

SCHOOL OF MARINE SCIENCES
ALAGAPPA UNIVERSITY, THONDI CAMPUS - 623409

AREA PAPER: MARINE BIOLOGY

Unit-I- General morphology and outline classification of fishes-major group of fishes of the world and their characteristics- identification of fishes of Indian waters. Basic anatomy of fish digestive, respiratory, nervous and reproductive system, Food and feeding habits-Age and growth-Length weight relationship-Maturity and fecundity-Reproduction-Embryonic, larval development and juvenile stages of finfishes and shell fishes. Migration of fishes-Biotic and abiotic factors affecting spawning in fishes. Study of microbial diseases: Methods of isolation -culture-Identification of pathogens and disease control. Microbial quality: changes during processing and storage. Introduction and scope of marine microbiology- Marine microbial habitats: estuaries, mangroves, salt marshes, beach, coastal ecosystems, coral reefs, water column, sediments and extremophiles Diversity of marine microorganism-Archaea, bacteria, cyanobacteria, algae, plankton, fungi, viruses and actinomycetes. Spoilage of seafood-microbial spoilage, spoilage of fresh and processed seafood - factors affecting spoilage, chemical indices of microbial spoilage, Histamine producers, tetradoxin, brevitoxin, ciguatera, aflotoxins. Seafood borne human pathogens-bacteria, fungi and viruses. Defects in fish processing technology.

Importance of Coastal aquaculture-Natural Stock-Over fishing-Depletion -Present status-Potentialities and socio-economic problems of aquaculture. Farm design and structure: Site selection-Technical consideration- Topography-Soil Characteristics - water supply- Pond type - Dyke -Inlet, outlet - Structures, type and Design of supply and drainage canals- Farm design, construction, operation and maintenance-Open sea forming: cages, pens -Raft -Raceways practices.

Unit-II- Invertebrates: Principles and classification; Origin, evolution and interrelationships of invertebrate's phyla - interrelationship among the classes within each invertebrate phylum. Study on the minor phyla. Prochordata: Principles and classification; Comparative morphology, reproduction and early development, larval metamorphosis; Origin, evolution and phylogenetic relationships. Chordata: Principles and classification; Origin, evolution and comparative anatomy of vertebrates through geological time scale. Structure, function and adaptive radiations of bony fishes and elasmobranchs. Amphibians: Effects of terrestrialization and origin; Reptiles: Evolution and adaptive radiation Birds: Origin, evolution and biology. Mammals: General characters, classification, evolution. Human evolution. Aquatic mammals: Classification, adaptations, and evolution of Cetacea and Sirenia.

Unit-III - History and scope of immunology types of immunity, Innate, acquired, Passive and active physiology of immune response. Humoral immunity and cell mediated immunity - Lymphoid organs-Primary and Secondary -Ontogeny and Physiology of immune system. Antigen, epitopes and heptanes. Immunoglobulin-structure, classes and function-Molecular biology of immunoglobulin synthesis-Origin, development and differentiation of T and B lymphocytes. Antibody diversity - Ag -Ab interactions-detection and measurement, agglutination and precipitation-enzyme immunoassays, polyclonal and monoclonal antibodies -Immuno blotting, ELISA, Immunoelectrophoresis.

Complement pathways-components - classical and alternate pathways-activation-Hypersensitivity-Anaphylaxis catatonic reaction. Immunity to infectious diseases-Immunization with vaccines - characteristics of good vaccine methods of vaccine production - classical and modern interleukins-types sources and their functions. Cancer and transplantation immunology. Immunopotential and immunosuppression -physical, chemical and biological method -introduction to tumor immunity, Tumor antigens. Host immune response to human tumors - immune diagnosis and therapy. Mendelian Genetics: Monohybrid - laws of dominance & segregation; Dihybrid cross - law of independent assortment - simple mendelian traits in man.Interaction of Genes: Complementary, Epistasis - Dominant & Recessive Polygenic Inheritance - Skin colour in man Multiple Alleles - Blood groups in man Linkage & Crossing over in *Drosophila*.Chromosome mapping, Sex-linked inheritance in man - Colour blindness and Haemophilia. Sex Determination - Types, intersexes,Gynandromorph and sex-mosaicsInborn Errors of metabolism, Non-disjunction - Syndromes - Klinefelter, Turner, Down, Cri-du-chart. Pedigree analysis, Inbreeding and Out- breeding, Eugenics, Euthenics and Genetic Counselling.

Unit-IV-

Mitochondria(glycolysis,Kreb's cycle,electron transport system,energy generation summary) Ultrastructure & functions of Ribosomes and Lysosomes.Ultrastructure and functions of Nucleus and nucleolus.Chromosomes:Structure & types and Giant Chromosomes.Cell division-Mitosis,Meiosis & their significance. DNA -Watson and Crick model of DNA, Replication. DNA as the Genetic material (Transformation,Transduction & Conjugation Experiments)RNA -types and structure Bacteriophage.Gametogenesis-Spermatogenesis and Oogenesis.Fertilization,cleavage and gastrulation. Gene Cloning: Restriction enzyme and DNA Ligation-Cohesive and blunt ligation, Linkers, adapters, homopolymer tailing; Transformation- Bacteria- Ca^{2+} mediated, electroporation, lipofection; PEG mediated, gene gun, electroporation, and Mammalian cells microinjection, transfection methods. Primer design; Fidelity of thermostable enzymes; Chemical

synthesis of oligonucleotides; PCR and its optimization; Types of PCR - multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR

Unit-V- Bio - Macromolecules as an energy source - Handerson and Hasselbalch equation - Acid base maintenance and their significance. Chemical bonds and their significance. Thermodynamics - laws and their significance. Carbohydrates- classification, structure, properties and biological importance of Monosaccharides, Disaccharides and Polysaccharides. Proteins- Classification and function of Proteins, structural levels of organization. Denaturation and isoelectric point of Proteins. Amino acids: Classification of amino acids, essential amino acids, reactions of amino and carboxyl groups of amino acids.

Marine pollution- definition - role of GESAMP - major pollutant - sources - transport path - dynamics. Toxicology - Lethal and Sub-lethal effects of pollutants to marine organisms bioconcentration, bioaccumulation and biomagnification, methods of toxicity testing, factors influencing toxicity, synergistic and antagonistic effects, role of microcosms & mesocosms. Sewage pollution - industrial - agricultural - domestic - impact on marine environment - treatment methods. Detergents - composition - interference with eutrophication - ecological impact. Marine debris - plastics - litter - impact in the marine environment. Lipids- Classification and properties of lipids. Types of fatty acids - saturated, unsaturated and essential fatty acids. Significance of lipoproteins and phospholipids. Structure, synthesis and biological significance of cholesterol, HDL and LDL. Metabolic pathways and Fermentations: Glycolytic pathway, Pentose phosphate pathway (HMP), Tricarboxylic acid cycle, Electron transport chain, CytC. Substrate level and oxidative phosphorylation, inhibitors and un-couplers of electron transport chain and function of ATPase (bacterial and mitochondrial), Fermentation- Lactic acid fermentation, Amino acid catabolism- Urea Cycle Deamination and transamination reactions. de novo biosynthesis of purines and pyrimidines, Ribonucleotide reductase and its role in nucleic acid metabolism, Good Laboratory practices


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