MAHARAJA KRISHNAKUMARSINHJI BHAVNAGAR UNIVERSITY

(With effect from Academic Year 2019-20)

SEMESTER I **M.Sc. Microbiology/Zoology/Botany** **Paper No: I**

Title of the Paper: Cell Biology and Molecular Biology

Marks: 100
Credits: 04

Marks: **Semester End Examination: 70**
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
Unit 1	General Cellular Status of prokaryotic and eukaryotic cells **cell organelles**: Mitochondria, Golgi bodies, Endoplasmic Reticulum, Chloroplast and Ribosomes Cytoskeleton: Organization and function of microtubules, microfilaments and Intermediate filaments		
Unit 2	Cell cycle: Cell division and its types (somatic and reduction division) Regulation of normal and abnormal type of cell divisions, Cell differentiation, Simple tissues, cell theory		
Unit 3	Resume of DNA structure, central dogma of molecular biology, DNA Replication, DNA repair system, DNA polymerase, Exonucleases, Endonucleases, homing and retrohoming Endonucleases, Topoisomerases, Gyrases, Methylases, Ligases and Protein Factors.Superhelical Density, C-value paradox, Cot curves. DNA Sequencing: Maxam and Gilbert, Sanger's and Automated Method.		
Unit 4	Basic features of genetic code, variation in the genetic code, second genetic code, Wobble hypothesis. Structural features of r-RNA, t-RNA and m-RNA. Transcription, RNApolymerases, Bacterial promoters, RNA processing in Bacteria andEukaryotes, Ribozymes and reverse transcriptase, RNA foot printing. Regulation of Transcription: Operon model, Positive and Negative control.		

Break up of Continuous Internal Evaluation:

Internal Test: **15 Marks**
Assignment: **10 Marks**
Attendance: **05 Marks**
Total Marks: **30 Marks**

Reference Books:

1. Anlysis of Genes and Genomes – Richard Reece
2. Cell – A molecular approach – 2007
3. Cell Physiology – A. C. Giese
4. Cell and Molecular Biology – De Robertis and De Robertis
5. Essential Techniques in Cell Biology – Bhatnagar, Murthy, Chinoy, V.C. Shah
6. Genetis VIII – Lewin
7. Molecular Biology – Freifeldre
8. Molecular Biology of Cell – Albert et. al., (Garland)
9. Molecular Cell Biology – Lodish et. al., Scientific American books
10. Reproduction in Eukaryotic cells – Prescott, D. M., Academic press
11. Cell – Swanson and Webste

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SEMESTER I **M.Sc. Microbiology/Zoology/Botany** **Paper No: II**

Title of the Paper: Biochemistry

Marks: 100
Credits: 04

Marks: **Semester End Examination: 70**
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks /Weight
Unit 1	Proteins: Structure, classification, properties and functions. Amino acids and peptides. Methods for protein purification. Amino acid sequencing for proteins. Protein metabolism: Synthesis and degradation.		
Unit 2	Carbohydrates: Structure, classification, properties and functions. Glycoconjugates: Proteoglycans, glycoproteins and glycolipids. Carbohydrate metabolism: Glycolysis, TCA cycle, gluconeogenesis.		
Unit 3	Lipids**:** Structure, classification, properties and functions, biological membranes. Metabolism**:** Biosynthesis and degradation of lipids. Vitamins**:** Classification, chemistry and function.		
Unit 4	Enzymes**:** Apoenzyme, coenzyme and prosthetic groups. Properties, classification, functions and mode of action of enzymes and coenzymes. Hormones: Chemistry, mode of action and function of plants, animals and microbial hormones.		

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

Reference Books:

1. Biochemistry by Lehninger, Nelson, Cox
2. Biochemistry by N. P. Sharma.
3. Principles and Techniques of Biochemistry and Molecular Biology (6th edition) by Keith Wilson and John Walker.
4. Biochemistry by Stryer.

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SEMESTER I **M.Sc. Microbiology/Zoology/Botany** **Paper No: III**

Title of the Paper: Instrumentation in Biological Sciences

Marks: 100
Credits: 04

Marks: **Semester End Examination: 70**
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks /Weight
Unit 1	Methods**:** Measurements of pH, Conductivity, EDTA, Acid Base and Dichromate titrations, Centrifugation, Microscopy.		
Unit 2	Microtechniques: Cell culture technique and its potential use, Histological and Histochemical staining.		
Unit 3	Techniques: Chromatography: Paper chromatography – Unidimentional and two dimentional, thin layer chromatography (TLC), High pressure liquid chromatography (HPLC), Electrophoretic techniques – paper electrophoresis, gel electrophoresis, its application in biological sciences		
Unit 4	Instrumentation: Colorimetry, Sprectophotometry, Flame photometryand their applications in biological sciences.Atomic adsorption spectrophotometry (AAS), Mass spectrometrictechniques (MS), Nephelometry and Turbidimetry.		

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Mark

Reference Books:

1. An Introduction to Practical Biochemistry by Plummer.
2. Environmental science and Biotechnology : Theory and techniques by A. G. Murugesan and C. Rajakumari.
3. Instrumental methods of chemical analysis by B. K. Sharma.
4. Microscopy for students by J. D. Casartelli, McGraw, Hill pub.
5. Principles and techniques of biochemistry and molecular biology (6th edition) by Keith Wilson andJohn walker, Cambridge Edition.

SEMESTER I M.Sc. Botany Paper No: IV Title of the Paper: Practicals
Marks: 100 **Credits : 15**
Practical exercised based on paper I to III

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SEMESTER II **M.Sc. Microbiology/Zoology/Botany** **Paper No: V**

Title of the Paper: Genetics, Evolution and Biostatistics

Marks: 100
Credits: 04

Marks: **Semester End Examination: 70**
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
Unit 1	Gene concept and interaction of genes (complementary gene effects, epistasis and its Types) Mendel's work on heredity, Mendel's mono and dihybrid experiments. Neo- Mendelism, Mendel's Laws.Linkage and crossing over, coupling and repulsion hypothesis		
Unit 2	Sex-linked inheritance, Lethality in animals and humans. Non-chromosomal inheritance. Principles and theories of organic evolution. Mutation and its types,molecular basis of evolution, speciation.		
Unit 3	Application of computers instatistics, advantage of using a computer, computer codes, computerprogramme languages. MS Excel – statistical functions, descriptivestatistics, t-test, ANOVA, correlation, regression, Chi-square test. **Population and sample**: Sampling, sample size, sampling distribution, Finite and infinite population, necessity of sampling, methods of sampling **Variables**: Variables in Biology, Collection, classification and tabulation of data **Diagrams and Graphs**. Need, usefulness, guidelines, types of		
Unit 4	**Frequency distribution**: Definition, relative and percent relative frequencies, discrete and continuous frequency distribution, cumulative frequency distribution, frequency graphs. Descriptive statistics, Average: Definition, objectives, types ofaverages. **Deviation:** Mean deviation, standard deviation, interpretation ofstandard deviation, standard error, coefficient of variation, **Probability**: Probability scale, definitions, types and rules of probability, applications of probability, Venn diagrams. **Hypothesis testing**: Hypothesis and null hypothesis, samplingdistribution, level of Significance, Student's t-test, ANOVA – one way and two ways, correlation, coefficient of correlation, regression, Chisquaretest.		

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

Reference Books:

1. An introduction to biostatistics, 2nd Revised ed., by Urunmani.
2. Animal cytology and Evolution by White.
3. Biostatistics by P. K. Sen.
4. Cytology, genetics and Evolution by P. K. Gupta.
5. Cell dynamics by Springer and verlang wiin.
6. Evolution by Lull.
7. Evolution by Dobzhanky.
8. Evolution by Savage.
9. Foundation of Genetics by A.C.Pai, McGraw Hill Pub.
10. Genetics by Farnsworth, (Hyper and Row).
11. Genetics by Verma and Agarwal.
12. Genetics by Winchester, Oxford IBH Publication.
13. Genetics: New Frontiers by Chopra, Joshi, Sharma, Bansal.
14. Genetics. The thread of Life by Philippe Kourilsky.
15. Genetics and Origin of species by Dobzhanky, Columbia Univ. Press.
16. Introduction to Evolution (Ind. Edition) by Moody.
17. Principle of Genetics by Gardner, Wiley Eastern Pvt. Ltd.
18. Population, species and Evolution by Major.

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SEMESTER II **M.Sc. Microbiology/Zoology/Botany** **Paper No: VI**

Title of the Paper: Environmental Biology and Biotechnology

Marks: 100
Credits: 04

Marks: **Semester End Examination: 70**
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks /Weight
Unit 1	**Man and environment**: International efforts to tackle environmental pollution.Pollution of water and treatment of polluted waters. **Soil pollution**: Biocides, solid waste pollution. Noise pollution.		
Unit 2	**Air pollution:** Oxides of carbon, other green house gases, ozone, Sulphurdioxide, oxides of nitrogen, hydrocarbons and particulate air pollution. Centralcontrol devices for air pollution.		
Unit 3	Definition and scope of, Recombinant DNA Technology (Genetic Engineering), restriction enzymes, reverse transcriptase, ligation and transformation **Cloning vectors**: Plasmids, Cosmids, Phagemids, Phages, Artificial chromosomes, cloning strategies. PCR methods and applications. Productionof insulin, human growth hormone and vaccines by RDT. Site-directedmutagenesis, oligonucleotide directed mutagenesis **Bioinformatics:** Overview of Bioinformatics, Database types, Genomics andProteomics, Human Genome Project, DNA microarrays.		
Unit 4	Transgenic plants for resistance against insect pests, viruses, herbicides,bacterial and fungal pathogens for higher photosynthesis, nitrogen fixation andbetter seeds. Biosafety concerns with transgenic plants. Transgenic animals forhuman proteins. Biotechnological applications of animal cell and tissueculture.		

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

SEMESTER II **M.Sc. Microbiology/Zoology/Botany** **Paper No: VII**

Title of the Paper: Radiation Biology & Immunology

Marks: 100
Credits: 04

Marks: **Semester End Examination: 70**
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks /Weight
Unit 1	Introduction: Discovery of radiations, radioactive materials and their Biological effects. The atom, nuclides, radio nuclides. Characteristics andsource of alpha, beta, X and gamma rays and their interaction with matter. Radiation detection and uses: Units, measurements of radiation, utility indifferent fields of biological sciences.		
Unit 2	Biological effects: Radiation effects on biomolecules. Chromosomes, microorganisms, plants, mammals, blood and hematopoietictissues, digestive system, reproductive system, skin and hair, bones.Hazards of radiation.		
Unit 3	Immunity: Definition and types of immunity. Autoimmunity. Complement system, properties and mode of action. Antigens: Definition, types and properties. Antibodies: definition, classes,cellular mechanism of production. Antigen –antibody reactions. Monoclonal antibodies: Definitions, productions, uses.		
Unit 4	Hypersensitivity**:** Types (classes) of hypersensitivity reactions, vaccines. Vaccines: Types, DNA vaccines, malaria vaccines, edible vaccines, Interferon**:** Types, properties and mode of action.		

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

SEMESTER II **M.Sc. Zoology** **Paper No: VIII**

Title of the Paper: Practicals

Marks: 100
Credits : 15