules		1
USZOE403A	I	Comparative Embryology,	2	1
ELECTIVE 1	II	Aspects of Human Reproduction,		1
	III	Pollution and its effect on organisms		1
USZOE403B	I	Dairy industry	**2**	
ELECTIVE 2	II	Sericulture		
	III	Aquaculture		
USZOP4	Practical based on all three courses		**03**	**9**

Syllabus for
S.Y.B.Sc
Course – ZOOLOGY

1. Syllabus Semester III & IV (Theory and Practical)
2. References and Additional Reading
3. Scheme of Examination and Paper Pattern (Theory and Practical)
4. Model Question bank

	S.Y.B.Sc. ZOOLOGY UNIT WISE DISTRIBUTION						
Semester III				Semester IV			
Course 5	Course 6	Course 7	Course 7	Course 8	Course 9	Course 10	Course 10

		A	B			A	B
Unit 1 Fundamentals of Genetics	**Unit 1** Study of Nutrition & Excretion	**Unit 1** Ethology	**Unit 1** Aquarium maintenance	**Unit 1** Origin & evolution of life	**Unit 1** Cell Biology	**Unit 1** Comparative Embryology	**Unit 1** Dairy industry
Unit 2 Chromosomes & Heredity	**Unit 2** Study of Respiration & circulation	**Unit 2** Parasitology	**Unit 2** Agricultural pests & control	**Unit 2** Population Genetics & Evolution	**Unit 2** Endomembrane System	**Unit 2** Aspects of Human Reproduction	**Unit 2** **sericulture**
Unit 3 Nucleic Acids	**Unit 3** Control and Coordination Locomotion & Reproduction	**Unit 3** Economic zoology	**Unit 3** Amazing animals	**Unit 3** Scientific Attitude, Methodology, Writing & Ethics	**Unit 3** Biomolecules	**Unit 3** Pollution & Effects on Animals	**Unit 3** Aquaculture
Practical (USZO P3)	**Practical (USZO P3)**	**Practical (USZO P3)**	**Practical (USZO P3)**	**Practical (USZO P4)**	**Practical (USZO P4)**	**Practical (USZO P4)**	**Practical (USZO P4)**

S.Y.B.Sc. SYLLABUS DRAFT

SEMESTER III

Sr.	USZO301 COURSE-5	No. of lect	Learning

No		allotted	pleasure
	Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids		
	Unit 1: Fundamentals of Genetics	**15L**	**25hrs**
	Objectives: • To introduce basic terms of genetics. • To study Mendelian principles of inheritance and other forms and pattern of inheritance		
	Desired outcomes: • Learner shall comprehend and apply the principles of inheritance to study heredity. • Learner will understand the concept of multiple alleles, linkage and crossing over.		
1.1	**Introduction to Genetics** • Definition, Scope and Importance of genetics. • Classical and Modern concept of Gene (Cistron, Muton, Recon). • Brief explanation of the following terms: Allele, Wild type and Mutant alleles, Locus, Dominant and Recessive traits, Homozygous and Heterozygous, Genotype and Phenotype, Genome.	**02L**	**02hrs**
1.2	**Mendelian Genetics** • Mendelian Genetics: Monohybrid cross, Dihybrid cross, Test cross, Back cross, Mendel's laws of Inheritance, Mendelian traits in man. • Exceptions to Mendelian inheritance: Incomplete dominance, Co-dominance, Lethal alleles, Epistasis - Recessive, Double recessive, Dominant and Double dominant. • Chromosome theory of inheritance. • Pedigree Analysis-Autosomal dominant and Autosomal recessive, X-linked dominant, and X-linked recessive.	**08L**	**12hrs**
1.3	**Multiple Alleles and Multiple Genes** • Concept of Multiple alleles, Coat colour in rabbit, ABO and Rh blood group systems • Polygenic inheritance with reference to skin colour and eye colour in man. • Concept of Pleiotropy.	**03L**	**06hrs**
1.4	**Linkage and Crossing Over** • Linkage and crossing over, Types of crossing over, Cytological basis of crossing over.	**02L**	**05hrs**
	Unit: 2: Chromosomes and Heredity	**15L**	**26hrs**
	Objectives: • To familiarize the learners with the structure, types and classification of chromosomes. • To introduce the concept of sex determination and its types, sex influenced and sex limited genes.		
	Desired outcomes: • Learner will comprehend the structure of chromosomes and its types. • Learner shall understand the mechanisms of sex determination. • Learner would be able to correlate the disorders linked to a particular		

	sex chromosome.		
2.1	**Chromosomes** • Types of chromosomes–Autosomes and Sex chromosomes • Chromosome structure - Heterochromatin, Euchromatin • Classification based on the position of centromere • Endomitosis, Giant chromosomes- Polyteneand Lamp brush chromosomes and Significance of Balbiani rings	**04L**	**08hrs**
2.2	**Sex- determination** • Chromosomal Mechanisms: XX-XO, XX-XY, ZZ-ZW • Sex determination in Honey bees- Haplodiploidy • Sex determination in *Drosophila*-Genic balance theory, Intersex, Gynandromorphs • Parthenogenesis • Hormonal influence on sex determination-Freemartin and Sex reversal. • Role of environmental factors- Bonelia and Crocodile • Barr bodies and Lyon hypothesis	**07L**	**10hrs**
2.3	**Sex linked, sex influenced and sex limited inheritance.** • X-Linked: Colour-blindness, Haemophilia • Y-linked: Hypertrichosis • Sex-influenced genes • Sex limited genes	**04L**	**08hrs**
	Unit: 3 Nucleic acids	**15L**	**30hrs**
	Objectives: • To introduce the learner to the classical experiments proving DNA as the genetic material. • To make the learner understand the structure of nucleic acids and the concept of central dogma of molecular biology. • To familiarize the learner with the concept of gene expression and regulation.		
	Desired outcomes: • Learner will understand the importance of nucleic acids as genetic material. • The learner shall comprehend and appreciate the regulation of gene expressions.		
3.1	**Genetic material** • Griffith's transformation experiments, Avery-Macleod and McCarty, Hershey Chase experiment of Bacteriophage infection • Chemical composition and structure of nucleic acids • Double helix nature of DNA, Solenoid model of DNA • Types of DNA – A, B, Z & H forms • DNA in Prokaryotes -chromosomal and plasmid • Extra nuclear DNA -mitochondria and chloroplast • RNA as a genetic material in viruses • Types of RNA: Structure and function	**07L**	**14hrs**
3.2	**Flow of genetic information in a Eukaryotic cell** • DNA Replication • Transcription of mRNA • Translation • Genetic code	**05L**	**08hrs**

3.3	**Gene Expressions and regulation** • One gene-one enzyme hypothesis /one polypeptide hypothesis • Concept of Operon • Lac Operon	**03L**	**08hrs**
	SEMESTER III		
	Practical USZOP3 (Course V)		
1	Extraction and detection of DNA		
2	Extraction and detection of RNA.		
3	Mounting of Barr bodies.		
4	Study of polytene chromosome.		
5	Study of mitosis- temporary squash preparation of Onion root tip		
6	Detection of blood groups and Rh factor.		
7	Problems in Genetics a. Monohybrid/ Dihybrid cross b. X- linked inheritance c. Multiple alleles		
8	Chromosome morphology: Metaphase spreadsheet (photograph to be provided)		
9	Pedigree analysis		
10	Problems on molecular biology		

Sr. No	USZO302 COURSE-6	No. of lect allotted	Learning pleasure
	Study of Nutrition and Excretion , Respiration and circulation, Control and coordination, Locomotion and Reproduction		
	Unit: 1 Study of Nutrition and Excretion	**15L**	**23hrs**
	Objectives: • To introduce the concepts of physiology of nutrition, excretion and osmoregulation. • To expose the learners to various nutritional apparatus, excretory¬ and osmoregulatory structures in different classes of organisms.		
	Desired outcomes: • Learner would understand the increasing complexity of¬ nutritional, excretory and osmoregulatory physiology in evolutionary hierarchy. • Learner would be able to correlate the habit and habitat with¬ nutritional, excretory and osmoregulatory structures. Comparative study of Nutritional Apparatus (structure and function)		
1.1	Amoeba, Hydra, Cockroach, Amphioxus, Pigeon, Ruminants. 5L 06hrs Physiology of digestion in man	**05L**	**06hrs**
1.2	• Physiology of digestion in man	**02L**	**04hrs**
1.3	• Comparative study of Excretory and Osmoregulatory structures and function. • a) Amoeba -contractile vacuoles • b) Planaria -Flame cells • c) Cockroach-Malphigian tubules and green gland	**05L**	**08hrs**
1.4	Categorization of animals based on principle nitrogenous excretory products	**01L**	**01hrs**
1.5	Structure of kidney, Uriniferous tubule and physiology of urine formation in man	**02L**	**04 hr**
	Unit: 2: Study of Respiration and Circulation	**15L**	**27hrs**
	Objectives: • To introduce the concepts of physiology of respiration and¬ circulation • To expose the learner to various respiratory and circulatory¬ structures in different classes of organisms		
	Desired outcomes: • Learner would understand the increasing complexity of respiratory¬ and circulatory physiology in evolutionary hierarchy. • Learner would be able to correlate the habit and habitat with¬ respiratory and circulatory structures. Comparative study of Respiratory organs (structure and function).		
2.1	• Earthworm, Spider, Rohu/Anabus/Clarius, Frog and Pigeon. 3L 06hrs Accessory respiratory structures: Anabas /Clarius	**03L**	**06hrs**
2.2	• Structure of lungs and physiology of respiration in man	**02L**	**03hrs**
2.3	• Comparative study of circulation: Open and closed - single and double	**02L**	**04hrs**

2.4	• Types of circulating fluids- Water, coelomic fluid, haemolymph,¬ lymph and blood	**02L**	**03hrs**
2.5	• Comparative study of Hearts (Structure and function)¬ Earthworm, Cockroach, Shark, Frog, Crocodile and Pigeon	**04L**	**07hrs**
2.6	• Structure and mechanism of working of heart in man	**02**	**04hrs**
	Unit: 3 Control and coordination, Locomotion and Reproduction	**15L**	**25hrs**
	Objectives: • To introduce the concepts of physiology of control and coordination¬ and locomotion and reproduction • To expose the learner to various locomotory and reproductive¬ structures in different classes of organisms		
	Desired outcomes: • Learner would understand the process of control and coordination¬ by nervous and endocrine regulation. • Learner would be fascinated by various locomotory structures¬ found in the animal kingdom. • Learner would be acquainted with various reproductive strategies¬ present in animals.		
3.1	**Control and coordination** • **Irritability**-Paramoecium, Nerve net in Hydra, Nerve ring and¬ nerve cord in earthworm • Types of neurons on the basis of structure and function¬ • Conduction of nerve impulse: Resting potential, action potential and¬ refractory period • Synaptic transmission	**05L**	**08hrs**
3.2	**Movement and Locomotion** • **Locomotory organs-** structure and functions; a. Pseudopodia in Amoeba (sol gel theory), Cilia in Paramecium b. Wings and legs in Cockroach c. Tube feet in Starfish d. Fins of fish	**04L**	**08hrs**
3.3	Structure of Striated muscle fibre in human and Sliding filament theory	**02L**	**02hrs**
	Reproduction a. Asexual Reproduction- Fission, fragmentation, gemmule formation, budding b. Sexual reproduction i. Gametogenesis ii. Structure of male and female gametes in human iii. Types of fertilization iv. Oviparity, viviparity, ovo-viviparity	**04L**	**07hrs**
	SEMESTER III		
	Practical USZOP3 (Course VI)		
1	Urine analysis—Normal and abnormal constituents		

2	Detection of ammonia in water excreted by fish		
3	Detection of uric acid from excreta of Birds		
4	Study of striated and non-striated muscle fibre		
5	Study of nutritional Apparatus (Amoeba, Hydra, Earthworm, Pigeon, Ruminant stomach)		
6	Study of respiratory structures: a. Gills of Bony fish and Cartilaginous fish. b. Lungs of Frog c. Lungs of Mammal. d. Accessory respiratory structure in Anabas (Labyrinthine organ) e. Air sacs of Pigeon.		
7	Study of locomotory organs (Amoeba, Unio, Cockroach, Starfish, Fish, and Birds)		
8	Study of hearts (Cockroach, Shark, Frog, Calotes, Crocodile, Mammal)		
9	Study of permanent slides on topic of Reproduction a. Sponge gemmules b. Hydra budding c. T.S. of mammalian testis d. T.S. of mammalian ovary		

	USZOE1303 COURSE-7A		
	Ethology , Parasitology, Economic Zoology	**15L**	**26hrs**
	Unit: 1 Ethology		
	Objective: ➢ *To equip learners with a sound knowledge of how animals interact with one another and their environment.* ➢ *To enable the learners to understand different behavioural patterns.*		
	Desired Outcome: ➢ *Learners would gain an insight into different types of animal behaviour and their role in biological adaptations.* ➢ *Learners would be sensitized to the feelings instrumental in social behavior.*		
1.1	**Introduction to Ethology** ➢ Definition, History and Scope of Ethology ➢ Animal behaviour - Innate and Learned behaviour ➢ Types of learning-Habituation, Imprinting and types of imprinting -filial and sexual, Classical conditioning ➢ Instrumental learning and insight learning.	**4L**	**06hrs**

1.2	**Aspects of animal behaviour** ➢ Communication in Bees and Ants ➢ Mimicry and colouration ➢ Role of hormones and pheromones in sexual behaviour ➢ Displacement activities, Ritualization ➢ Migration in fish, schooling behaviour ➢ Habitat selection, territorial behaviour, food selection and foraging behaviour in African ungulates	**7L**	**12hrs**
1.3	**Social behaviour** ➢ Social behaviour in primates-Hanuman langur ➢ Elements of Socio-biology: Selfishness, cooperation, altruism, kinship and inclusive fitness	**4L**	**08hrs**
	Unit: 2 Parasitology	**15L**	**27hrs**
	Objective: ➢ *To acquaint learners with the concepts of parasitism, their relationship with environment.* ➢ *To make learners aware about the modes of transmission of parasites.*		
	Desired Outcome: ➢ *Learners would understand the general epidemiological aspects of parasites that affect humans and apply simple preventive measures for the same.* ➢ *Learners would comprehend the life cycle of specific parasites, the symptoms of the disease and its treatment.*		
2.1	**Introduction to Parasitology and types of parasites** ➢ Definitions: parasitism, host, parasite, vector-biological and mechanical ➢ **Types of parasites-** Ectoparasites, Endoparasite and their subtypes ➢ Parasitic adaptations in Ectoparasites and Endoparasites ➢ Types of hosts: intermediate and definitive, reservoir	**3L**	**06hrs**
2.2	**Host-parasite relationship-Host specificity** ➢ Definition, structural specificity, physiological specificity and ecological specificity.	**2L**	**06hrs**
2.3	**Life cycle, pathogenicity, control measures and treatment** ➢ *Entamoeba histolytica, Fasciola hepatica, Taenia solium, Wuchereria bancrofti*	**4L**	**06hrs**
2.4	**Morphology, life cycle, pathogenicity, control measures and treatment** ➢ Head louse(*Pediculushumanus capitis*), Mite (*Sarcoptesscabei),* Bed bug (*Cimexlectularis)*	**2L**	**06hrs**
2.5	**Parasitological significance** ➢ Zoonosis- Bird flu, Anthrax, Rabies and Toxoplasmosis	**4L**	**03hrs**
	Unit 3 Economic Zoology	**15L**	**24hrs**
	Objective: ➢ *To disseminate information on economic aspects of zoology like apiculture, vermiculture, dairy science.* ➢ *To encourage young learners for selfemployment.*		
	Desired Outcome:		

	➢ *Learners wouldgain knowledge on animals useful to mankind and the means to make the most of it.* ➢ *Learners would learn the modern techniques in animal husbandry.* ➢ *Learners would be pursuing entrepreneurship as careers*		
3.1	**APICULTURE**	**6L**	**08hrs**
3.1.1	**Methods of bee keeping and management** ➢ An introduction to different species of honey bees used in apiculture. ➢ Selection of flora and bees for apiculture. ➢ Advantages and disadvantages of traditional and modern methods of apiculture. ➢ Pests and Bee enemies- Wax moth, wasp, black ants, bee-eaters , king crow and disease control		
3.1.2	**Economic importance** ➢ Honey- Production, Chemical composition and economic importance ➢ Bees wax- Economic importance. ➢ Role of honey bees in pollination.		
3.2	**VERMICULTURE**	**4L**	**08hrs**
3.2.1	**Rearing methods, management and economic importance** ➢ An introduction to different species of earthworms used in vermiculture. ➢ Methods of vermiculture. ➢ Maintenance and harvesting ➢ Economic importance: advantages of vermiculture, demands for worms; market for vermin-compost and entrepreneurship.		
3.3	**DAIRY SCIENCE**	**5L**	**08hrs**
3.3.1	**Dairy development in India** ➢ Role of dairy development in rural economy, employment opportunities	**1L**	
3.3.2	**Dairy Processing** ➢ Filtration, cooling, chilling, clarification, pasteurization, freezing		
3.3.3	**Milk and milk products** ➢ Composition of milk ➢ Types of milk: A. Buffalo milk and B. Cow milk (a1 and a2) Whole milk and toned milk ➢ Milk products		

	SEMESTER III		
	Practical USZOE1P3 (Course VIIA)		
1	Extraction of Casein from Milk and its qualitative estimation		
2	Preparation of paneer from given milk sample		
3	Measurement of density of milk using different samples by Lactometer		
4	Study of Honey Bee : a) Life Cycle of Honey Bee and Bee Hive b) Mouthparts of Honey Bee c) Legs of Honey Bee d) Sting Apparatus of Honey Bee		
5	Study of ethological aspects: a) Warning Colouration b) Instincts c) Imprinting d) Communication in animals: Chemical signals and sound signals e) Displacement activities in animals: Courtship and mating behavior in animals and ritualization		
6	Study of Protozoan parasites: a. *Trypanosoma gambiense* *b. Giardia intestinanalis*		
7	Study of Helminth parasites: *a) Ancylostomaduodenale* *b) Dracunculusmedenensis*		
8	Parasitic adaptations: Scolex and mature proglottid of Tapeworm		
9	Study of Ectoparasites: a. Leech b. Tick c. Mite		
10	Project- Suggested topics on economic zoology (eg Apiculture, sericulture/ lac culture / vermicompost Technique / Construction of artificial beehives /Animal husbandry/ aquaculture etc)		
	USZOE2303 COURSE-7B		
	Aquarium maintenance,Agricultural pests and their control,Amazing animals	**15L**	**26hrs**
	Objective: ➢ *To develop the skill of aquarium maintenance and budget allocation for setting up an aquarium fish farm.* ➢ *To study the biology of aquarium fishes, food, feeding and transportation of fishes.*		
	Desired Outcome: ➢ *Learner will develop the skill of aquarium maintenance and become familiar with the budgeting aspects for setting aquarium fish farm.* ➢ *Learner will derive knowledge about the biology of aquarium fishes as also food, feeding and transportation of fishes.*		

	Unit 1 Aquarium maintenance		
1.1	Introduction and scope	**2L**	**04hrs**
1.2	Exotic and Endemic species	**2L**	**06hrs**
1.3	Biology of Aquarium Fishes-	**2L**	**08hrs**
1.3.1	➢ Guppy ➢ Molly ➢ Gold fish		
1.3.2	Common characters and sexual dimorphism Marine fishes - ➢ Anemone fish ➢ Butterfly fish	**2L**	**6L**
1.3.3 .	Common characters and sexual dimorphism Marine fishes – ➢ Anemone fish ➢ Butterfly fish	**2L**	**4L**
1.4	Food and feeding- ➢ Live fish feed ➢ Formulated fish feed	**2L**	**4L**
1.5	Fish transportation – i)Transport ii) handling iii) packing	**3L**	**5L**
1.6	General Aquarium maintenance- budget for setting up an aquarium Fish Farm.	**2L**	**4L**
	Unit: 2 Agricultural pests and their control	**15L**	**27hrs**
	Objective: ➢ *To study different types of pests.* ➢ *To comprehend various aspects of agricultural pests and their economic implications.* ➢ *To learn about the differing pest control practices and plant protection appliances.*		
	Desired Outcome: ➢ Learner will gain information on the different types of pests and comprehend various aspects of agricultural pests and its economic implications. ➢ Learner shall derive knowledge of pest control practices and appliances used for plant protection against pests.		
2.1	Introduction and concept of Pest	**2L**	**06hrs**
2.1.1 **.**	Types of pests ➢ Agricultural ➢ Household ➢ Stored grains ➢ Structural ➢ Veterinary	**3L**	**06hrs**

	➢ Forestry		
2.2	Major insect pests of agricultural importance (Life cycle, nature of damage and control measures). a) Jowar stem borer b) Brinjal fruit borer c) Aphids d) Mango stem borer e) Pulse beetle f) Rice weevil.	**3L**	**06hrs**
2.3	Non insect pests: Rats and Bandicoots, Crabs, Snails, Slugs, Birds and Squirrels.	**2L**	**06hrs**
2.4	Pest control practices: i) Cultural control ii) Physical control iii) Mechanical control iv) Chemical control v) Biological control, vi) concept of IPM.	**3L**	**03hrs**
2.5	Plant protection appliances: Rotary duster, knapsack sprayer and cynogas pump, hazards of pesticides and antidotes.	**2L**	**03hrs**
	Unit 3 Amazing animals	**15L**	**24hrs**
	Objective: ➢ To comprehend the concept of life timeline, and the natural history of some amazing animals. ➢ To kindle interest and yearning to study amazing animals.		
	Desired Outcome: ➢ *Learner shall understand the concept of life time-line.* ➢ *Learner will gain knowledge of and develop various skills while studying amazing animals.*		
3.1	Natural History a) Introduction and life timeline b) Butterflies the flying jewels- Blue Mormon, Striped tiger c) Herpetofauna of India- Flying frog, Fan Throated lizard and Gharial d) Feathered Bipeds: Kingfisher, Drongo e) Mammals of India: Malabar giant squirrel	**4L**	**08hrs**

3.2	The world's most amazing animals a) Octopus b) Spider c) Mudskipper d) Flying fish e) Pebble toad f) Strawberry poison frog g) Komodo dragon h) Lesser flamingo i) Great white pelican j) Spatule -tailed hummingbird k) Cheetah	**5L**	**10hrs**
3.3	Five most incredible animals discovered within the last decade a) The purple (Joker) Crab, b) The African dwarf sawshark (Stabbing Shark), c) The Psychedelic (Crime Fighting) Gecko, d) The Matilda Viper e) The Michael Jackson Monkey	**3L**	**5hrs**
3.4	Marvels of Animals a) Mantis shrimp: Fastest punch b) Homing in Pacific Salmon c) Sperm whale: Mechanism of deep sea diving.	**3L**	**08hrs**

	Practical USZOE2P3 (Course VIIB)
1	Aquarium maintenance –equipments required to set up –Types of filter, type of gravel, air pump, type of bulb, net, verities of aquarium plants, verities of fishes.
2	Types of pests –Agricultural-Aphids,Household-cockroaches,ants,structural-termites, stored grains-grain borer, Veterinary- fleas, Forestry- caterpillar.
3	Non insect pests- a) Invertebrates -nematodes, mites, snails, slugs. b) Vertebrates- rats, birds
4	Types of pest control –a) Physical b) Biological c) Electronic d) Insecticides, Rodenticides and Special Treatments
5	Amazing animals- a) Spider b) Pebble toad c) Komodo dragon d) Flamingo
6	Most incredible animals in last decades – a) Joker crab b) Michel Jackson monkey c)Matilda viper
7	Most endangered animals of India – a) One horned rhino b) Asiatic Lion c) Bengal tiger d) Snow leopard
8	A project of aquarium setting in lab.
9	A field visit to study the natural flora and fauna.

Note -The practicals may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and asenvisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall beprocured for the purpose of conducting practicals mentioned here-in-above.
#There shall be at least one excursion/field trip.

SEMESTER IV

Sr. No	USZO401 COURSE-8	No. of lect allotted	Learning pleasure
	Origin and Evolution of Life, Population and Evolutionary Genetics, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research.		
	Unit 1: Origin and Evolution of Life	**15L**	**30hrs**
	Objectives: ➢ *To impart scientific knowledge about how life originated and evolved on our planet.*		
	Desired outcomes: ➢ *Learner will gain insight about origin of life.* ➢ *Learner will ponder and critically view the different theories of evolution.*		
1.1	**Introduction** • Origin of Universe • Chemical evolution - Miller-Urey experiment, Haldane and Oparin theory • Origin of Life • Origin of Eukaryotic cell	**05L**	**10hrs**
1.2	**Evidences in favour of Organic evolution** • Evidences from: Geographical distribution, Palaeontology, Anatomy, Embryology, Physiology and Genetics	**04L**	**08hrs**
1.3	**Theories of organic evolution** • Theory of Lamarck • Theory of Darwin and Neo Darwinism • Mutation Theory • Modern Synthetic theory • Weismann's Germplasm theory • Neutral theory of Molecular evolution	**06L**	**12hrs**
	Unit: 2: Population Genetics and Evolution	**15L**	**28hrs**
	Objectives: • To develop knowledge and understanding of genetic variability within a population and how the change in the gene pool leads to evolution of species		
	Desired outcomes: • Learner would understand the forces that cause evolutionary changes in natural populations • Learner would comprehend the mechanisms of speciation • Learner will be able to distinguish between microevolution, macroevolution and megaevolution		
2.1	**Introduction to Population genetics** • Definition • Brief explanation of the following terms: Population, Gene pool, Allele frequency, Genotype frequency, Phenotype frequency, Microevolution	**01L**	**03hrs**

2.2	**Population genetics**	**06L**	**10hrs**
	• Hardy- Weinberg Law • Factors that disrupt Hardy Weinberg equilibrium: Mutation, Migration (Gene flow), Non-random mating (Inbreeding, inbreeding depression, Assortative mating-Positive and Negative, Dis-assortativemating),Genetic drift (Sampling error, Fixation, Bottleneck effect and Founder effect) • Natural Selection • Patterns of Natural Selection • Stabilizing selection • Directional selection (Examples: Peppered moth, Antibiotic resistance in bacteria, Pesticide resistance) • Disruptive selection		
2.3	**Evolutionary genetics** • Genetic variation: Genetic basis of Variation-Mutations and Recombination (crossing over during meiosis, independent assortment of chromosomes during meiosis and random union of gametes during fertilization) • Nature of genetic variations: Genetic polymorphism, Balanced polymorphism, Mechanisms that preserve balanced Polymorphism-Heterozygote advantage and frequency dependent selection, • Neutral variations • Geographic variation (Cline) • Species Concept: Biological species concept and evolutionary species concept • Speciation and Isolating mechanisms**:**Definition and Modes of speciation (Allopatric, Sympatric, Parapatric and Peripatric) • Geographical isolation • Reproductive isolation and its isolating mechanisms (Prezygotic and Postzygotic)	**08L**	**15hrs**
	• Macroevolution and Megaevolution: Concept and Patterns of macroevolution (Stasis, Preadaptation /Exaptation, Mass extinctions, Adaptive radiation and Coevolution), Megaevolution		
	Unit: 3 Scientific Attitude Methodology, Scientific Writing and Ethics in Scientific Research	**15L**	**32hrs**
	Objectives: • To inculcate scientific temperament in the learner		
	Desired outcomes: • The learner shall develop qualities such as critical thinking and analysis • The learner will imbibe the skills of scientific communication and he/she will understand the ethical aspects of research		
3.1	**Process of science:** • A dynamic approach to investigation- The Scientific method ,Deductive reasoning and inductive reasoning, Critical thinking, Role of chance in scientific discovery • Scientific Research: Definition, Difference between method and methodology, Characteristics, Types • Steps in the Scientific Method:Identification of research problem, Formulation of research hypothesis, Testing the hypothesis using	**04L**	**10hrs**

	experiments or surveys, Preparing research/study design including methodology and execution (Appropriate controls, sample size, technically sound, free from bias, repeat experiments for consistency), Documentation of data, Data analysis and interpretation, Results and Conclusions • Dissemination of data:Reporting results to scientific community (Publication in peer- reviewed journals, thesis, dissertation, reports, oral presentation, poster presentation) • Application of knowledge: Basic research, Applied research, Translational research, Patent		
3.2	**Scientific writing:** • Structure and components of a research paper:(Preparation of manuscript for publication of research paper- Title, Authors and their affiliations, Abstract, Keywords and Abbreviations, Introduction, Material and Methods, Results, Discussion, Conclusions, Acknowledgement, Bibliography; Figures, Tables and their legends	**04L**	**10hrs**
3.3	**Writing a review paper** • Structure and components of research report: Report writing, Types of report • Computer application:Plotting of graphs, Statistical analysis of data. Internet and its application in Research-Literature survey, Online submission of manuscript for publication	**03L**	**05hrs**
3.4	**Ethics** • Ethics in animal research:The ethical and sensitive care and use of animals in research, teaching and testing, Approval from Institutional animal ethics Committee • Ethics in clinical research:Approval from Clinical Research Ethics Committee Informed consent • Approval from concerned/ appropriate authorities: National Biodiversity Authority, State Biodiversity Board, Forest Department • Conflict of interest	**03L**	**05hrs**
3.5	**Plagiarism**	**01L**	**02hrs**

	SEMESTER IV		

Sr. No	USZO401 COURSE-8	No. of lect allotted	Learning pleasure
	Practical USZOP4 (Course VIII)		
1	Study of population density by Line transect method & Quadrant method and calculate different diversity indices. A. Index of Dominance B. Index of frequency C. Rarity Index D. Shannon Index E. Index of species diversity		
2	Study of Prokaryotic cells (bacteria) by Crystal violet staining technique		
3	Study of Eukaryotic cells (WBCs) from blood smear by Leishman's stain		
4	Identification and study of fossils a. Arthropods: Trilobite b. Mollusca: Ammonite c. Aves: Archaeopteryx		
5	Identification of a) Allopatric speciation (Cyprinodont species) b) Sympatric speciation (Hawthorn fly and Apple maggot fly) c) Parapatric speciation (Snail)		
6	Bibliography/ Abstract writing		
7	Preparation of Power Point Presentation		

Sr.No.	USZO402 Course IX	No.of lects allotted	Learning pleasure
	Unit 1: Cell Biology	**15L**	**24hrs**
	Objectives: ➢ *To study the structural and functional organization of cell with an emphasis on nucleus, plasma membrane and cytoskeleton.*		
	Desired outcomes: ➢ *Learner would acquire insight of transport mechanisms for the maintenance and composition of cell*		
1.1	**Introduction to cell biology** • Definition and scope • Cell theory • Generalized prokaryotic , eukaryotic cell: size, shape and structure	**02L**	**04hrs**
1.2	**Nucleus** • Size, shape, number and position • Structure and functions of interphase nucleus • Ultrastructure of nuclear membrane and pore complex • Nucleolus: general organization, chemical composition & functions • Nuclear sap/ nuclear matrix¬ • Nucleocytoplasmic interactions	**05L**	**06hrs**
1.3	**Plasma membrane** a. Fluid Mosaic Model b. Junctional complexes c. Membrane receptors d. Modifications: Microvilli and Desmosomes	**04L**	**08hrs**
1.4	**Transport across membrane** a. Diffusion and Osmosis b. Transport: Passive and Active c. Endocytosis and Exocytosis	**02L**	**04hrs**
1.5	Cytoskeletal structures Microtubules: Composition and functions Microfilaments: Composition and functions		
	Unit: 2: Endomembrane System	**15L**	**28hrs**
	Objectives: • To acquaint the learner with ultrastructure of cell organelles and their functions		
	Desired outcomes: • Learner would appreciate the intricacy of endomembrane system. • Learner would understand the interlinking of endomembrane system for functioning of cell		
2.1	**Endoplasmic reticulum:** General morphology of endomembrane system • Morphology and Types of ER • Biogenesis of ER • Functions of RER and SER	**01L**	**03hrs**
2.2	**Golgi complex:** Morphology of Golgi complex, Cytochemistry . • Functions of Golgi complex	**06L**	**10hrs**

	• Protein Glycosylation, • Lipid and Polysaccharide Metabolism • Protein Sorting and Secretion • Golgi anti-apoptotic protein (GAAP)		
2.3	**Lysosomes:** Origin, occurrence and polymorphism Functions of lysosomes: Peroxisomes: Origin, morphology & functions	**08L**	**15hrs**
2.4	**Mitochondria:** Morphology and chemical composition of mitochondria, Bioenergetics, • Chemical energy & ATP • Glycolysis • Krebs cycle • Respiratory chain and Oxidative phosphorylation		
	Unit: 3 Biomolecules	**15L**	**30hrs**
	Objectives: To give learner insight into the structure of biomolecules,¬ and their role in sustenance of life		
	Desired outcomes: The learner will realize the importance of biomolecules and¬ their clinical significance		
3.1	**Biomolecules** : Concept of Micromolecules and Macromolecules	**02L**	**05hrs**
3.2	**Carbohydrates:** Definition Classification, Properties and Isomerism,¬ Glycosidic bond Structure of¬ a. Monosaccharides- Glucose and Fructose b. Oligo-saccharides - Lactose and Sucrose c. Polysaccharides - Cellulose, Starch, Glycogen and Chitin Biological role and their Clinical significance	**04L**	**08hrs**
3.3	• **Amino Acids and Proteins:** Basic structure of amino acid, classification of amino acids, Essential and Non-essential amino acids, Peptide bond, Protein conformation: Primary, Secondary, Tertiary, Quaternary • Types of proteins – Structural (Collagen) and functional proteins (Hemoglobin) role and their Clinical significance	**05L**	**08hrs**
3.4	**Lipids**: Definition, classification of lipids with examples, Ester linkage Physical and Chemical properties of lipids, • Saturated and Unsaturated fatty acids , Essential fatty acids Triacylglycerols, Phospholipids (Lecithin and Cephalin) and Steroids (Cholesterol). • Biological role and their Clinical significance	**04L**	**05hrs**
3.5	**Vitamins**: Water soluble vitamins(e.g. Vit C, Vit B12) • Lipid soluble vitamins (e.g. Vit A, Vit D) • Biological role and their Clinical significance	**02L**	**04hrs**

	SEMESTER IV		
	Practical USZOP4 (Course VIII)		
1	Study of permeability of cell through plasma membrane (Osmosis in blood cells)		
2	Measurement of cell diameter by occulometer (by using permanent slide)		
3	Qualitative tests for carbohydrates (Molisch's test, Benedicts test, Barfoed's test, Anthrone test)		
4	Qualitative tests for protein (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test)		
5	Qualitative test for lipids (Solubility test, Sudan III test)		
6	Study of rancidity of lipids by titrimetric method		
7	Ultra structure of cell organelles (Electron micrographs) a. Nucleus b. Endoplasmic reticulum (Smooth and Rough) c. Mitochondria. d. Golgi apparatus e. Lysosomes		
8.	Study of clinical disorders due to carbohydrates, proteins and lipid imbalance (Photograph to be provided / significance to given and disorder to be identified) a. Hyperglycemia, Hypoglycemia. b. Thalassemia, Kwashiorkar c. Obesity, Atherosclerosis		

	USZOE1403 COURSE-10A		
	Comparative Embryology, Aspects of Human Reproduction, Pollution and its effect on organisms		
	UNIT 1: Comparative Embryology	**15L**	**25hrs**
	Objective: ➢ *To acquaint the learner with key concepts of embryology.*		
	Desired Outcomes: ➢ *Learner will be able to understand and compare the different pre- embryonic stages* ➢ *Learner will be able to appreciate the functional aspects of extra embryonic membranes andclassify the different types of placentae.*		
1.1	➢ Types of Eggs- Based on amount and distribution of yolk	2L	4hrs
1.2	➢ Structure and Types of Sperms	2L	4hr
1.3	➢ Types of Cleavages.- Holoblastic and Meroblastic	2L	4hrs
1.4	➢ Types	1L	4hrs
1.5	➢ Gastrulation	2L	4hrs
1.6	➢ Coelom -Formation and types	4L	6hrs

	UNIT 2: Aspects of Human Reproduction	15L	30 hrs
	Objectives: ➢ *To acquaint the learners with different aspects of human reproduction.* ➢ *To make them aware of the causes of infertility, techniques to overcome infertility and the concept of birthcontrol*		
	Desired Outcome: ➢ *Learners will able to understand human reproductive physiology* ➢ *Learners will become familiar with advances in ART and related ethical issues.*		
2.1	**Human Reproductive system and Hormonal regulation** ➢ Anatomy of human male and female reproductive system ➢ Hormonalregulationof Reproduction and Impact of age on reproduction-Menopause and Andropause	2L	4hrs
2.2	**Contraception & birth control** ➢ Difference between contraception and birth control ➢ Natural Methods: Abstinence , Rhythm method, Temperature method, cervical mucus or Billings method, Coitus interruptus, Lactation amenorrhea ➢ Artificial methods **:** Barrier methods, Hormonal methods, Intrauterine contraceptives, Sterilization, Termination , Abortion	2L	4hrs
2.3	**Infertility** **Female infertility** ➢ **Causes -** Failure to ovulate; production of infertile eggs ; damage to oviducts (oviduct scarring and PID or Pelvic inflammatory disease, TB of oviduct), Uterus (T. B. of uterus and cervix) ➢ **Infertility associated disorders (**Endometriosis, Polycystic Ovarian syndrome (PCOS), POF (Primary ovarian failure) STDs (Gonorrhea, Chlamydia, Syphilis and Genital Herpes); Antibodies to sperm; Genetic causes-Recurrent abortions; Role of endocrine disruptors	4L	8hrs
	Male infertility **Causes :** Testicular failure, infections of epididymis, seminal vesicles or prostate, hypogonadism, cryptorchidism , congenital abnormalities,Varicocele, Blockage, Azoospermia, Oligospermia, abnormal sperms, autoimmunity, ejaculatory disorders andIdiopathic infertility.		

2.5	**Treatment of Infertility** ➢ Removal /reduction of causative environmental factors ➢ Surgical treatment ➢ Hormonal treatment- Fertility drugs ➢ Assisted Reproductive Technology ➢ In vitro fertilization, Embryo transfer (ET), Intra-fallopian transfer (IFT), Intrauterine transfer (IUT), Gamete intra-fallopian transfer (GIFT), intra-zygote transfer (ZIFT), Intracytoplasmic sperm injection (ICSI) with ejaculated sperm and sperm retrieved from testicular biopsies – Testicular sperm extraction (TESE), Pronuclear stage transfer (PROST). ➢ Sperm banks, cryopreservation of gametes and embryos ➢ Surrogacy	7L	8hrs
	UNIT3: Pollution and its effect on organisms	**15L**	**27hrs**
	***Objective*:** ➢ *To provide a panoramic view of impact of human activities leading to pollution and its implications.*		
	Desired Outcome: ➢ *The learners will be sensitized about the adverse effects of pollution and measures to control it.*		
3.1	**Air Pollution** ➢ **Types and sources of air pollutants** ➢ Effects and control measures	3L	6hrs
3.2	**Water Pollution** ➢ Types and sources of water pollutants ➢ Effects and control measures	3L	6hrs
3.3	**Soil Pollution** ➢ Types and sources of soil pollutants ➢ Effects and control measures	**3L**	**4hrs**
3.4	**Noise pollution** ➢ Different sources of sound pollution ➢ Effects and control measures	1L	3hrs
3.5	**Pollution by radioactive substances**	1L	2hrs
3.6	**Pollution by solid wastes** ➢ Types and sources, ➢ Effects and control	2L	4hrs
3.7	**Pollution –** Climate Change and Global Warming	2L	2hrs

	Practical USZOE1P4 (Course XA)
1	Estimation of Dissolved oxygen from the given water sample .
2	Estimation of Salinity by refractometer from the given water sample.
3	Estimation of conductivity by conductometer from the given water sample .
4	Determination of blood pressure by spyghmomanometer.
5	Detection of Creatinine in urine.
6	Determination of blood sugar by GOD and POD method
7	Study of bleeding time and clotting time.
8	Study of the following permanent slides, museum specimens and materials. a. Mammalian sperm and ovum. b. Egg types –Fish eggs, Frog eggs , Hen's egg. c. Cleavage , blastula and gastrula (Amphioxus, Frog and Bird).
9	Study of commercially important fishery (Catla, Rohu, Catfish, Mackerel, Pomfret, Bombay duck, Prawn/ Shrimp, Crab, Lobster, Edible oyster)
10	Review writing based on programmes telecast by Doordarshan, Discovery channel, Gyandarshan, UGC programmes, Animal planet
11	Study of natural ecosystem and field report of the visit

	USZOE2403 COURSE-10B		
	Dairy Industry,sericulture,Aquaculture		
	UNIT 1: Dairy Industry	**15L**	**25hrs**
	Objective: ➢ *To comprehend the functioning of various aspects of dairy industry.* ➢ *To study different indigenous and exotic cattle breeds and buffalo breeds in India.* ➢ *To develop an understanding of the different systems of breeding and various aspects dealing with housing of dairy animals.*		
	Desired Outcomes: ➢ *Learner shall gain knowledge on the functioning of various aspects of dairy industry,indigenous, exotic cattle and buffalo breeds in India.* ➢ *Learner shall study different systems of breeding and gain information regarding various aspects pertaining to housing of dairy animals.*		
1.1	Definition Indian Cattle breeds ➢ Malvi ➢ Hariyana ➢ Deoni ➢ Red sindhi ➢ Khillari	2L	8hrs
1.2	Exotic breeds ➢ Jersy ➢ Holstein	2L	4hr
1.3	Indian buffalo breeds ➢ Nagpuri ➢ Bhadawari ➢ Murrah ➢ Jafrabadi	2L	4hrs
1.4	Systems of inbreeding and crossbreeding	1L	4hrs
1.6	Cleaning and sanitation	2L	6hrs
1.7	Weaning of calf,castration and dehorning	2L	4hrs
1.8	Diseases and control	2L	4hrs
	UNIT 2: Sericulture	**15L**	**30 hrs**
	Objectives: ➢ *To comprehend the functioning of sericulture industry and its scope in India.* ➢ *To study the varieties of silk-worms and host plants.* ➢ *To critically study the life history and rearing of Bombyxmori, harvesting, processing of cocoon, production*		

	of silk and diseases afflicting silk-worms.		
	Desired Outcome: ➢ Learner shall understand the basics of the functioning of sericulture industry and its scope in India. ➢ Learner shall gain knowledge on the varieties of silk-worms, host-plants and aspects on silk extraction and the diseases afflicting silk-worms.		
2.1	Introduction and its scope	2L	4hrs
2.2	Verities of silk worm, host plants	2L	4hrs
2.3	Life history and rearing of *Bombyxmori*	2L	8hrs
2.4	Harvesting and processing of cocoon	2L	4hrs
2.5	Reeling and extraction of silk	3L	4hrs
2.6	Diseases and control measures	3L	4hrs
	UNIT3: Aquaculture	**15L**	**27hrs**
	Objective: ➢ *To comprehend various kinds of aquaculture practices and its scope as fishery resource in India.* ➢ *To study various techniques employed in aquaculture practices*		
	Desired Outcome: ➢ *Learner shall understand the aquaculture practices and the scope of fishery in India.* ➢ *Learner will gain knowledge of various techniques employed in aquaculture practices.*		
3.1	Pisiculture a) Definition and scope of fishery resources in India b) Finfish culture ➢ Monoculture ➢ Polyculture c) Role of exotic fishes in polyculture d) Cage culture e) Induced breeding f) Fish seed transport, fish diseases, their symptoms and control	5L	6hrs
3.2	Prawn/shrimp culture a) Giant fresh water prawn (*Macrobrachiumrosenbergii*) b) white shrimp(*Penaeusvannamei*) c) Sources, seed, culture methods	5L	6hrs
3.3	Pearl culture a) Pearl producing species and their distribution b) Pearl culture methods	**5L**	**4hrs**

	c) Composition of pearl		

	Practical USZOE2P4 (Course XB)
1	Comparison of protein content from cow's milk and buffalo's milk.
2	Comparison of fat content from cow's milk and buffalo's milk.
3	Preparation of falooda
4	Preparation of caramel custard.
5	Restraining devices used in cattle farming- Halters, gags, bull-rings, muzzeles, cradle, crush, ropes
6	Life cycle of *Bombyx morri*
7	Crustacean fishery – common characters and sexual dimorphism in Lobster ,prawn, shrimp ,crab
8	Visit to dairy farm /aquaculture and submit report of the same.

Note -The practicals may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught byusing photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and asenvisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall beprocured for the purpose of conducting practicals mentioned here-in-above.
#There shall be at least one excursion/field trip.

N.B :
I) It is pertinent to note that we have to adhere strictly to the directions as given in the UGC Circular F14-4/2006 (CPP-II).

II)Apart from the institutional Animal Ethics Committee (IAEC) and any other Committee appointed by a Competent Authority/Body from time to time, every college should constitute the following Committees :

1) A Committee for the Purpose of Care and Supervision of Experimental Animals (CPCSEA) and
2) A Dissection Monitoring Committee (DMC)

Composition of DMC shall be as follows :

i) Head of the Concerned Department (Convener/Chairperson)
ii) Two Senior Faculty Members of the concerned Department
iii) One Faculty of related department from the same College

One or two members of related department from neighboring colleges.

USE OF ANIMALS FOR ANY EXPERIMENT/DISSECTIONS/MOUNTING IS BANNED. SIMULATIONS, AUTHORISED PERMANENT SPECIMENS/SLIDES,CHARTS, MODELS AND OTHER INNOVATIVE METHODS ARE ENCOURAGED.

SCHEME OF EXAMINATION (THEORY)

(a) External assessment of one hundred (100) marks per course per semester should be conducted as per the following skeleton question paper pattern.
(c) One practical examination of fifty (50) marks per course each should be conducted at the end of every semester.

SKELETON- EXAMINATION PATTERN FOR THE ABOVE SYLLABUS

All Questions are compulsory
Figures to the right indicate full marks

Time: 3 hours **Total marks: 100**

Q1	Objective*	20 marks
Q.2.	UNIT 1 Answer any four out of eight (5 marks each)	20 marks
Q.3.	UNIT 2 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.4.	UNIT 3 Answer any two out of four (10 marks each)	20 marks
Q.5.	a. Unit 1 - (One note of five marks OR objective type questions) b. Unit 2 - (One note of five marks OR objective type questions) c. Unit 3- (One note of five marks OR objective type questions)	20 marks

Note:
1) *For Question No. 01 it is recommended to have objective questions on all units, such as –
(a) Match the column (b) MCQ
(c) Give one word for (d) True and False
(e) Define the term (f) Answer in one sentence etc
2) Under Question No. 05 there should be one note of five marks with internal or of five objective questions each of 01 mark. This pattern is applicable to all three sub-questions.

Semester –III
REFERENCE BOOKS AND ADDITIONAL READING

COURSE-V (USZO301)

1. Principles of Genetics. Gardner, E.J., Simmons, M.J and Snustad, D.P. John Wiley and Sons
2. Concepts of Genetics. Klug, W.S., Cummings M.R., Spencer, C.A. Benjamin Cummings
3. Genetics- A Molecular Approach. Russell, P. J Benjamin Cummings
4. Genetics: Analysis of Genes and Genomes. Daniel L., Hartl, Elizabeth W. Jones Jones& Bartlett Publishers
5. Introduction to Genetic Analysis. Griffiths, A.J.F., Wessler. S.R., Lewontin, R.C. and Carroll, S.B. W. H. Freeman and Co
6. Cell Biology Genetics, Molecular Biology Evolution and Ecology Verma P.S. and Agrawal P.K., 9th edition, S. Chand Publication, New Delhi
7. Principles of Genetics – Eight edition- Eldon john Gardner, Michael J. Simmons, D. Peter Snustad
8. Genetics- Weaver, Hedrick, third edition, McGraw Hill Education
9. Genetics A Mendelian approach Peter J.Russel, Pearson Benjamin Cummings
10. Genetics A conceptual approach, Benjamin A. Pierce, Southwestern University, W.H. Freeman and company, New York
11. Genetics, Third Edition, Monroe W. Strickberger
12. Genetics from gene to genome, third edition, LeelandH.Hartwell, Leeroy Hood, Michael 7. L. Goldberg, Ann E. Reynolds, Lee M. Silver, McGraw Hill Education

COURSE-VI (USZO302)

1. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co.
2. Invertebrate Zoology Volume II- Jordan and Verma , S. Chand and Co.
3. Invertebrate Zoology- Majupuria T. C., Nagin S.and Co.
4. Chordate Zoology- Dhami P. S. and Dhami J. K. , R. Chand and Co.
5. Invertebrate Zoology- Dhami P. S. and Dhami J. K., R. Chand and Co.
6. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition.
7. Zoology- Miller S. A. and Harley J. B., Tata McGraw Hill.
8. Modern Textbook of Zoology, Invertebrates, Kotpal R. L
9. Biological Science, Taylor D.J., Stout G.W., Green N.P.O, Soper R.,Cambridg University Press.

COURSE-VII (USZOE1303A)

1. Animal Behaviour- David Mc Farland
2. Animal Behaviour- Mohan Arora
3. Animal Behaviour- Reena Mathur
4. An introduction to Animal Behaviour- Dawkins
5. Animal Behaviour-Agarwal
6. Animal Behaviour- Tinbergen
7. Biology of Insects- 1992 SaxenaS. C. Oxford and IBH Publishing CoNew Delhi. Bombay. Calcutta
8. A Text Book of Entomology- 1974Mathur V. K. and Upadhayay KGoel Printing press, Barani.
9. Bee and Bee Keeping- Roger A. Morse, Conell University PressLondon
10. Vermiculture Technology - Clive A. Edwards, Norman Q. Arancon and Rhonda Sherman
11. Parasitology- ChatterjeeK.D., Chatterjee Medical Publishers.

12. Medical Parasitology- Arora
13. Textbook of Medical Parasitology-.C.K JayaramPaniker, Jaypee Brothers.
14. A text book of Parasitology- KochharS.K. Dominant Pub. & Dis, New Delhi.
15. Essentials of Parasitology- Gerald and Schmidt: Universal Bookstall, New Delhi.
16. Parasitology- Sharma P.N.andRatnuL.N., Chand S &Co.Pvt.Ltd.
17. Introduction to Parasitology- Chandler and Read John Wiley & Sons
18.Economic Zoology- Biostatistics and Animal behaviour – S.Mathur, Rastogi Publicatons.
19. Economic Zoology- Shukla G.S. & Upadhyay V.B., Rastogi Publications.
20. A handbook on Economic Zoology, S.Chand& Co.

COURSE-VII (USZOE2303B)

1. A General textbook of entomology -- A D Imms. Asia Publication.
2. Agricultural insect pests and their control. V.B. Awasthi. Scientific Publication.
3. A manual of practical entomology. – M MTrigunayat. Scientific Publication.
4. Applied Entomology – AlakaPrakash and Fennemore. New Age Publishers.
5. Applied Entomology – Awasthi. Scientific Publication.
6. A Text book of insect morphology, physiology and endocrinology – Tembhare D. B.– Chand Publication
7. Entomology and Pest Management –Larry P. Pedigo. Pearson Education.
8. Forensic Entomology-The utility of Arthropods in legal investigations. –Jason H. Byrd and James L. Castner. CRC Press.
9. General and applied Entomology – David and Ananthakrishnan. Tata McGraw Hill
10. Insect endocrinology and physiology – Tembhare D B – S Chand publication.
11. Insect Jewelry by Roger D. Akre., Laurel D. Hansen, and Richards S. Zack: in Summer (1991). (Online available as research article).
12. Insect Year Book of Agriculture- American Agriculture Department Publication.
13. .
14. Economic Zoology- Shukla G.S. & Upadhyay V.B., Rastogi Publications.
15. A handbook on Economic Zoology, S. Chand & Co.
16. Candler, W., & Kumar, N. (1998). India: The dairy revolution: The impact of dairy development in India and the World Bank's contribution. World Bank Publications.
17. Park, Y. W., & Haenlein, G. F. (Eds.). (2013). Milk and dairy products in human nutrition: production, composition and health. John Wiley & Sons.
18. Venkatasubramanian, V., Singh, A. K., & Rao, S. V. N. (2003). Dairy development in India: An appraisal of challenges and achievements. Concept Publishing Company.
19. Shrivastava, J. S. M. (2008). Dairy Development In The New Millennium (The Second White Revolution). Deep and Deep Publications.
20. http://listverse.com/2012/12/03/10-amazing-animal-abilities/
21. www.toptenz.net/top-10-amazing-animals-discovered-within-the-last-decade.php
22. dailynewsdig.com/top-10-amazing-animal-hybrids.
23. https://www.pinterest.com/pin/16044142395584735/
24. www.naturalhistorymag.com/
25. https://naturalhistory.si.edu/.

MODEL QUESTION BANK SEMESTER III
USZO301(COURSE V)

Question bank is suggestive. The paper setters are free to modify the questions or

include new questions to the best of their perception

Unit:1 (10 Marks)

1. Define genetics and explain its scope and importance.
2. Explain Mendel's laws of inheritance
3. Describe in detail the monohybrid cross and state the Mendelian principle of inheritance derived from it. Add a note on Co-dominance
4. Describe in detail dihybrid cross and state the Mendelian principles of inheritance derived from it
5. Discuss in brief inheritance of Mendelian phenotypic traits in humans.
6. Describe incomplete dominance with a suitable example
7. Describe Co-dominance with a suitable example
8. What is epistasis? Give a detailed account of double dominant epistasis
9. What is epistasis? Give a detailed account of recessive epistasis
10. What is epistasis? Give a detailed account of dominant epistasis
11. What is epistasis? Give a detailed account of double recessive epistasis
12. Explain the pattern of inheritance of recessive and dominant lethal alleles
13. Explain the inheritance of multiple alleles with the help of a suitable example
14. Describe polygenic inheritance with reference to skin colour and eye colour in man
15. Compare pleiotropy and polygenic inheritance
16. Explain the phenomenon of linkage with respect to Morgan's Experiment. Add a note on the differences between complete and incomplete linkage
17. Describe the pattern of inheritance of blood group and Rh factor in man
18. Explain the cytological basis and molecular mechanisms of crossing over
19. Explain pedigree analysis of X-linked recessive traits

Unit:1 (5 Marks)

1. Describe the classical concept of gene
2. Explain the modern concept of gene
3. Differentiate between (Any two):
   (a) Genotype and phenotype of an organism
   (b) Dominant and recessive traits
   (c) Gene and genome
   (d) Homozygous and heterozygous
   (e) Monohybrid and Dihybrid cross
   (f) Incomplete Dominance and Co-dominance
   (g) Multiple alleles and Polygenes
   (h) Test cross and Backcross
4. Explain how probability is used to predict the results of genetic crosses
5. Write a note on the chromosome theory of inheritance
6. Describe co-dominance with a suitable example
7. Give an account of the symbols used in human Pedigree analysis
8. Characteristics of autosomal dominant traits
9. Characteristics of X-linked recessive traits
10. Characteristics of autosomal recessive traits
11. Characteristics of X-linked dominant traits
12. Intermediate lethal alleles

13. Phenylketonuria
14. Albinism
15. Explain the inheritance of skin colour in humans
16. Write a note on pleiotropy.

Unit: 2 (10 Marks).

1. Explain the structure of eukaryotic Chromosome
2. Classify chromosomes on the basis of position of centromere
3.Explain any two mechanisms of chromosomal basis of sex determination
4. Explain the inheritance of colour blindness in man
5. Explain sex determination in man/ Honey bee/ Birds/ Drosophila

Unit: 2 (05 Marks)

1. Describe the terms euchromatin and heterochromatin
2. Write a note on polytene chromosomes
3. Write a note on Lampbrush chromosomes
4. Write a note on salivary gland chromosome of Drosophila
5. Write a note on Balbiani rings
6. Explain endomitosis
7. Write a note on Gyanandromorphs
8. Explain the role of environment on sex determination
9. Explain the role of hormones in sex determination
10. Explain hypertrichosis
11. Differentiate between sex linked and sex influenced genes
12. Differentiate between human X and Y chromosome
13. Differentiate between autosomes and sex chromosomes
14. Write a note on Lyons hypothesis
15. What are Barr bodies? Give a scientific reason that Barr bodies are present only in women and not in men
16. Give a scientific reason that Y chromosome is a sex determining chromosome in man
17. Explain parthenogenesis
18. Give scientific reason that the X linked genes affect males more than females in human beings
19. What is centromere? Explain its role during cell division

Unit: 3 (10 marks)

1. Describe Griffith transformation experiment
2. Explain Avery, Macleod, McCarty's experiment
3. Give an account of Hershey Chase experiment of bacteriophage infection
4. Write a note on types of DNA
5. Explain RNA as a genetic material
6. Describe the process of DNA replication
7. Write in detail the process of transcription
8. Discuss the process of translation
9. What is gene expression? Describe the regulation of genes with Lac operon
10.

Unit 3: Write short notes on – (5 Marks)

1. Chemical composition of nucleic acid
2. A and B DNA
3. Plasmid
4. Function of mRNA
5. Function of tRNA
6. Genetic code
7. One gene one enzyme hypothesis
8. Concept of operon
9. ZDNA
10. H DNA
11. Chromosomal DNA in prokaryotes
12. Mitochondrial DNA
13. DNA in chloroplast

USZO302 (COURSE VI)

Question bank is suggestive. The paper setters are free to modify the questions or include new questions to the best of their perception

Unit 1: (10 Marks)

1. Explain in detail the digestive system of earthworm.
2. Explain in detail the digestive system of cockroach.
3. Describe the digestive system in bivalve.
4. Describe the digestive system of pigeon.
5. With the help of a labeled diagram describe the structure and functions of ruminant stomach.
6. Explain the physiology of digestion in cockroach.
7. Give an account of the enzymes involved in the process of digestion in cockroach.
8. With the help of a labeled diagram describe the structure of mammalian kidney.
9. Give a detailed account of process of urine formation in man.
10. With the help of a labeled diagram describe the structure of septal nephridium of earthworm.

Unit 1: (05 Marks)

1. Write a note on nutrition apparatus in amoeba.
2. Describe briefly gastro-vascular cavity in hydra.
3. Write a note on Wheel organ of Amphioxus.
4. Write a note on ruminant stomach.
5. Write short note on digestion of proteins with respect to man.
6. Write short note on digestion of carbohydrates with respect to man
7. Write short note on digestion lipids with respect to man
8. Write short note contractile vacuoles as excretory and osmoregulatory structures in protozoa.
9. Write a note on flame cells.
10. Write a note on nephridia as excretory organs in earthworm.
11. Describe briefly excretory and osmoregulatory structures in arthropods.
12. Write a note on structure of kidney in fish.
13. Write a note on structure of amphibian kidney.
14. Write a note on structure of kidney in bird.
15. Write a note on structure of mammalian kidney.
16. Write a note on Ammonotelic organisms.
17. Write a note on Ureotelic organisms.

18. Write a note on Uricotelic organisms.
19. Write a note on ultrafiltration.

Unit 2: (10 Marks)

1. Describe briefly air sacs in pigeon.
2. Describe briefly the process of internal respiration with respect to man
3. Describe briefly the process of external respiration with respect to man
4. Give a brief account of types of circulating fluids present in animals.
5. Describe briefly mechanism of working of heart.
6. Describe briefly two chambered heart in shark.
7. Describe briefly structure of heart of frog.
8. Describe briefly heart of crocodile.
9. Give a brief account of heart of man.

Unit 2: (5 Marks)

1. Write short note on cutaneous respiration.
2. Write a note on Spiracle in cockroach.
3. Write a note on book lungs in spider.
4. Explain the structure of gills of bony fish
5. Explain the structure of gills of cartilaginous fish.
6. Describe briefly lungs as respiratory organs in frog.
7. Describe briefly lungs as respiratory organs in man.
8. Explain briefly accessory respiratory structure in *Anabas*.
9. Write short note on open circulation.
10. Write short note on closed circulation.
11. Write a note on heart of cockroach
12. Write a note on heart of earthworm.

Unit 3:(10 Marks)

1. Describe different types of neurons on the basis of structure and function.
2. Explain conduction of nerve impulse.
3. Briefly describe synaptic transmission.
4. Describe briefly hormones as chemical messenger.
5. Explain briefly feedback mechanism of hormone regulation.
6. Explain sol-gel theory of amoeboid movement.
7. Describe ciliary movement in *Paramecium*.
8. Give an account on types of wings in insects.
9. Explain types of fins in Pisces.
10. Describe sliding filament theory.
11. Describe briefly asexual reproduction in animals.
12. Describe the structure and function of tube feet.
13. Describe spermatogenesis.
14. Describe oogenesis.
15. Describe briefly the structure of mammalian gametes.
16. Give an account on types of fertilization.

Unit 3: (5 Marks)

1. Write a note on irritability in *Paramecium*.
2. Write a note on resting potential of nerve membrane.
3. Write a note on action potential of nerve membrane.
4. Describe different types of neurons on the basis of structure.
5. Describe briefly different types of neurons on the basis of functions.
6. Describe the structure of synapse.
7. Write a note on striated muscle fibre.
8. Describe the structure of cilia.

9. Give an account on types of legs in insects.
10. Write a note on ovo-vivipariry.
11. Write a note on viviparity.
12. Write a note on oviparity.
13. Describe the structure of mammalian egg.
14. Describe the structure of mammalian sperm.
15. Describe the formation of gemmule in sponges.
16. Write a note on budding as asexual reproduction in mammals

USZOE1303 (COURSE VIIA)

Question bank is suggestive. The paper setters are free to modify the questions or include new questions to the best of their perception

Unit 1: (5 Marks)

1. How do honey bees communicate for foraging?
2. What is classical conditioning? Explain with an example.
3. What is imprinting? Explain different types of imprinting.
4. What do you mean by learning? Describe any two types of learning.
5. Describe the various ways in which ants communicate.
6. What is the significance of mimicry and warning coloration?
7. What is mimicry? Explain different types of mimicry with examples.
8. What is displacement activity? In what situations do displacement activities occur? Explain with examples.
9. Write notes on:
   i. Migration in Fish
   ii. Territorial behavior
   iii. Schooling behavior in fish
   iv. Altruism and kinship
10. Which are the different types of social groups seen in non human primates?
11. Comment on any two aspects of non human primate social behavior.

Unit 2: (10 Marks)

1. Give an account of the life history and pathogencity of the parasite causing amoebic dysentery.
2. Describe in detail part of life cycle of *P.vivax* in mosquito.
3. Give an account of asexual cycle of *P.vivax* in man.
4. Describe the life history of *Taeniasolium.*
5. Give an account of parasitic adaptive features of *Taeniasolium.*
6. Give an account of the life history of *Fasciola hepatica.*
7. Give an account of the life history of filarial worm and discuss its pathogenic effects.
8. Describe the life history of bedbug and suggest some control measures.
9. Give an account of the life history of *Sarcoptesscabiei.*
10. Give an account of the life history of head louse *Pediculus.*
11. What is bird flu? How is it spread and what are its symptoms?
12. How would you control the transmission of anthrax among humans?
13. How is anthrax transmitted to man?

Unit 2: (5 Marks)

1. Describe the structure of *E. histolytica.*
2. Where is *E. histolytica* found and what disease does it cause?
3. Write a short note on pathogenecity of *E. histolytica*.
4. Briefly describe the life cycle of *E. histolytica.*
5. What are the symptoms of malaria? Write its control measures.

6. Give an account of symptoms and pathogenecity of *Plasmodium vivax.*
7. Illustrate the complete life history of *T. solium* with the help of diagram only.
8. What is the effect of *Fasciola* on the hosts?
9. What are the primary and secondary hosts of *Wuchereriabancrofti*? Which stage of *Wuchereria* is infective for man?
10. What is host specificity?
11. What are the signs and symptoms of bird flu?
12. How is rabies transmitted?
13. What are the preventive measures to be taken to prevent infection of rabies virus?
14. What is toxoplasmosis and what are its causes?
15. Write notes on:
    i. Parasitic adaptations in endoparasites
    ii. Cysticercus or bladder worm.
    iii. Pathogenecity of *Wuchereria*
    iv. Control measures of bedbug.
    v. Types of hosts

Unit 3: (10 Marks)

1. What does the modern method of apiculture include? Explain in brief.
2. How is an artificial bee hive constructed?
3. How do you select the flora and bee species for apiculture?
4. What are the benefits of vermiculture?
5. Describe any two methods of vermiculture.
6. How is raw milk processed?
7. What are the common adulterants of milk in India

Unit 3: (5 Marks)

1. State the economic importance of honey and beeswax.
2. What are the disadvantages of the indigenous method of apiculture?
3. How does the wax moth cause damage to the honey comb?
4. Name any two bee enemies and explain how they harm the bees.
5. Give an account of the commonly found species of honey bee in India.
6. What are the advantages of the modern method of apiculture?
7. Which type of flora is beneficial for apiculture?
8. Which type of bee is suitable for apiculture?
9. What is the chemical composition of honey?
10. What is the suitable material for culturing earthworms?
11. What are the advantages of processing dairy products?
12. What is skimmed milk and toned milk? How are they prepared?
13. How is recombined milk prepared?

USZOE2303 (COURSE VIIB)

Unit 1 10 mark each

1. Give a brief account on exotic species used in aquarium.
2. Give a brief account on endemic species used in aquarium.
3. Give sexual dimorphism in fresh water fishes along with examples.
4. Give sexual dimorphism in marine water fishes along with examples.
5. Give a brief account on food and feeding used in aquarium.
6. Give a brief account on fish transportation in aquarium.

Unit 2 (10 mark each)

1. Explain agricultural pests along with suitable example.
2. Explain household pests along with suitable example.
3. Explain stored grains pests along with suitable example.
4. Explain structural pests along with suitable example.
5. Explain veterinary pests along with suitable example.
6. Explain forestry pests along with suitable example.

Unit 3. (10 mark questions):

1. Give a brief account on Blue mormon butterfly and Striped Tiger butterfly
2. Describe the behavior of Octopus and spider as most dedicated mothers in the world.
3. Describe marvelous characters of fan throated lizard and flying frog.
4. Describe marvelous characters of Mantis shrimp.
5. Give a brief account on Malabar giant squirrel
6. Describe marvelous characters of the Purple (Joker) crab and lesser flamingo.
7. Describe marvelous characters of the Stabbing Shark and Crime Fighting gecko.
8. Describe marvelous characters of the Gharial and the Matilda Viper
9. Describe marvelous characters of the MichealJackjon Monkey and micro chameleon.

Unit 1: 5 Mark questions:

Write short note on :-

1. Budget for setting up an aquarium
2. Fish packing
3. Formulated fish feed
4. Gold fish
5. Molly
6. Guppy.

Unit 2: (5 Mark questions):

Write short note on :-

1. Jowar stem borer
2. Brinjal fruit borer
3. Aphids
4. Mango stem borer
5. Pulse beetle
6. Rice weevil.
7. Non insect pests
8. Cultural control
9. Physical control
10. Mechanical control
11. Chemical control
12. Biological control,
13. concept of IPM.

Unit 3: (5 Mark questions):

Write short note on the amazing characters in following amazing animals.

1. Blue mormon butterfly
2. Striped Tiger butterfly
3. Mudskipper,
4. Komodo dragon,
5. Pebble toad,
6. Lesser flamingo,
7. Great white pelican,
8. Drongo
9. Malabar giant squirel
10. Cheetah,
11. Octopus

Unit 3: (5 Marks)

1. **Write notes on:**
   i. Defensive behavior in Octopus
   ii. Territorial behavior in tiger

PRACTICAL
USZOP3 (Course V)
Skeleton-Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question **15 marks**

Q1. Extraction and detection of DNA

OR

Q1. Extraction and detection of RNA

Minor Question **07 marks**

Q2. Mounting of Barr bodies

OR

Q2. Study of mitosis-Temporary squash preparation of Onion root tip

OR

Q2. Detection of blood groups and Rh factor

Q3. Problems on Genetics and Molecular biology
(Transcription /Genetic code) (01 problem each) **10 marks**

Q4. Identification **08 marks**
A. Chromosome morphology
B. Pedigree analysis

Q5. Viva and Journal **10 marks**

PRACTICAL
USZOP3 (Course VI)
Skeleton-Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question 15 marks

Q1. Urine analysis—Normal and abnormal constituents

Minor Question 10 marks

Q2. Detection of ammonia in water excreted by fish

OR

Q2. Detection of uric acid from excreta of Birds

Q3. Identification 15 marks
a. Nutritional apparatus
b. Respiratory structures
c. Locomotory organs
d. Study of hearts
e. Permanent slides on reproduction

Q4. Viva 05 marks

Q5. Journal 05 marks

PRACTICAL

USZOE1P3 (Course VIIA)
Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question 12 marks

Q1. Extraction of Casein from Milk and its qualitative estimation

OR

Q1. Preparation of paneer from the given milk sample.

OR

Q1. Measurement of density of milk using different samples by lactometer

Minor Question 08 marks

Q2. Life Cycle of Honey Bee and Bee Hive

OR

Q2. Mouthparts of Honey Bee

OR

Q2. Legs of Honey Bee

OR

Q2. Sting Apparatus of Honey Bee

Q3. Identifiy and describe as per instructions15 marks

a. Ethology
b. Protozoan parasites
c. Helminth parasites
d. Ectoparasites
e. Parasitic adaptations

Q4. Project submission and Viva based on project 10 marks

Q5. Journal 05 marks

PRACTICAL

USZOE2P3 (Course VIIB)

Skeleton-Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question 15 marks

Q1. Identification (5 Mark each)

a) Aquarium equipment.
b) Type of pest (Any insect)
c) Non insect pest

Q.2 Identification (3 Mark each) 15 marks

a) Type of pest control
b) Type of pest control
c) Amazing animal
d) Incredible animal
e) Endangered animal

Q.3 Submission of photographs of any 5 amazing animals. 05 marks

Q4. Project submission and Viva based on project 10 marks

Q5. Journal 05 marks

Semester IV
Reference and additional reading

COURSE-VIII (USZO401)

1. Theory of Evolution- Smith, Cambridge Press, and Low price Ed
2. Evolution - Strickberger, CBS publication
3. Evolution- P.S.Verma and Agarwal
4. Introduction to Evolution by Moody
5. Biology. E. P. Solomon, L. R. Berg, D. W. Martin, Thompson Brooks/Cole
6. Biology -The Unity and Diversity of Life**.** C. Starr, R. Taggart, C. Evers, L.Starr, Brooks/Cole Cengage learning International Edition
7. Research Methodology, Methods and Techniques- by C.R. Kothari, Wiley Eastern Ltd. Mumbai
8. Practical research planning and design 2nd edition- Paul D Leedy, MacmilanPublication

9. **COURSE-IX (USZO402)**

10. 1. Cell Biology. Singh and Tomar, Rastogi Publication.
11. 2. Cell and Molecular Biology E.D.P De Robertis and E.M.R Robertis ,CBS Publishers and Distributors.
12. 3. The cell A molecular Approach Goeffrey M.Coper ASM Press Washington D.C.
13. 4. A textbook of cytology Suruchi Tyagi Dominant Publishers and Distributors New Delhi.
14. 5. Cell and molecular biology Gupta P.K , Rastogi Publication, India.
15. 6. Cell Biology Pawar C.B. Himalaya publication
16. 7. Molecular Biology of the cell (6th ed) by the Insertus
17. 8. Campbell Biology (9th Ed.)
18. 9. Principles of Biochemistry, 2005, 2nd and 3rd edn. Lehninger A.L. Nelson D.L. and Cox M.M ,
19. 10. Biochemistry, Dushyant Kumar Shrma, 2010, Narosa Publishing house PVT.Ltd.
20. 11. Fundamentals of Biochemistry, Dr AC Deb, 1983, New Central Book Agency Ltd.

21. 12. A Textbook of Biochemistry, 9th edition, Dr. Rama Rao A.V.S.S and Dr A Suryalakshmi.
22. 13. Biochemistry-G Zubay , Addison Wesley, 1983
23. 14. Biochemistry, L Stryer, 3rd/4th/5th ed, 1989 , Freeman and Co. NY
24. 15. Harper's Biochemistry,1996, 26th edition, Murray R.K. Granner D.K. Mayes P.A. Rodwell V.M. Hall international USA
25. 16. Outline of Biochemistry, 1976, E.E. Conn and P.K. Stumpf. John Wiley and Sons USA

COURSE-X(USZOE1403A)

1. Developmental Biology- 5th Edition, Scot F.Gilbert, Sinauer Associates Inc.
2. Developmental Biology- SubramoniamT.,Narosa Publishers.
3. Developmental Biology-BerrilN.J., Tata Mc Graw –Hill Publication.
4. Essential Reproduction-Martin H. Johnson, Wiley-Blackwell Publication.
5. Chick Embryology- Bradley M. Pattern.
6. Embryology-Mohan P. Arora.
7. Chordate Embryology-Dalela,Verma and Tyagi
8. Human Anatomy and Physiology. E. L. Marieb, Pearson Education Low Price Edition
9. Biological Science. Taylor, Green and Stout. Cambridge Publication
10. Biology. E. P. Solomon, L. R. Berg, D. W. Martin, Thompson Brooks/Cole
11. Human Biology-Daniel D Chiras Jones and Bartlett
12. The Physiology of Reproduction Vol I & II - E.K .Nobil and JU. D.Neil, Raven Press, New York.
12. Air Pollution,KudesiaV.P. Pragati Prakasan,Meerut
13. Fundamentals of Air PollutionDaniel A.Vallero,Academic press 5th Edition
14.Principles and Practices of Air Pollution Control and Analysis J.R. MudakaniI K International Pub. House Pvt. Ltd.
15.Text Book of Air Pollution and its Control,S.C.Bhatia Atlantic
16.Water Pollution,KudesiaV.P.,Pragati Prakasan,Meerut
17. A text book of Environmental Chemistry and Pollution Control,S.S.Dogra,Swastic Pub,New Delhi
18.Practical Methods for water and Air Pollution Monitoring,S.K.Bhargava,New Age International
19. Hand Book of Water and waste water Analysis,Kanwaljit Kaur,Atlantic
20. Aquatic Pollution by Edward A.Laws
21. Environmental Science and Technology,StanelyE.Manahan
22. Environmental Chemistry,A.K.De, New Age International
23. A Text Book of Environmental Studies,GurdeepR.Chatwal,Harish Sharma,Madhu Arora,Himalaya

COURSE-X (USZOE2403B)

References of Elective 2

1.Principles of Dairy Chemistry R. Jenness, S. Patton John Wiley and Sons Inc.
2.Fundamentals of dairy chemistry B.H. Webb, A.H. Johnson, J.A. Alford Avi Pub. Co.
3. Food Chemistry Owen R. Fennema CRC Press
4. Food Chemistry John M. De Man Springer
5.Technology of Dairy Products Early, Ralph. Academic & Professional, 1998

6.Quality of milk production and processing technology D.K. Thompkinson and latha sabikhi New India Publishing agency, New delhi
7. Outlines of Dairy Technology Sukumar De Oxford UniversityPress, New delhi
8. Food Microbiology William C. Frazier, dennis C. Westoff Tata Mcgrew Hill publishing Company Ltd. New Delhi
9. Applied Dairy Microbiology Elmer H. Marth, James L. Steele CRC Press
12.Dairy plant engineering and management Tufail Ahmed Kitab Mahal
13. Heat and mass transfer R.K Rajput S.Chand
14. Fluid mechanics A.K Upadhyay S.K Kataria
15.LatestAquaculture, Principles and Practices by Pillay T.V.R. – Fishing New Books (1988).
16.Course Manual in Fishing Technology by LathaShenoy, CIFE, Versova, Mumbai.
17.Prawn and Prawn Fisheries by Kurian and Sebestian

Freshwater aquaculture	R.k. rathy	Scientific publication	
2	A text book of fish biology and fisheries	Khanna & singh	Narendra Publication
3	Handbook of fisheries and aquaculture	Yadav	ICAR
4	Fish processing technology	Gopakumar	ICAR
5	Ornamental fish farming	Saroj. K, swain	ICAR
6	Sport fisheries of india	K.l. sehgal	ICAR
7	Coldwater fisheries of india	V.g. jhingran	ICAR
8	Fish nutrition in aquaculture	Sena s. Desilva	ICAR
9	Practical course manual fishery and gear technology	Latha shenoy, y	CIFE, Mumbai
10	Breeding and seed production of finfish and shellfish	Thomas,rath	Daya pub.
11	Fundamental of fish taxonomy	Jayaram, KC	Narendra
12	Limnology	Welch	Narendra
13	Model question bank on ICAR J.R.F	Ratanankumar, K	Narendra
14	Manual of freshwater biota	Jayshree Datta Munshi	Narendra
15	Ornamental fish culture and aquarium management	Dholakia	Astral
16	Postharvest technology of fish and fish products	Balachandran	Astral
17	Handbook of freshwater fishes of India	Beaven R	Techno
18	Conservation and management of aquatic ecosystems	Unni, K Sankaran	Daya
19	Modern fishing gear technology	Hameed, M Shahul	Daya
20	Introduction to fish physiology	Smith, L.S	Narendra
21	Textbook of fish biology and fisheries	Khanna/Singh	Narendra
22	Textbook of fish diseases	Amalacher, E	Narendra

1. INDIAN SILK - MONTHLY JOURNAL
2. SERI BUSINESS MANUAL – A USER'S GUIDE (Eng)
3. Handbook of Sericulture Technologies 4th Edition (Tamil)
4. Handbook of Sericulture Technologies 5th Edition (English)
5. Handbook of Sericulture Technologies 4th Edition (Kannada)
6. Vanya Silk Directory (English)
7. COMPENDIUM OF STATISTICS OF SILK INDUSTRY – 1999 in English
8. SERICULTURE & SILK INDUSTRY STATISTICS – 2003 (with CDR version)
9. SERICULTURE & SILK INDUSTRY STATISTICS – 2007 (with CD version)
10. SERICULTURE & SILK INDUSTRY STATISTICS – 2012 (with CD version)
11. VANYA – WILD SILKS OF INDIA in English
    * VOL.I - AN INTRODUCTION TO VANYA SILKS
    * VOL.II - PROFILES OF FARM ACTIVITIES
    * VOL.III - MANAGEMENT MATRIX
    * VOL.IV- PROFILES OF NON-FARM ACTIVITIES
12. CAC TEXT BOOKS IN English
    * Silkworm Rearing Technology
    * Mulberry Cultivation & Physiology
    * Mulberry Crop Protection
    * Sericulture Extn. Management & Economics
    * Silkworm Crop Protection
    * Silkworm Breeding & Genetics
13. HANDBOOK OF PRACTICAL SERICULTURE (ENGLISH & HINDI)
14. HANDBOOK OF MUGA CULTURE IN ENGLISH
15. ERICULTURE IN INDIA IN ENGLISH
16. TIPS TO SUCCESSFUL SILKWORM COCOON CROPS :
17. GUIDELINES FOR BIVOLTINE REARING:
18. CSR & TI (MYSORE) BULLETINS ON IMPROVED PRACTICES OF SERICULTURE in Hindi & Telugu
19. Reports of Indian Delegations: Sericulture in Japan & South Korea Vol. I & II in English
20. Proceedings of the International Congress on Tropical Sericulture - 1988 in English
21. Satellite Remote Sensing Applications for Sericulture Development in English
22. Biodiversity of Muga Silkworm & its Utilization
23. F.A.O. MANUAL ON SERICULTURE

For Additional and Latest Information on the topics, various Web Sites can be visited.

MODEL QUESTION BANK SEMESTER IV

USZO401(COURSE VIII)

Question bank is suggestive. The paper setters are free to modify the questions or include new questions to the best of their perception

Unit 1: (10 Marks)

1. Write explanatory notes on:1. Lamarckism. 2. Darwinism and Neo Darwinism.3. Mutation Theory 4. Modern Synthetic theory.5. Weismann's germplasm theory
2. Neutral theory of molecular evolution. (Some of them can be asked as short notes as well)
3. Discuss evidences in favour of organic evolution by giving examples of geographical distribution
4. Discuss evidences in favour of organic evolution by giving examples of genetics, and molecular biology
5. Discuss evidences in favour of organic evolution by giving examples of physiology and biochemistry
6. Discuss brief account of Origin of eukaryotic cell

Unit 1: (5 Marks)

1. Describe chemical evolution with Miller-Urey experiment
2. Describe chemical evolution with Haldane and Oparin theory
3. Write short notes on: 1. Mutation Theory 2. Modern Synthetic theory

Unit 2: (10 Marks)

1. Define the term 'population genetics'. Describe in brief the various evolutionary forces that tend to disturb genetic equilibrium and introduce changes in the gene pool of a population
2. State Hardy Weinberg's law of equilibrium and discuss its salient features
3. Give an account of the different factors involved in speciation
4. Describe the different types of speciation
5. Explain the role of geographic isolation in the development of new species
6. Explain the role of reproductive isolation in the development of new species
7. Discuss the pre-zygotic barriers responsible for reproductive isolation
8. Discuss the post-zygotic barriers which lead to reproductive isolation
9. Describe the sources of genetic variation in natural populations
10. Explain the nature and extent of genetic variation within populations
11. Describe the mechanisms that preserve balanced polymorphisms
12. Describe the salient features of microevolution

13. Compare and contrast microevolution and macroevolution
14. Explain the salient features of macroevolution
15. Give an account of the different patterns of macroevolution
16. Elaborate on the role of adaptive radiation and extinction in macroevolution
17. What do you understand by the term natural selection? Describe the different types of natural selection with suitable examples
18. What is megaevolution? Explain the mechanism of megaevolution using a suitable example

Unit 2:(5 Marks)

1. Explain the term ‘gene pool’. How does evolution operate via the gene pools of populations?
2. Differentiate between:
    a. Allopatric and Sympatric speciation
    b. Biological and evolutionary species
    c. Microevolution and macroevolution
    d. Stabilizing selection and disruptive selection
    e. Convergent and divergent evolution
3. Explain stabilizing selection with the help of a suitable example
4. How does the example of sickle cell allele illustrate heterozygote advantage?
5. How does frequency-dependent selection affect genetic variation within a population over time?
6. Write short notes on:
    a. Role of mutations in evolution
    b. Role of migration in evolution
    c. Non-random mating
    d. Role of natural selection in evolution
    e. Genetic drift
    f. Bottleneck effect
    g. Founder effect
    h. Directional evolution in peppered moth
    i. Evolution of Antibiotic resistance in bacteria
    j. Geographic variation
    k. Genetic polymorphism
    l. Parapatric speciation
    m. Adaptive radiation
7. What is the biological species concept? What are its limitations? How does it differ from the evolutionary species concept?
8. Explain the concept of co evolution using suitable examples

Unit 3: (10 Marks)

1. Describe briefly, the steps towards preparing a research design
2. Describe literature survey, collection of data and its analysis
3. What is a patent and how is it obtained?
4. Write an account on application of statistics in research

Unit 3: (5 Marks)

1. Define research. State the difference between research method and research methodology
2. Write a note on computer application in research
3. Describe briefly identification of research problem and formulation of research hypothesis
4. What is abstract writing?
5. What is plagiarism?
6. What is bibliography?
7. Write a short note on ethics in animal research
8. Write a short note on ethics in clinical research

USZO402 (COURSE IX)
Question bank is suggestive. The paper setters are free to modify the questions or include new questions to the best of their perception

Unit 1: (10 marks)
1. Explain prokaryotic cell.
2. Explain Eukaryotic cell.
3. Give an account of cell theory.
4. Describe the ultrastructure of nuclear membrane.
5. State the chemical composition and functions of nucleolus.
6. Describe nucleocytoplasmic reactions.
7. Explain rRNA processing.
8. Describe fluid mosaic model of plasma membrane.
9. Give an account of active and passive transport
10. Describe various modifications of plasma membrane
11. Explain pinacocytosis, phagocytosis and secretion
12. Give an account of cell permeability
13. Differentiate prokaryotic and eukaryotic cell

Unit 1: (5 Marks)
1. Virus
2. Nuclear matrix
3. Number ad position of nucleus
4. Molecular organization of chromatin

5. Unit membrane concept
6. Nucleolus
7. Membrane receptors
8. Sandwich model
9. Cell coat
10. Cell recognition

Unit 2: (10 Marks)
1. Write a note on structural organization & importance of endomembrane system.
2. Describe ultrastructure of Endoplasmic Reticulum
3. Describe the types and functions of ER.
4. Give an account of ultrastructure and functions of Golgi complex.
5. Write an essay on functions of Golgi complex.
6. Give an account of polymorphism in lysosomes.
7. Write an essay on peroxisomes.
8. Describe the structure and chemical composition of mitochondria.
9. Write a note on mitochondria as powerhouse of the cell.
10. Describe the major functions of mitochondria.

Unit 2: (5 Marks)
1. Importance of endomembrane system
2. Write a short note on biogenesis of endomembrane system
3. Functions of Rough Endoplasmic Reticulum
4. Functions of Smooth Endoplasmic Reticulum
5. Structure of Golgi complex
6. Chemical composition of Golgi complex
7. Lipid & polysaccharide metabolism in Golgi complex
8. Secretion and protein sorting by Golgi complex
9. Write a brief note on GAAP
10. Write a brief note on protein glycosylation by Golgi complex
11. Origin and functions of lysosomes
12. Write a short note on peroxisomes
13. Structure of mitochondria
14. Chemical composition of mitochondria
15. Write a short note on ATP
16. Write a short note oglycolysis
17. Write a short note on Kreb's cycle
18. Write a short note on oxidative phosphorylation

Unit 3: (10 Marks)
1. Discuss the chemical behavior of carbon and a note on variety of functional groups of biomolecules.
2. Explain the concept of micromolecules and macromolecules.
3. Describe the structure of water. Add a note on physic-chemical properties of water.
4. Define carbohydrate. Add a note on its classification.
5. What are carbohydrates? Explain the classification of carbohydrate with suitable examples.
6. Explain with suitable example monosaccharide and disaccharide.
7. Discuss the properties of carbohydrates.
8. What are disaccharides? Draw the structures of maltose and sucrose.

9. What are polysaccharides? How are they classified? Write the structures of glycogen and heparin/ chitin and heparin.
10. Discuss about chemical structure of the monosaccharides/ disaccharides.
11. What are amino acids? Discuss classification of amino acids based on R group.
12. Give an account of primary and secondary structure of proteins.
13. Write an account on tertiary and quarternary structure of proteins.
14. Describe the structure of saturated and unsaturated fatty acids.
15. Define essential fatty acids. Add a note on it.
16. Define lipids. Write a note on mono, di and triglycerides/ phospholipids.
17. What are fatty acids? Add a note on types of fatty acids.
18. Describe the structure and functions of water soluble vitamins.
19. Describe the structure and functions of lipid soluble vitamins.

Unit 3: (5 Marks)
1. Write a short note on monomers and polymers.
2. Write note on properties of carbohydrates.
3. Give an account of polysaccharides.
4. With suitable example explain glycosidic bond.
5. Explain the linkage in lactose and sucrose.
6. Give the biological importance of carbohydrates.
7. What are essential and nonessential amino acids?
8. Give an account of properties of amino acids.
9. Define and explain peptide bond with suitable example.
10Explain the different types of proteins with suitable examples.
11. Explain the biological role of proteins.
12. Peptide bond
13. Types of fatty acids.
14. Biological role of lipids
15. Properties of fatty acid
16. Sterol and waxes
17. Describe properties of fatty acid/lipids.
18. Discuss the clinical significance of protein / carbohydrate /lipids.
19. Write short note on clinical significance of lipids.
20. Write a note on isomerism in carbohydrates and amino acids?
21. Describe the structure and functions of vitamin A/ vitamin B/ vitamin C/ vitamin D.

USZOE1403(COURSE XA)

Question bank is suggestive. The paper setters are free to modify the questions or include new questions to the best of their perception

Unit-1: (10 Marks)

1) Classify the different types of eggs..
2) Briefly explain types and structure of sperms (any two animals).
3) Define cleavage Explain types of cleavages.
4) Give brief account on various types of blastulae.
5) What is gastrulation ? Explain gastrulation in frog.
6) Give an account of process of coelom formation and its types.

7) Give an account of extra embryonic membranes.
8) Describe briefly the types of eggs on the basis of amount and distribution of yolk.
9) Describe the early development of mammalian egg uptogastrulation.
10) Give a brief note on different types of sperms.
11) Write a note on blastula and explain its types.
12) Explain the comparative process of embryo formation**.**

Unit-1: (5-Marks)

1) Draw neat labeled diagram and explain any one of the following:
   (Microlecithal, ,Alecithal, Homolecithal, Heterolecithal, Isolecithal, Telolecithal, Centrolecithal, Discoidal).
2) Explain structure of sperms of frog/ reptiles/ birds/ mammals.
3) Short note on Holoblastic cleavage. Or Meroblastic cleavage.
4) Short note on equal or unequal cleavage.
5) Short note on Discoblastula or Coeloblastula.
6) Short note on centroblastula or amphiblastula or stereoblaastula,
7) Explain the process of coelom formation in process of gastrulation.
8) Short notes on : Amnion /Chorion/Allantois/Yolk sac.
9) Explain the function of Amnion /Chorion/Allantois/Yolk sac/.
10) Short note on Deciduous or non-deciduous placenta
11) Write the functions of placenta.

Unit 2: (10 Marks)

1. Describe male reproductive system and its hormonal regulation.
2. Describe female reproductive system and its hormonal regulation.
3. Define reproduction. Explain the hormonal regulation of reproduction.
4. What is contraception? Explain different methods of contraception.
5. How is contraception different from birth control?
6. Define infertility and explain the causes of female infertility.
7. What are the causes of male infertility?
8. Explain the hormonal treatment for infertility using drugs.
9. Describe the methods of treatment of infertility.
10. Give a brief account of infertility related disorders.
11. What are sperm banks? Add a note on cryopreservation of sperms.
12. What is testicular biopsy? Explain Testicular sperm extraction (TESE), Pronuclear stage transfer (PROST).
13. What are the steps involved in Embryo transfer (ET) and / Intra-fallopian transfer (IFT)?
14. What is ART technique? Add a note on IVF (steps, success and ethical considerations).

Unit 2: (5 Marks)

1. Write a note on impact of age on reproductive stage –
    a. Menopause
    b. Andropause
2. What is amenorrhea?
3. What are IUD's? How do they work as barriers for fertilization?
4. How does sterilization act as a method of contraception?
5. Write a note on birth control.
6. What is the difference between natural and artificial methods of contraception?
7. How is T.B. a cause of female infertility?
8. What are the genetic causes of infertility?
9. Write a note on STD's as infertility related disorders?
10. Explain briefly:
    a. Impotency
    b. Surrogacy
    c. Endometriosis
    d. Idiopathic infertility
11. What are the roles of endocrine disruptions in infertility?
12. Explain the role of the following in infertility:
    a. Gonorrhea
    b. Syphilis
    c. Genital Herpes
    d. Chlamydia
13. Write a note on treatment of infertility by removal of causative environmental factors.
14. Write a note on Ethical considerations of ART.

Unit 3: (10 Marks)

1. What are the causes, effects and control measures for air pollution?
2. What are the causes, effects and control measures for water pollution?
3. What are the causes, effects and control measures for soil pollution?
4. What are the causes, effects and control measures for noise pollution?
5. Define air pollution and give an account of hazardous air pollutants.
6. Explain the causes of nutrient pollution and its control measures.
7. What is ocean littering? Explain in details the causes and control measures for ocean littering?
8. Describe the alteration of metabolism of micro-organisms due to soil pollution.
9. Explain noise pollution along with its measurement and permissible limits.
10. Give a brief account of methods to control gaseous / particulate matters.
11. What is pollution? Add notes on:
    a. Effect of air pollution on vegetation.
    b. Effect of noise pollution on animals.

12. How can the people be made aware of pollution and its effects?

Unit 3: (5 Marks)

1. Explain the effects of air pollution on human beings.
2. What are different types of pollutants that cause air pollution?
3. Write short notes on:
    a. Ozone depletion
    b. Green house gases
    c. Global warming
    d. Acid rain
    e. Sonic boom
    f. Acoustic zoning
4. Explain the effect of thermal pollution on biodiversity.
5. Write a note on solar radiation.
6. Write a note on ionizing radiation
7. How are heavy metals responsible for nutrient pollution? Cite some examples of effects of heavy metal pollution on human health.
8. How is oil spills a cause of water pollution / ocean littering?
9. How do pesticides and fertilizers contaminate water?
10. How can oil be retracted back from sea / ocean?
11. What are the effects of soil pollution on food chain?
12. How are POP's and ordinary salts responsible for nutrient pollution?
13. What are the auditory / non – auditory effects of noise pollution.
14. Why is the necessity to save drinking water?

USZOE2403(COURSE XB)

Unit 1(10 Marks each)

1. Give in brief different indigenous breeds of cattle with a suitable example.
2. Give in brief different exotic breeds of cattle with a suitable example.
3. Give in brief different breeds of buffalo with a suitable example.
4. Give in brief different housing types in dairy farm.
5. Explain different types of diseases in cattle farming and add a note on control .

Unit 1(05 Marks each)

Write short note on

1. Malvi
2. Hariyana
3. Deoni
4. Red sindhi
5. Khillari
6. Jersy

7. Holstein
8. Nagpuri
9. Bhadawari
10. Murrah
11. Jafrabadi
12. Weaning of calf
13. Castration
14. Dehorning
15. Cleaning and sanitation.

Unit 2 (10 Marks each)

1. Give in brief life history of silkworm.
2. Give in brief reeling and extraction of silk.
3. Give in brief diseases and control measures in sericulture.
4. Give in brief harvesting and processing of cocoon.

Unit 2 (05 Marks each)

1. Varieties of silkworm
2. Rearing of silkworm
3. Silk extraction
4. Host plants.

Unit 3 (10 Marks each)

1. Give an account on pisiculture ,add anote on finfish culture
2. Explain monoculture with respect to aquaculture
3. Explain polyculture with respect to polyculture
4. Give an account on fresh water prawn culture
5. Give an account on pearl culture.

Unit 3 (05 Marks each)

Write short notes on :-

1. Composition of pearl
2. White shrimp culture
3. Cage culture
4. Induced breeding with respect to aquaculture
5. Fish diseases
6. Symptoms of diseases
7. Control of diseases.

PRACTICAL

USZOP4 (Course VIII)

Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question

Q1. Study Population density by Line transect or Quadrant method

and calculate biodiversity indices (any 2) **12 marks**

Minor Question **08 marks**

Q2. Prepare a smear to show prokaryotic cell.

OR

Q2. Prepare a smear to show eukaryotic cell.

Q3. Identify and describe as per instructions **08 marks**

a. Fossils b. Speciation

Q4. From the given article prepare the bibliography/ abstract **06 marks**

Q5. Power point presentation **06 marks**

Q6. Viva and Journal **10 marks**

PRACTICAL
USZOP4 (Course IX)
Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question 15 marks

Q1. Study of permeability of cell through plasma membrane (Osmosis in blood cells).

OR

Q1. Measurement of cell diameter by occulometer (by using permanent slide)

Minor Question 10 marks

Q2. Qualitative tests for carbohydrates (Molisch's test, Benedicts test, Barfoed's test, Anthrone test)

OR

Q2. Qualitative tests for proteins (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test)

OR

Q2. Qualitative test for lipids (Solubility test, Sudan III test)

OR

Q2. Study of rancidity of lipids by titrimetric method

Q3. Identify and describe as per instructions 15 marks

1. Ultra structure of cell organelles (a, b & c)
2. Clinical disorders (d & e)

Q4. Viva 05 marks
Q5. Journal 05 marks

PRACTICAL
USZOE1P4 (Course XA)
Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question 12 marks

Q1. Estimation of Dissolved oxygen from the given water sample

OR

Q1. Detection of Creatinine in urine

OR

Q1. Determination of blood sugar by GOD and POD method

Minor Question 08 marks

Q2. Estimation of Salinity by refractometer from the given water sample

OR

Q2. Estimation of conductivity by conductometer from the given water sample

OR

Q2. Determination of blood pressure by using sphygmomanometer

OR

Q2. Study of bleeding time and clotting time

Q3. Identify and describe as per instructions 15 marks

1. Permanent slides (a &b)
2. Fishery (c, d & e)

Q4. Field Report and viva based on it. 10 marks

Q5. Journal 05 marks

PRACTICAL
USZOE2P4 (Course XB)
Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Major Question 12 marks

Major Question 15 marks

Q1.Comparison of protein content from cow's milk and buffalo's milk.

OR

Q.1 Comparison of fat content from cow's milk and buffalo's milk

Minor Question 08 marks

Q.2 Preparation of falooda.

OR

Q.2 Preparation of caramel custard.

Q.3 Identification (3 marks each) 12 marks

a) Restraining device
b) Restraining device
c) Any stage of life cycle of *Bombyx morri*
d) Crustacean fishery

Q4. Report submission and Viva based on project 10 marks

Q5. Journal 05 marks

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