S.P. Mandali's

RAMNARAIN RUIA AUTONOMOUS COLLEGE, MATUNGA, MUMBAI – 400 019.

DEPARTMENT OF ZOOLOGY

Portion for Internal Test 2020-2021 (SYBSc, TYBSc, AC and MSc II)

S.Y.B.Sc. (Semester III)

Paper Code and Title	Unit	Portion
RUSZOO301 Genetics, Heredity and Nucleic acids	**I**	**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, Codominance, 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
	II	**Chromosomes** • Introduction to morphology of chromosome, Chromosome structure- Heterochromatin, Euchromatin • Classification based on the position of centromere • Types of Chromosomes- Autosomes and Sex chromosomes Endomitosis, Giant chromosomes- Polytene and Lamp brush chromosomes and significance of Balbiani rings
	III	Griffith's transformation experiments, Avery-Macleod and McCarty, Hershey and 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 and Extra nuclear DNA –mitochondria and chloroplast.

RUSZOO302 Life process	**I**	**Comparative study of Nutritional Apparatus with reference to feeding adaptations** -Structure and functions: • Invertebrates- eg: Amoeba- Pseudopodia, Hydra Tentacles, Earthworm-Suction, Cockroach-biting and chewing. • Vertebrates-Fish, Reptiles- Calotes • Digestive system and physiology of digestion with respect to Man
	II	**Circulation** • Comparative study of circulation: Open and closed - single and double • Types of circulating fluids - Water, coelomic fluid, haemolymph, lymph and Blood • Comparative study of Hearts (Structure and function) with reference to Earthworm, Cockroach, Shark, Frog, • Physiology of Human Heart
	III	**Control and coordination** • Irritability –Paramecium, 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 – Chemical and Electrical • Neurotransmitter (Addiction to psychotic substances) • Endocrine regulation: Hormones as chemical messengers and feedback mechanisms, hormones as therapeutic agents
RUSZOO303 Ethology and Economic Zoology	**I**	**Introduction to Ethology** • Definition, History and Scope of Ethology • **Animal behaviour** - Innate and Learned behavior • **Types of learning** -Habituation, Imprinting and types of imprinting (filial and Sexual), Classical conditioning, Instrumental learning and insight learning **Communication in Bees and Ants**
	II	**Morphology, life cycle, pathogenicity, control measures and treatment** • Head louse (*Pediculus humanuscapitis*) • Mite (*Sarcoptes scabie*i) Bed bug (*Cimex lectularis*) **Parasitological significance** • Zoonosis - Bird flu • Anthrax • Rabies • Toxoplasmosis
	III	**Apiculture**

		• 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 • Bee keeping industry- Present status and recent efforts to improve and boost the industry • Economic importance– Honey: Production, Chemical composition and economic importance • Bees wax- Economic importance • Role of honey bees in pollination

T.Y.B.Sc. (Semester V)

Paper Code	Unit	Portion
RUSZOO501 Study of animal types – Non chordates	**I**	**Phylum- Annelid e.g. Earthworm** Systematic position, habit and habitat Structure and histology of body wall Locomotion Type of nutrition
	II	**Phylum- Arthropoda e.g. Cockroach** Systematic position, Habit and habitat External characters Morphology and Physiology of Digestive system Physiology of Blood vascular system
	III	**Phylum-Mollusca e.g. Sepia** Systematic position, Habit and habitat External characters Morphology and Physiology of Digestive system
	IV	**Phylum- Echinodermata e.g. Starfish** Systematic position, Habit and habitat External characters, Endoskeleton, coelom
RUSZOO502 Haematology and Immunology	**I**	**Basic Haematology** **Composition of blood** - Plasma & formed elements **Blood volume** - Total quantity and regulation, Haemorrhage **Plasma proteins** - Inorganic constituents, respiratory gases, organic constituents other than proteins (include internal secretions, antibodies and enzymes)
	II	**Diagnostic techniques used in haematology** • Microscopic examination of blood: For detection of blood cancers (Lymphoma, Myeloma); infectious diseases (Malaria, Filariasis,

		Leishmaniasis); hemoglobinopathies (Sickle-cell, Thalassemia) • Coagulopathies: Diagnostic methods (haemophilia and purpura) • Microbiological examination: Blood culture: Method and application in Diagnosis of infectious diseases (Typhoid and TB)
	III	**Components of immune system:** • Innate immunity – Definition, Factors affecting innate immunity, Mechanisms of innate immunity – physical barriers, chemical barriers and cellular barriers • Adaptive or Acquired immunity – Active Acquired immunity – Natural and Artificial; Passive Acquired immunity – Natural and Artificial
	IV	**Antigen-Antibody interaction** • General features of antigen-antibody interaction; Precipitation reaction: Definition, characteristics and mechanism, precipitation in gels (slide test) - Radial immunodiffusion (Mancini method), Double immunodiffusion (Ouchterlony method) • Agglutination reaction: definition, characteristics and mechanism • Haemagglutination (slide and micro-tray agglutination), passive agglutination, Coomb's test and ELISA
RUSZOO503 Molecular Biology and Biotechnology	**I**	**Types of mutation** • Point mutations – substitution, deletion and insertion mutations • Substitution mutations – silent (same-sense), missense and nonsense mutations, • Transition and transversion, Deletion and Insertion mutations – frameshift mutations • Trinucleotide repeat expansions – fragile X syndrome, Huntington disease • Spontaneous mutation – tautomeric shifts, spontaneous lesion
	II	**Techniques in Genetic Engineering** • PCR techniques: Principles, working and applications of thermocycler and introduction to RTPCR. **Separation and detection techniques**: Blotting techniques: Southern blotting, Northern blotting and Western blotting Applications of blotting technique.
	III	**Inborn Errors of Metabolism:** Phenylketonuria, G-6- PD deficiency, Alkaptonuria, Albinism, Niemann Pick syndrome

		• **Single gene mutation**: Cystic fibrosis, Muscular dystrophy
	IV	**Physicochemical properties** – pH, CO2 and bicarbonate, buffering, O2, osmolality, temperature, viscosity, surface tension and foaming • **Types of media** – Natural and Artificial media • **Serum** – protein, growth factors, hormones, nutrients and metabolites, lipids, minerals and inhibitors • **Balanced Salt Solutions**
RUSZOO504 Endocrinology, Osteology and Embryology.	**I**	**Endocrine glands and regulation** General organization of mammalian endocrine system **Hormones**: Classification, properties, mechanism of hormone action, hormone secretion and transport
	II	**Introduction: Cartilage and Bone** • Chemical composition, Structure and Function of Cartilage. • Chemical composition, Structure and Functions of Bone.
	III	**Introduction to experimental embryology** Germplasm theory, Mosaic theory, Regulative theory, Gradient theory, Spemann's theory of organizers **Basic concept and principles of experimental embryology** - fate maps
	IV	**Basic structure of integument**: Epidermis and dermis; classification of keratinized and nonkeratinized derivatives

T.Y.B.Sc. (Applied Component: Marine Science) [Semester V]

Paper Code	Unit	Portion
RUSZOO501 Marine Science I	**I**	**Zonation of the Sea** –Vertical and Horizontal Inter-tidal organisms (rocky, muddy & sandy shores)
	II	**Physical parameters of the sea** • Density • Illumination • Temperature • Pressure
	III	**Fishery acts and monitoring bodies** **Remote sensing and forecasting** **Geographical Information System (GIS)**: • Concept • Applications of GIS in aquatic Resource identification **Digital Image Processing** (DIP): Different Methods and Approaches
	IV	NIO, CMFRI, CIFE, FSI, CIBA, MPEDA NIOT Endangered, Threatened and Vulnerable marine species

MSc Part II

RPSZOO301 **Basics of Industrial and Environmental Biotechnology – I**	Unit- 1	**The implications of recombinant DNA technology of commercial products and microbial synthesis** • General account on applications of biotechnology • Commercialization of biotechnology & biotech companies • Prospects of novel food technology
	Unit- 2	**Large scale culture & production from recombinant microorganisms & genetically engineered animal cells** • Batch fermentation • Fed batch fermentation • Continuous fermentation
	Unit- 3	**Medical Biotechnology** • Sub-unit Vaccine production against viruses- Herpes simplex, Bovine foot &mouth disease virus • DNA vaccine • Attenuated vaccine – cholera and salmonella • Multitalented subunit vaccine • Anti idiotype vaccine
	Unit- 4	**Environmental Biotechnology I** • Microorganisms in lignocellulose degradation • Isolation of prokaryotic & eukaryotic cellulase gene • Manipulation of cellulase gene
RPSZOO302 Genetic Engineering Techniques and Its Applications	Unit- 1	**Genome management and analysis** • Chemical Synthesis of DNA-Oligonucleotide synthesis by Phosphoramidite method, Synthesis of genes • DNA Sequencing -- Maxam-Gilbert method, Sanger's dideoxynucleotide method, By using bacteriophage M13, By Primer walking, Next generation sequencing
	Unit- 3	**Bioinformatics** Uses and application of computers in biological sciences DNA profiling: cDNA and EST's (expressed sequence tags)

	Unit- 4	**Animal biotechnology and Human therapies** • Mice as model system for human disease Recombinant DNA technology to prevent animal disease • Knockout mice
RPSZOP303 Comprehensive Physiology-I	Unit-1	**Levels of response and Nutritional Physiology** • Molecular, Membrane, Organ and Organism. A brief idea of physiological response at molecular level • Functional consequences of molecular composition and arrangement. • Diffusion, active transport, pump; uniports, symports and antiport, co-transport by symporters and anitporters.
	Unit- 2	**Dynamics of physiological fluids-circulation** • Circulating fluids-Cytoplasm, Hydrolymph, hemolymph, lymph and Blood b) Circulatory mechanisms and Fluid compartments, movement of body fluids by somatic muscles. Hemolymph and open system • Pressure and flow in vertebrate circulatory system.
	Unit- 3	**Physiology of motility** • Axoplasmic movement, Chromosome involvement • Actomyosin complex • Sliding filament theory
	Unit- 4	**Neurotransmission Physiology** • Membranes potential Ions as current carriers - Protons, calcium, potassium, structure of cation-permeable channels and chloride channels
RPSZOP304 Environmental and Applied Physiology -I	Unit- 1	**Stress, Water as an environmental factor** • Plastic and elastic strain • Stress resistance

	Unit- 2	**Oxygen as environmental factor** • Oxygen dependencies in living organisms • Adaptation of vertebrates in prolonged diving
	Unit- 3	**Environmental Radiation.** • Radiation as an environmental parameter. • Biomolecules involved in perception and trapping of solar radiations: Chlorophyll, Bacterio-rhodospin, Rhodospin and Vitamin A. Adaptations of animals to absence of solar radiations.
	Unit- 4	**Enzymes and Body Fluids as Clinical Diagnostic Tools.** • Plasma specific and non-plasma specific enzymes • Diagnostic importance of LDH • Enzyme in diagnosis of myocardial infarction • Enzymes in Liver diseases and toxicity
RPSZOG303 General, Physical, Chemical and Biological Oceanography	Unit-1	**General oceanography** • Continental shelf, continental slope, submarine canyons, submarine mountain ranges, Guyots and trenches with special reference to the Indian Ocean and adjacent seas.
	Unit-2	**Physical oceanography** • Vertical circulation**:** wind induced circulation, Thermohaline circulation and upwelling of water**.** • Waves**:** Characteristics of waves, deep water and shallow water waves, transitional waves, wind generated waves, internal waves and Tsunami
	Unit-3	**Chemical oceanography** • Composition of sea water
	Unit-4	**Biological oceanography** • Marine biotic diversity: Plankton, Nekton, Benthos- brief account • Intertidal organisms and their zonation.

RPSZOG304 Planktology, fish, fishery science, immunology of fish and aquaculture	Unit-1	**Planktology** • Adaptation to planktonic life. • Factors influencing the distribution and abundance, plankton bloom, patchiness, vertical distribution and red tide.
	Unit-2	**Fish and fisheries science** • Teleosts**:** Sciaenoids, Indian salmon, Seer fish, Mackerel, Sardine, Carangids, Tuna, Sole fish, Harpodon, Ribbon fish fisheries.
	Unit-3	**Immunology of fish** • Defence system: Specific and non-specific • Response to pathogens • Fish vaccinations
	Unit-4	**Aquaculture** • Different systems of aquaculture such as Pond Culture, Cage Culture, Pen Culture, Running Water Aquaculture, Raft Culture, Aqua ranching

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