

CMJ UNIVERSITY, SHILLONG

REGULATION FOR MSC ZOOLOGY

Duration – Two Years

Eligibility - B.Sc. with relevant subject or its equivalent

Scheme of Distribution of Marks

Sr. No.	First Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Functional Morphology Of Invertebrates and Chordates, Cell & Molecular Biology & Biophysics	30	70	100	40
2	Advanced Genetics, Basic Concepts Of Microbiology & Immunology	30	70	100	40
3	Bio Statistics & Computer Applications	30	70	100	40
4	Environmental Science & Developmental Biology	30	70	100	40
Sr. No.	Second Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Biochemistry & Molecular Biology	30	70	100	40
2	Basic Concepts Of Biotechnology, Evolution& Taxonomy	30	70	100	40
3	Animal Physiology	30	70	100	40
4	Cell Biology	30	70	100	40
5	Practical- II				

M.Sc ZOOLOGY(First year)

FUNCTIONAL MORPHOLOGY OF INVERTEBRATES AND CHORDATES, CELL & MOLECULAR BIOLOGY AND BIOPHYSICS

MSZ - 101

SYLLABUS

UNIT-I

Origin and evolution of Metazoa - Theories - Symmetry and its significance in animal organization - Interrelationship between different phyla - Echinodermata phylogeny and evolution. Origin of paired fins & limbs origin and evolution of invertebrates - Adaptive radiation of elasmobranchs and bony fishes - Terrestrialization of amphibia - Evolution of reptiles - Origin and evolution of birds - Connecting links between Reptiles and birds - Origin of mammals

UNIT-II

Comparative anatomy of chordates, integumentary system, Urinogenital system, heart and aortic arches, brain & urinogenital system.

UNIT-III

DNA and RNA - Structure, types & functions - Replication of DNA - DNA Repair mechanism - Gene action and protein synthesis

UNIT-IV

Biology of aging and cancer cells.

UNIT-V

Microscopy (Compound - Phase contrast - Electron (TEM & SEM) Microscopy) - Colorimetry - Spectrophotometry (Visible, UV, IR) - Centifuge (Ultra - centrifuge) - Electrophoresis (PAGE) - Chromatography (TLC) Properties of Natural light - Biological applications of X rays, UV rays and Infra red rays - Isotopes and their uses in biological investigation - X-ray diffraction

ADVANCED GENETICS, BASIC CONCEPTS OF MICROBIOLOGY AND IMMUNOLOGY

MSZ – 102

SYLLABUS

UNIT-I

Gene and metabolic pathways – Metabolic block in Drosophila (eye pigmentation) Inborn errors of Metabolism in man – Haemoglobin disorders – Sickle cell anemia and thalassemia Human Karyotype preparation and chromosomal syndromes in man – (Down's, Turner's and Klinefelter's syndromes).

UNIT-II

Genetics of races and species formation – genetic load – genetic polymorphism – Evolution of sex chromosome – Dosage compensation – X inactivation – genomic imprinting.

UNIT-III

Application of genetics in plant and animal breeding – Application of genetics in crime & law – DNA finger printing – Genetic basis of intelligence – Studies on twins.

UNIT-IV

Morphology – Types – Cell wall of gram positive and gram negative bacteria – Structure and life cycle of DNA (T_4 phase) and RNA Virus (HIV) and bacteria (eg. Lysogenic and Lytic cycles – Sterilization technique – Culture of bacteria – Types of media and condition for culturing.

Study of causative organisms – Modes of transmission and control of common bacteria and viral agents of man – Polio, HIV, HBV A and B, Tuberculosis, Leprosy, Diphtheria, Typhoid, Gonorrhoea and Cholera, (Balantidium, Streptococcus, Staphylococcus).

UNIT-V

Cells of immune system – Origin and differentiation of T, B cells and macrophage – Antigens – Class determinants – Relative sites and receptor site.

Vaccine – Types – Mode of action and vaccine for various diseases. Antibody – Immunoglobulin – Types – Subtypes – Properties and functions.

Major histocompatibility complex (MHC) and its products in man. Disease and immune response – Viral bacterial disease parasitic infections. Tumour immunology Immune deficiency disease – AIDS - Auto immune disease – examples - Types of hypersensitivity – concept (Types-IV).

BIO STATISTICS AND COMPUTER APPLICATIONS

MSZ – 103

SYLLABUS

UNIT – I

CLASSIFICATION AND PRESENTATION OF DATA

Definition – Statistics and its application in Biology – Collection of data. Classification: Qualitative and Quantitative.

Tabulation : Diagrammatic representation – Graphical representation – frequency curves – frequency polygon and ogive curve – Population statistics.

UNIT – II

DESCRIPTIVE AND INFERENTIAL STATISTICS

Measures of Central tendency: Arithmetic mean – Median – mode.

Measures of dispersion : Standard deviations and standard errors – co-efficient of variance.

Probability distribution – Binomial and Poisson distribution – Student 't' Test – estimation and hypothesis. Test of significance – small samples and large samples – X^2 distribution and its uses.

UNIT –III

CORRELATION AND REGRESSION

Correlation: Correlation of Karl Pearson's Co-efficient of correlation – testing its significance – interpretation.

Regression Analysis: Regression Coefficient – Construction of regression lines – properties – application.

UNIT – IV

BASIC CONCEPT OF COMPUTERS

Introduction to computers – characteristics of computers – Classification of digital computer systems – Anatomy of a digital computer – Number system (Basic Concept only) – memory units – Input and output devices – Auxiliary storage devices.

UNIT-V

COMPUTER APPLICATIONS:

Computer Software: Programming languages (BASIC, COBOL, FORTRAN AND C – only basic concept) – Operating Systems. Windows (WORD – EXCEL AND OWERPOINT – BASIC concept only). Data processing and Database Management – Internet – Email – Computer applications in Science and Technology.

ENVIRONMENTAL SCIENCE AND DEVELOPMENTAL BIOLOGY

MSZ – 104

SYLLABUS

UNIT – I

(Environmental Science-i) Ecosystem – Natural and man – made ecosystems with examples – Energy flow – Pyramids, food –chain and food –web – Productivity – Ecological efficiencies.

Natural Resources – Renewable – Forest management – Deforestation and A forestation – Protection of wild-life resources – Conservation projects.

UNIT – II

(Environmental Science-ii) Pollution And Management – Sources effects and control of air, soil and water pollution – Heavy metals – Ground water and marine pollution – Noise pollution – Radio active pollution – Bioaccumulation – Biomagnifications.

Energy Resources – Non – Renewable resources (mineral) – Conventional (Coal, petroleum) – Renewable – Non-conventional (Solar, wind) – conventional – Hydel, tidal powers, salinity, energy, geothermal and nuclear Power – Programmes in India.

UNIT –III

(Developmental Biology-i) Gametogenesis-

Primordial germ cells – Spermatogenesis - The origin of yolk – Yolk - Nuclear activity during growth of the Oocyte – Blansky - Gene amplification nucleolus and synthesis and storage of Ribosomes – Fertilization - Gamete Fusion – Cleavage – Blastula – Morul – Cleavage – Laws - Patterns of Cleavage - Factors affecting cleavage - Chemical changes in Cleavage - Polarity and Gradient

UNIT –IV

(Developmental Biology-ii) Gastrulation

Morphogenetic Movements - Fate – Map - Physiology of Gastrulation - Gastrulation N Amphioxus - Gastrulation in Amphibian - Gastrulation in Chick - Gastulation in Mammals – Organogenesis - Development of Eye - Development of Heart - Development of Kidney - Development of Brain

UNIT –V

(Developmental Biology-iii) Foetal membranes and Placenta-Classification and Physiology

Development of Extra-Embryonic Membranes - Placenta and Placentation - Physiology of Placenta – Metamorphosis - Hormonal Control of Amphibian Metamorphosis - Mode of Hormonal Action - Experimental Embryology - Inductors and Organiser

MASTER OF SCIENCE [ZOOLOGY]Second Year
BIOCHEMISTRY AND MOLECULAR BIOLOGY
MSZ - 201

BIOCHEMISTRY

UNIT – I

Carbohydrates: - Monosaccharides and Disaccharides – Definition, classification, structure, properties and biological significance, Polysaccharides – Types and biological importance.

UNIT – II

Enzymes: Definitions, classification, Active site, Lock and key model, Induced fit hypothesis, Kinetics factors affecting enzyme activity, M.M. equation, LB. Plot, Enzyme inhibition.

UNIT – III

Lipids: Classification of lipids, physical and chemical properties, saturated, unsaturated fatty acids and steroids. Structure of cell membrane and Transport.

MOLECULAR BIOLOGY

UNIT – IV

Introduction to Molecular Biology and Genetic. DNA Replication. Prokaryotic and eukaryotic DNA replication, Mechanics of DNA replication, Enzymes and accessory proteins involved in DNA replication. DNA Repair and Recombination.

UNIT – V

Transcription-Prokaryotic, Eukaryotic, RNA polymerase, General and specific transcription factors, Regulatory elements and mechanisms of transcription regulation, Transcriptional and post-transcriptional gene silencing.

BASIC CONCEPTS OF BIOTECHONOLOGY, EVOLUTION AND TAXONOMY

MSZ - 202

UNIT - I

Biotechnology: Definition, Scope, Importance, Major areas of Biotechnology, Genetic Engineering: Vectors, Major Steps Involved, rDNA Technology Tissue, Culture Technology: Cell Culture, Organ Culture, Embryo Technology, Invitro Fertilization, Embryo Transfer

UNIT - II

Fermentation Technology: Bioreactor, Primary and Secondary metabolites (Lactic Acid, Alcohol, Vitamins, Penicillin and Vinegar), Food Biotechnology: Single Cell Protein (SCP), Production (Bacterial, algal and fungal), Enzyme Biotechnology: Properties, Free Enzymes, Immobilization

UNIT - III

Applied Biotechnology: Application of rDNA technology in the production of vaccines, hormones, Monoclonal antibodies – Applications, Transgenesis in plants and animals, Gene Therapy – Methods, DNA Finger Printing - Applications

UNIT - IV

Speciation: Evolutionary Rates and punctuated equilibrium, Hardy Weinberg Law and Evolution, Patterns of Evolution, Organic Evolution at human level, Adaptation: Adaptation and Evolution, Coloration of Animals, Non-adaptive Characters, Animal Distribution, Evolutionary Significance

UNIT - V

Taxonomy: Nature of International Code of Zoological Nomenclature, Principles relating to nomenclature, Taxonomic Keys, Objectives and uses in Zoological Studies, Chemotaxonomy, Molecular Evolution, Gene Evolution, Molecular Drive

ANIMAL PHYSIOLOGY

MSZ - 203

UNIT – I

Nutrition: Carbohydrates, Proteins and Lipids: Physiology of absorption, Respiration: Types of respiratory mechanisms (Integumentary, bronchial, tracheal and pulmonary), Physiology of respiration in man, Respiratory pigments and their role in oxygen and carbon dioxide transport in man.

UNIT – II

Circulation: Control of heart beat, Cardiac cycle, Electrocardiogram (ECG), Coagulation of blood, Hemodynamic, Excretion: Patterns of excretion in relation to environment, Physiology of excretion in man, Regulation of excretion.

UNIT – III

Nervous Co-ordination: Types of neurons, Transmission of nerve impulses, Synaptic transmission, Autonomic nervous system, Organization and function, Reflex action, Chemical Co-ordination, Neurosecretion and its importance in insects, Hormones of vertebrates, Molecular mechanism of hormone action.

UNIT – IV

Muscle physiology: Molecular structure, Chemical composition, Mechanism of muscle contraction, Regulation of energetic of muscle contraction, Nerve Physiology: Functional Architecture of a Neuron, Nerve Fibers, the Origin and Propagation of Nerve Impulse, Donnan Equilibrium, The Reflex Action and The Reflex Arc

UNIT - V

Sensory Physiology: Receptors, Classification and Functions, Mechanism of hearing, Physiology of vision in man, Bioluminescence: Types, Chemical and Physical aspects, Functional significance.

CELL BIOLOGY

MSZ - 204

UNIT - I

Cell Diversity: Cell size shape, cell theory, structure and function of cell organelles in prokaryotic & eukaryotic cells. The cell cycle and programmed cell death: Cell cycle, molecular events in plants and animals. The mechanics of cell division. Cell motility.

UNIT - II

The cytoskeleton: The self assembly and dynamic structure of cytoskeletal filaments, How cells regulate their cytoskeletal filaments; molecular motors, the cytoskeleton and cell behavior. Microtubule motors and movements. Cell-cell interactions: Cell Adhesion proteins, tight and gap junctions, plant cell adhesion and plasmodesmata.

UNIT - III

Energy conversion: Mitochondria and chloroplasts. Electron transport chains and their protein pumps, the genetic system of mitochondria and plastids. The evolution of electron transport chains.

UNIT-IV

Transport of nutrients, ions and macromolecules across membranes. Signal transduction, mechanism and cellular responses to environmental signals. Bio-synthesis of proteins in Eukaryotic cells, Co-and post translational modification, intracellular protein traffic. Protein localization: synthesis of secretory and membrane proteins.

UNIT - V

Cellular basis of differentiation and development-mitosis, gametogenesis and fertilization Development in Drosophila and Arabidopsis; PM5 spatial and temporary regulation of gene expression.

******* MSZ 205 Practical- II *******

