KANNUR UNIVERSITY
(Abstract)

MSc Microbiology Programme - under Credit Based Semester System in Affiliated Colleges -Revised Scheme, Syllabus & Model Question Papers - Implemented with effect from ***2014 admission-Orders Issued.***

ACADEMIC BRANCH

No. Acad/C2/8007 /2014 **Dated, Civil Station P.O, 08 -07-2014**

Read: 1.U.O No. Acad/C1/11460/2013 dated 12-03-2014
2. Minutes of the meeting of the Board of Studies in Microbiology (Cd) held on 27-01-2014
3. Minutes of the meeting of the Faculty of Science held on 25-03-2014
4. Letter dated 25.06.2014 from the Chairperson, BOS in Microbiology (Cd)

ORDER

1. The Revised Regulations for PG Programmes under Credit Based Semester System (CBSS) were implemented in this University with effect from 2014 admission as per paper read (1) above.

2. As per paper read (2) above the Board of Studies in Microbiology (Cd) finalized the Scheme, Syllabus & model Question Papers for MSc Microbiology programme to be implemented with effect from 2014 admission.

3. As per read (3) above the Faculty of Science held on 25-03-2014 approved Scheme, syllabus & model question papers of MSc Microbiology programme to be implemented with effect from 2014 admission.

4. The Chairperson, Board of Studies in Microbiology (Cd) vide paper read (4) above has submitted the finalized copy of Scheme, syllabus & Model question papers of MSc Microbiology programme for implementation with effect from 2014 admission.

5. The Vice Chancellor, after examining the matter in detail, and in exercise of the powers of the Academic Council as per section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with, has accorded sanction to implement the revised scheme, syllabus& model question papers of MSc Microbiology Programme with effect from 2014 admission.

6. Orders, are therefore issued implementing the revised scheme, syllabus & model question papers of MSc Microbiology programme under Credit Based Semester System (CBSS) with effect from 2014 admission subject to report to Academic Council

7. Implemented revised Scheme, Syllabus & Model Question Papers are appended.

Sd/-
DEPUTY REGISTRAR (ACADEMIC)
FOR REGISTRAR

Contd.....2

To

1. The Principals of Affiliated Colleges offering M.Sc Microbiology Programme
2. The Examination Branch (through PA to CE)

Copy To:

1. The Chairperson, BOS Microbiology (Cd)
2. PS to VC/PA to PVC/PA to Registrar
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Approved for Issue

Section Officer

❖ ***For more details; log on to www.kannur university.ac.in***

KANNUR UNIVERSITY

Course Structure & Syllabus for
Postgraduate Programme in

MICROBIOLOGY

under
Choice Based Credit Semester System (KUCBCSS-PG)
(For affiliated colleges with effect from 2014 admission)

Credit and mark distribution for M.Sc. Microbiology (KUCBCSS-PG-2014 Admission)

Semester I

Course code	Title of the course	Marks			Credit	Hours /week
		Internal	External	Total		
MBG1C01	Biochemistry	10	40	50	4	5
MBG1C02	Biophysics	10	40	50	3	4
MBG1C03	Cell Biology	10	40	50	3	4
MBG1C04	General Microbiology	10	40	50	4	4
*MBG1P01	Practical I (Practicals of MBG1C01 and MBG1C02)	-	-	-	-	4
*MBG1P02	Practical II (Practicals of MBG1C03 and MBG1C04)	-	-	-	-	4
Total		**40**	**160**	**200**	**14**	**25**

*Practical examinations are to be conducted along with II semester examinations.

Semester II

Course code	Title of the course	Marks			Credit	Hours /week
		Internal	External	Total		
MBG2C05	Immunology	10	40	50	3	3
MBG2C06	Microbial Physiology & Metabolism	10	40	50	3	3
MBG2C07	Molecular Biology	10	40	50	3	3
MBG2E01	Genetics	10	40	50	4	4
MBG2E02	Enzymology					
MBG2E03	Bioinstrumentation					
*MBG1P01	Practical I(Practicals of MBG1C01 and MBG1C02)	10	40	50	2	-
*MBG1P02	Practical II(Practicals of MBG1C03 and MBG1C04)	10	40	50	2	-
MBG2P03	Practical III(Practicals of MBG2C05)	10	40	50	2	4
MBG2P04	Practical IV(Practicals of MBG2C06)	10	40	50	2	4
MBG2P05	Practical V(Practicals of MBG2C07)	10	40	50	2	4
Total		**90**	**360**	**450**	**23**	**25**

Semester III						
Course code	**Title of the course**	**Marks**			**Credit**	**Hours /week**
		Internal	**External**	**Total**		
MBG3C08	Biostatistics and Bioinformatics	10	40	50	3	3
MBG3C09	Food and Agriculture Microbiology	10	40	50	3	3
MBG3C10	Medical Bacteriology	10	40	50	3	4
MBG3C11	Virology, Mycology and Parasitology	10	40	50	3	3
MBG3E04	Biosafety, Bioethics and Intellectual Property Rights	10	40	50	4	4
MBG3E05	Medicinal Chemistry					
MBG3E06	Algal Biotechnology					
*MBG3P06	Practical VI (Practicals of MBG3C09)	-	-	-	-	4
*MBG3P07	Practical VII (Practicals of MBG3C10 and MBG3C11)	-	-	-	-	4
Total		**50**	**200**	**250**	**16**	**25**
*Practical examinations are to be conducted along with IV semester examinations.						

Semester IV						
Course code	**Title of the course**	**Marks**			**Credit**	**Hours /week**
		Internal	**External**	**Total**		
MBG4C12	Recombinant DNA Technology	10	40	50	2	3
MBG4C13	Environmental Microbiology	10	40	50	3	3
MBG4C14	Microbial Technology	10	40	50	2	3
MBG4E07	Diagnostic techniques in Microbiology	10	40	50	4	4
MBG4E08	Gene Therapy					
MBG4E09	Biomolecular Modeling &Drug Design					

*MBG3P06	Practical VI (Practicals of MBG3C09)	10	40	50	2	-
*MBG3P07	Practical VII (Practicals of MBG3C10 and MBG3C11)	10	40	50	2	-
MBG4P08	Practical VIII (Practicals of MBG4C13)	10	40	50	2	4
MBG4P09	Practical IX (Practicals of MBG4C14)	10	40	50	2	4
MBG4Pr	Project	30	120	150	6	4
MBG4C15	General Viva-Voce	10	40	50	2	-
Total		**120**	**480**	**600**	**27**	**25**
Grand Total		**300**	**1200**	**1500**	**80**	**-**

Theory examination hours for each course will be three hours. During the II, III and IV semesters the student has to undergo any one of the elective courses offered during that particular semester. Duration of practical examinations of MBG1 P01, MBG1 P02, MBG2 P03 MBG2 P04 and MBG2 P05 will be three hours X one day for each and that of MBG3 P06 MBG3 P07 MBG4 P08 and MBG4 P09 will be three hours X two consecutive days for each. Evaluation of project will be as per the general PG regulations of the university. General viva can be conducted on the same day of project evaluation.

MBG1C01: BIOCHEMISTRY [Contact hours: 55]

Module I: 7hrs
Molecular logic of living system- Characteristics of living matter at molecular level. Origin of life and cells.

Module II: 8 hrs
Carbohydrates: Definition and classification and structure of monosaccharides, disaccharides, polysaccharides, glycosaminoglycans.

Module III: 8 hrs
Proteins: Amino acids- classification based on structures, properties of amino acids. Isoelectric pH, buffering actions of amino acids and proteins. Structural organization of proteins: primary, secondary, tertiary and quaternary structure, motifs and domains. Denaturation, isoelectric precipitation of proteins.

Module IV: 8 hrs
Lipids: Definition and classification, structure, function, physical and chemical properties - cholesterol, ergosterol, phosphatidic acid, lecithin, cephalin, phosphatidyl serine, sphingo lipids, eicosanoids. Saponification number, acid number and iodine number of fats.

Module V: 8 hrs
Nucleic acids: Purines and pyrimidines, double helical structure, Watson - Crick Model of DNA, base-paring and base stacking, Hoogsteen base-pairing, DNA polymorphism Classification of nucleic acids.

Module VI: 8 hrs
Vitamins and minerals: chemistry, source and functions of water soluble and fat soluble vitamins. Source and functions of macro elements and trace elements (Na, K, Cl, Ca, Fe, Cu, Se, Zn).

Module VII: 8 hrs
Chemistry and function of peptide and steroid hormones. Examples and functions of plant and animal pigments, pheromones. Neurotransmitters.

References

1. Lehninger's Principle of Biochemistry. Nelson L D and M M Cox. Macmillan Worth Publication Inc.

2. Biochemistry. Jeremy M. Berg John and Tymoczko Lubert Stryer. W H Freeman & Co. NY.
3. Biochemistry with Clinical Correlation. Thomas M Devlin. Wiley- Liss Publication.
4. Biochemistry. Donald Voet, Judith G Voet, Charlottew pratt. John Wiley and Sons.
5. Biochemistry. Jeoffrery Zubay. Wm C Brown Pub.
6. Biochemistry. Mathews C K and KE van Holde. Benjamin Cumming Pub. Co.
7. Biophysical chemistry. Cantor and Schimmel. W H Freeman & Co. NY.

MBG1C02: BIOPHYSICS [Contact hours: 55]

Module I: 10 hrs

Thermodynamics: open, closed and isolated systems, laws of thermodynamics, thermodynamic equilibrium, concept of enthalpy, entropy and free energy, free energy of ATP hydrolysis. Negative entropy changes in living systems, interpretation of life in terms of non equilibrium thermodynamics. Chemical kinetics: rate, order and molecularity of a reaction, energy of activation.

Module II: 9 hrs

Concepts and importance of following in biology: pH, hydrogen bond, water structure, surface tension, adsorption, osmosis, dialysis, colloids, detergents, redox potential.

Module III: 9 hrs

Basic principles of protein structure: Asymmetric carbon, amino acids and peptides, main chain and side chain torsion angles, cis and trans peptides. Principle and patterns of protein conformation. Ramachandran plot. Structure of Lysozyme and rubisco. Protein - protein interaction.

Module IV: 9 hrs

Basic principles of nucleic acid structure: conformation of nucleotides, oligonucleotides, DNA supercoiling and t-RNA structure. Protein-Nucleic acid interactions, H-L-H, Zn-finger and Leucine zipper motifs.

Module V: 9 hrs

Configuration and conformation of monosaccharides, Haworth projection formula, boat and chair conformation, types of linkages. Conformation of polysaccharides.

Module VI: 9 hrs

Membrane structure and transport: lipid bilayer model, membrane potential, Donnan equilibrium. Membrane transport, diffusion, facilitated diffusion, carrier mediated transport and channel mediated transport.

References

1. Biological thermodynamics. Donald T Haynie, Cambridge University Press, Cambridge.
2. Biophysics. M. V. Volkenstein, Mir publishers.
3. Biopolymers. A G Walson and J Blackwell, Associated Press.
4. Essentials of Biophysics. P Narayanan, New Age International publishers.

5. Introduction to Protein Structure. C Branden and I Tooz, Garland Press, New York. Principles of Protein Structure. GE Schulz & RH Schirmer, Springer Verlag, Berlin.
6. Biochemical Calculations. Segel Irvin H. John Wiley and Sons, New York.
7. Biochemistry: The Chemical Reactions of Living Cells. Metzler David E. Volume 1 & 2, Academic Press, California.
8. Biophysical chemistry. Cantor and Schimmel. WH Freeman and Company, New York.

MBG1C03: CELL BIOLOGY [Contact hours: 55]

Module I: 6 hrs

Cell as a unit of life. Properties of life, scientific hypothesis for origin of life. Development of chemosynthesis and photosynthesis. General organization of cell.

Module II: 15 hrs

The structural and functional organisations of cell membrane, ionic transport (Passive and active transport) the extracellular matrix of eukaryotes, cell wall. Structure and functions of endoplasmic reticulum, golgi complex, ribosomes, lysosomes, peroxisomes (glyoxysomes), and plastids. Structure, function and molecular level organization of chloroplast, and mitochondria.

Module III: 10 hrs

Cytoskeleton and cell motility: Microtubules, microfilaments and intermediate elements. Structure and function of cell membrane. Structure of nuclear membrane, transport through the nuclear membrane. Nature of the genetic material, Proteins associated with nuclei. Packaging of genetic material: nucleosome model. Organisation of chromatin: chromosome structure.

Module IV: 10 hrs

Cell communication and cell signalling, receptors, signaling through G protein coupled receptors.

Module V: 14 hrs

Cell cycle: Molecular control of cell cycle. Cancer biology: Genetic rearrangements in progenitor cells, oncogenes, tumour suppressor genes, cancer & the cell cycle. Interaction of cancer cells with normal cells, apoptosis.

References

1. Cell biology- concepts and experiments. Gerald Karp. Mc Graw Hill.
2. Cell and molecular biology. De Robertis. Holt- Saunders.
3. Lehninger's Principles of Biochemistry. Nelson D. L. and Cox M. M.. Fourth edition, W. H. Freeman & Co. New York.
4. Molecular biology of the cell. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Roff, Keeth Roberts, Peter Walter. Garland Science Taylor and Francis group.
5. The world of the cell. Becker, Kleinsmith, Wayne M Lewis J. Pearson edn.
6. The cell- molecular approach. Geoffrey M. Cooper, Robert E. Housman. ASM press.

MBG1C04: GENERAL MICROBIOLOGY [Contact hours: 55]

Module I: 10 hrs

History and Scope of microbiology. Microscopy and specimen preparation: Light microscope- Bright field microscope, Dark field microscope, Phase contrast microscope, fluorescence microscope. Electron microscope- Transmission and Scanning electron microscope. Confocal microscopy.

Module II: 6 hrs

Controlling microbial growth: Physical control methods, chemical control methods. Evaluation of antimicrobial agent effectiveness. Determination of antibiotic sensitivity.

Module III: 15 hrs

Whittaker's five kingdom concept, three domain concept of Carl Woese. Polyphasic taxonomy. Classification of Bacteria: Criteria for bacterial classification, major categories and group of Eubacteria and Archaebacteria. Morphology, reproduction and classification of fungi. General properties and classification of viruses. Viroids and Prions.

Module IV: 12 hrs

Eukaryotic and prokaryotic cell structures: The nucleus/nucleoid, cytoplasmic structures, motility organelles. Gram-positive and Gram-negative cell envelope. Staining.

Module V: 12 hrs

Microbial growth: Reproduction in prokaryotic and eukaryotic microorganisms. Microbial growth curve. Nutritional requirements of growth. Culture media- selective and differential culture media. Pure culture techniques. Culture preservation.

References

1. Microbiology. Jacquelyn G Black. WILEY publications.
2. Alcamo's fundamentals of microbiology. Jaflrey C Pommerville. Jones and Bartlett Publishers.
3. Microbiology. Lansing M Prescott, John P Harley et al. McGraw Hill publication.
4. Brock Biology of microorganisms. Michaelf.Madigan, Jack Parker et al. Prentice Hall publications.
5. An introduction to microbiology. Tortora, Funke et al. Pearson education Ltd.

6. Bergey's manual of systematic bacteriology. Don J Brenner, Noel R Krieg, James T Stalely. Springer publications.
7. Introductory Microbiology. J Heritage, EGV Evans & RA Killington. Cambridge University Press.
8. General Microbiology. Hans G Schlegel. Cambridge University Press.

MBG1P01: PRACTICAL- I [Contact hours: 44]
(Practicals of MBG1C01 and MBG1C02)

1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of proteins.
3. Qualitative analysis of lipids.
4. Estimation of protein.
5. Estimation of lipids (cholesterol, phospholipids, triacylglycerols).
6. Estimation of carbohydrates (glucose, fructose, lactose, starch).
7. Estimation of nucleic acid (DNA and RNA).
8. Preparation of buffers using KH_2PO_4 and K_2HPO_4, acetic acid and sodium acetate, K_2HPO_4 and H_3PO_4.
9. Purification of substances by dialysis
10. Denaturation studies on proteins.
11. Separation of sugar and amino acids by paper and thin layer chromatography.
12. Determination of saponification value and iodine number of fat.

MBG1P02: PRACTICAL- II [Contact hours: 44]
(Practicals of MBG1C03 and MBG1C04)

1. Study of mitosis.
2. Study of meiosis.
3. Study of polytene chromosome.
4. Cell fractionation.
5. Formaldehyde-glutaradehyde fixation of plant tissues.
6. Embedding in and sectioning wax.
7. General tissue staining (Toluidine blue, Orange G, Safranin etc)
8. Estimation of DNA by Diphenylamine test.
9. Estimation of RNA by Orcinol method.
10. Micrometry: measurement of micro organisms.
11. Motility determination: hanging drop method.
12. Staining: simple, Gram's, acid-fast, spore, capsule and granular staining.
13. Media preparation: liquid, solid.
14. Pure culture techniques: streak plate, pour plate, spread plate.
15. Anaerobic cultivation: RCM, anaerobic jar.
16. Biochemical tests for identification of bacteria.

MBG2C05: IMMUNOLOGY [Contact hours: 55]

Module I: 5hrs
History and scope of Immunology. Types of immunity - innate, acquired, passive and active. Antigens types, haptens, epitopes. Immunoglobuin structure, distribution and function. Innate Immune response: Mechanism, Inflammation, Complement system.

Module II: 8hrs
Lymphoid tissues – ontogeny and physiology of immune system - origin and development, differentiation of lymphocytes. Lymphocyte subpopulation of human being. Structure and function of class I and II histocompatibility antigens. Antigen processing and presentation. HLA in human health and diseases.

Module III: 7hrs
Molecular biology of Immunoglobulin synthesis. Effector mechanisms in immunity – macrophage activation. Cell mediated cytotoxicity. Cellular interaction in immune response. Antigen recognition, T & B cell receptors, MHC restriction. Lymphocyte activation, clonal proliferation, differentiation.

Module IV: 7hrs
In vitro and invivo assays of cell mediated immunity.Cytokines and their role. Immunoregulation- specific helper and suppressor cells, specific factors, idiotype network. Immune response genes. Immunological tolerance.

Module V: 7hrs
Antigen-antibody interactions: Agglutination, precipitation, complement fixation, immuno diffusion, immunoelectrophoresis, ELISA, radio immuno assays, western blotting, immunofluorescence, immunoelectron microscopy.

Module VI: 6hrs
Hypersensitive reactions, types, prevention. Autoimmune disorders: Organ specific and systemic autoimmune diseases.

Module VII: 7hrs
Transplantation immunology: Immunologic basis of graft rejection, clinical manifestations of graft rejection, tissue typing, immunosuppressive therapy. Cancer and the immune system: Oncogenes and cancer induction, tumor specific and tumor associated antigens. Immune response to tumors: role of NK cells and macrophages.

Module VIII: 8hrs

Immunology of infectious diseases: viral, bacterial, fungal infections, protozoan diseases. Vaccines: Active and passive immunization. Live, killed, attenuated, sub unit vaccines. Vaccine technology- role and properties of adjuvants, recombinant DNA and protein based vaccines, plant-based vaccines. Chimeric and hybrid monoclonal antibodies.

References

1. Immunology. Richard A Goldsby, Thomas J Kindt, Barbara A Osborne, Janis Kuby. W H Freeman and Company.
2. Immunology. Roitt, Brostoff, Male Mosby.
3. Immunobiology. Janeway, Travers Walport, Shlomchik. Churchill Livingstone.
4. Immunology. Tizard. Thomson Publishers.
5. Medical Immunology. Tristram G Parslow, Daniel P Stites, Abba I Terr, John B Imboden. Mc Graw Hill.
6. Practical immunology. Frank C Hay and Olwyn M R Westwood. Black Well science

MBG2C06: MICROBIAL PHYSIOLOGY AND METABOLISM [Contact hours: 55]

Module I: 7 hrs

Major nutritional types of microorganisms: Photolithoautotrophy, photoorganohetrotrophy, chemolithoautotrophy, chemoorganoheterotrophy. Functions of common vitamins in microorganisms. Uptake of nutrients by cells: facilitated diffusion, active transport, group translocation, iron uptake.

Module II: 5 hrs

Measurement of microbial growth- measurement of cell numbers and cell mass. Molecular basis of cell growth and division in prokaryotes. Continuous culture of microorganisms- chemostat, turbidostat. Environmental factors on growth- solutes and water activity, temperature, oxygen concentration, pressure and radiation. Habitat, diversity and physiology of extremophiles.

Module III: 9hrs

Physiology of motility and bioluminescence. Quorum sensing in bacteria - types and regulations. Heat-shock proteins and stress tolerance in microorganisms. Photosynthesis – brief account of photosynthetic and accessory pigments, chlorophyll, bacteriochlorophyll, rhodopsin, carotenoids and phycobiliproteins. Biosynthesis of secondary metabolites viz. antibiotics and alkaloids.

Module IV: 9 hrs

Structure, function and physiological significance of enzymes, classification and nomenclature. Rate of enzyme catalysed reactions, rate laws and rate constants, Michaelis Menton's hypothesis, significance and determination of Km and, Vmax, enzyme inhibition-reversible and irreversible inhibition, competitive and non competitive inhibition.

Module V: 10 hrs

Glycolysis, TCA cycle, pentose phosphate pathway, glyoxylate pathway, pathway of glucose oxidation, gluconeogenesis, glycogen metabolism, biosynthesis of poly saccharides.

Module VI: 5 hrs

Biosynthesis of saturated, unsaturated, hydroxyl and branched chain fatty acid. Oxidation of fatty acids, biosynthesis and degradation of phospholipids. Steroid biosynthesis, conversion of cholesterol to other important molecules.

Module VII: 5 hrs

Metabolism of amino acids- essential and non essential amino acids, urea cycle.

Module VIII: 5 hrs

Denovo synthesis of purines and pyrimidines, nucleotide metabolism and interconvertions of purines and pyrimidines.

References

1. Microbiology. Lansing M Prescott, John P Harley, Donald A Klein. McGraw-Hill.
2. Microbial Physiology. Albert G Moat, John W Foster, Michael P Spector. Willey-Liss.
3. Bacterial Metabolism. Gerhard Gottschalk. Springer.
4. Lehninger's Principle of Biochemistry. Nelson L D and M M Cox. Macmillan Worth Publication Inc.
5. Biochemistry. Jeremy M.Berg John and Tymoczko Lubert Stryer. W H Freeman & Co. NY.
6. Biochemistry with Clinical Correlation Thomas M Devlin.Wiley- Liss Publication.
7. Biochemistry. Donald Voet , Judith G Voet, Charlottew pratt. John Wiley and Sons.
8. Biochemistry. Jeoffrery Zubay. Wm C Brown Publ.
9. Biochemistry. Mathews C K and K.E. van Holde. Benjamin Cumming Publ. Co.

MBG2C07: MOLECULAR BIOLOGY [Contact hours: 55]

Module I: 5 hrs
Organisation of genes and chromosomes: Operon, interrupted genes, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin.

Module II: 10 hrs
DNA replication, repair and mutation: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, DNA damage and repair mechanisms, types of mutation.

Module III: 11 hrs
RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, inhibitors of transcription, RNA processing, RNA editing, splicing, polyadenylation, structure and functions of different types of RNA, biosynthesis of tRNA and rRNA.

Module IV: 11 hrs
Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, aminoacyl tRNA synthetase, translational inhibitors, post translational modification of proteins.

Module V: 10 hrs
Control of gene expression at transcription and translation level: Bacterial operons (lac, trp), regulation of phages and viruses, chromatin activity and gene regulation in eukaryotes.

Module VI: 8 hrs
Methods for analysis of gene expression at RNA and protein level: Whole genome analysis, DNA microarray, genome analysis for global patterns of gene expression using fluorescent labelled cDNA or end labelled RNA probes.

References

1. Molecular Biology. Robert F Weaver. McGraw Hill International Edition.
2. Cell and molecular biology- Concepts and experiments. Gerald Karp. John Wiley and sons. Inc.
3. Molecular biology of the Gene. James D Watson, Tania A Baker, Stephen P Bell, Alexander Gann, Michael Levine, Richard Losick. Pearson Education.

4. Genes IX. Benjamin Lewin. Jones and Bartlett Publishers.
5. Molecular cell biology. Lodish, Berk, Matsudara, Kaiser, Krieger, Scott, Zipursky, Darnell. W H Freeman& Co. New York.

MBG2E01: GENETICS [Contact hours: 55]

Module I: 7hrs

Concepts of Genetics its scope and significance. Mendelian genetics and physical basis of heredity. Concept of multiple alleles. Modification of dominance relationship. Gene interactions: Epistasis, pleiotropy, genomic imprinting, penetrance and expressivity.

Module II: 7 hrs

Sex linked, sex limited and sex influenced traits with suitable examples. Chromosomal and genic balance theory of sex determination. Human sex anomalies -Klinefelter's and Turner's syndrome.

Module III: 7 hrs

Linkage and crossing over: Coupling and repulsion hypothesis, theories of crossing over, three point test cross. Linkage maps, tetrad analysis. Recombination: Homologous and non-homologous recombination, transposition and site specific recombination. Transposable elements.

Module IV: 6 hrs

Extra chromosomal inheritance: Criteria for extra chromosomal inheritance. Inheritance of mitochondrial and chloroplast genes.

Module V: 6 hrs

Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications. Human genetics: Pedigree analysis.

Module VI: 7 hrs

Microbial genetics: bacterial chromosomes and plasmids, conjugation, transduction and transformation in bacteria. Bacteriophages and their genetic systems. Lytic and lysogenic phases of λ phage. Genetic recombination and its molecular mechanism.

Module VII: 7 hrs

Mutations: Types, causes and detection. Mutant types- lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants and insertional mutagenesis.

Module VIII: 8 hrs

Population genetics: Populations, gene pool, gene frequency, Hardy-Weinberg law. Concepts and rate of change in gene frequency through mutation, random genetic drift, migration, inbreeding and natural selection. Speciation. Molecular evolution: Concepts of neutral evolution, molecular divergence and molecular clocks.

References

1. Genetics. A conceptual approach. Benjamin A Pierce. W H freeman and company.
2. Genetics. Monroe W Strickberger. Prentice Hall of India.
3. Genetics. Peter J Russel. Pearson education.
4. Concepts of Genetics. William S Klug. Pearson edn.
5. Essentials of Human Genetics. Manu L Kothari. University Press.
6. Principles of genetics. Snustad. John Wiley and sons.

MBG2E02: ENZYMOLOGY [Contact hours: 55]

Module I: 8 hrs
An introduction to enzymes: classification and nomenclature. Enzymes- structure, function and purification. Specificity of enzyme action.

Module II: 15hrs
Enzyme kinetics: Single substrate-Single intermediate, Michaelis-Menten and Briggs Haldane kinetics, graphical analysis of kinetic data, determination of Km and Vmax. Enzyme inhibition: Mechanism and rate studies. Degree of enzyme inhibition; competitive and non competitive and uncompetitive inhibition.

Module III: 12 hrs
Mechanism of enzyme action: catalytic strategies, covalent catalysis, mechanism of chymotrypsin, metal ion catalysis. General acid base catalysis. Catalysis by approximation.

Module IV: 10 hrs
Enzyme regulation: Allosteric regulation; isoenzymes, zymogen activation, reversible covalent modification. Cooperativity; MWC and sequential model of allosteric enzymes

Module V: 10 hrs
Enzyme engineering: Active site mapping; immobilized enzymes and its application in industry and medicine; abzymes; drug design based on active site of an enzyme.

References

1. Enzymes. Trevor Palmer. East west Press
2. Fundamentals of Enzymology. Nicholas C.Price and Lewis Stevens. Third edition. Oxford University Press, Newyork.
3. Biochemistry. Jeremy M. Berg, John Tymoczko and Lubert Stryer. Fifth edition. W.H Freeman and company, Newyork.
4. Lehninger Principles of Biochemistry. David L Nelson and Michael M Cox.
5. Harper's Illustrated Biochemistry. Robert K Murray, Daryl K Granner, Peter A Mayes and Victor W Rodwell. Twenty sixth editions. Mc Graw-Hill companies.
6. Fundamentals of Biochemistry. Donald Voet, Judith G Voet and Charlotte W Pratt. John Wiley & Sons.

MBG2E03: BIOINSTRUMENTATION [Contact hours: 55]

Module I: 15 hrs

Basic laboratory Instruments: Principle and working of pH meter, Laminar-air flow. Centrifugation: Types of centrifuge machines, preparative and analytical centrifuges, differential centrifugation, sedimentation velocity, sedimentation equilibrium, density gradient methods and their applications. Sterilizing devices like autoclave and Hot air oven.

Module II: 10 hrs

Chromatography: Principles, classification of chromatography, procedures and application of chromatography, adsorption, partition, molecular sieve, ion exchange, affinity, GC and HPLC.

Module III: 10 hrs

Electrophoresis: Principles and classification of electrophoresis viz., moving boundary and zone electrophoresis. Procedures and application of electrophoresis. starch gel, agarose, native and denaturing PAGE, isoelectric focusing.

Module IV: 10 hrs

Coloriemetry, spectrophotometry and spectroscopy : Basic principles and application, UV-Visible, IR, atomic absorption emission spectrophotometry. UV, IR, Raman, CD spectroscopy. NMR, ESR, mass spectroscopy. X-ray crystallography.

Module V: 10 hrs

Radioisotopic techniques: Use of radioisotopes in life sciences, detection and measurement of α, β, γ rays using scintillation counters, Geiger-Muller counters, autoradiography.

References

1. Practical Biochemistry Principles and techniques. Keith Wilson and John Walker. Cambridge University Press.
2. Physical Biochemistry. D Friefelder, W H Freeman & Company.
3. The Physical Basis of Biochemistry. Peter R Bergethon. Springer-Verlag.
4. Bioseperations. Principles and techniques. Sivasankar. Prentice- Hall India.
5. Principle of physical chemistry. Puri, Sharma, Pathania.VPC publications.

MBG2P03: PRACTICAL III [Contact hours: 38]
(Practicals of MBG2C05)

1. Histology of lymphoid organs-study with permanent slides.
2. Preparation of lymphocytes from blood and solid lymphoid organs.
3. Immunization and production of polyclonal antiserum.
4. Haemmagglutination reaction.
5. Latex agglutination.
6. Single radial immunodiffusion.
7. Double diffusion in two dimensions.
8. Immunoelectrophoresis.
9. Bradford method for total protein estimations.
10. Purification of antibodies.
11. Affinity and ion exchange chromatography

MBG2P04: PRACTICAL IV [Contact hours: 38]
(Practicals of MBG2C06)

1. Isolation of photosynthetic bacteria.
2. Isolation and characterization of anaerobic microorganisms
3. Effect of UV radiations, pH, disinfectants, and heavy metal ions on spore germination of *Bacillus* species.
4. Estimation of calcium ions present in sporulating bacteria by EDTA method.
5. Demostration of utilization of sugars by oxidation and fermentation techniques.
6. Study of bacterial chemotaxis.
7. Efect of ethanol and heat stresses on the protein pattern of bacteria.
8. Estimation of acid and alkaline phosphatase.
9. Determination of amylase activity.
10. Effect of temperature on enzyme activity.

MBG2P05: PRACTICAL V [Contact hours: 40]
(Practicals of MBG2C07)

1. Isolation of DNA from Bacteria.
2. Isolation of DNA from Plant (CTAB method.)
3. Isolation of DNA from animal tissue.
4. Quantitation of DNA.
5. Isolation of RNA from Plant (GITC method).
6. SDS-PAGE of proteins.
7. Protein finger printing in Bacteria.
8. Bacterial gene expression using Lac promoter.
9. Blotting and hybridization.
10. Study of bacterial conjugation and transformation.

MBG3C08: BIOSTATISTICS AND BIOINFORMATICS [Contact hours: 54]

Module I: 6 hrs
Different types of numerical data: ranked data, discrete and continuous data. Frequency distribution tables: Relative and cumulative frequency, Graphical representation of data: line charts, Bar charts, Pie chart, Histograms.

Module II: 8 hrs
Measures of central tendency: arithmetic mean, median, mode, geometric and harmonic mean. Measures of dispersion: range, interquartile range, variance and standard deviation, coefficient of variation. Correlation and regression: correlation coefficient, regression coefficient, regression line.

Module III: 5 hrs
Probability: Permutation and combination, types of events, Definition of probability, addition and multiplication theorems of probability.

Module IV: 8 hrs
Sampling theory: Population and sample, methods of sampling, random sampling. Tests of significance: Estimation, confidence limit, level of significance, Standard error, testing of hypothesis. Student's t test, chi-square test.

Module V: 8 hrs
Principles of experimental designs; completely randomized, randomized complete block design. Latin square designs, augmented block design, simple factorial experiments, analysis of variance (ANOVA).

Module VI: 4 hrs
Introduction to Bioinformatics: Scope of Bioinformatics, bioinformatics and the internet. Data acquisition-sequencing DNA, RNA and proteins.

Module VII: 5 hrs
Protein sequence data bank: NBRF-PIR-SWISSPROT. Nucleic acid sequence data bank: Gen bank, EMBL. Database searches: FASTA and BLAST data base searches.

Module VIII: 5 hrs
Genomics: Genome mapping, genome sequencing, annotation, comparative genomics, Functional genomics-ESTs, SAGE, DNA micro arrays.

Module IX: 5 hrs
Bioinformatics tools for analysis of proteomics data (Tool available at ExPASy proteomics server), Structure visualization tools: Rasmol, SPDBV.

References

1. Principles of Biostatistics. Pagano M. & Kimberlee G. Duxbury Press
2. Probability and Statistical Inference. Hogg R. V. Tanis E. A., Prentice Hall, New Jersey
3. Experimental Design Data Analysis for Biologists. Quinn G. P. & Keough M. J. Cambridge University Press
4. Statistical Methods in Biology. Bailey NTJ., Cambridge University Press
5. Biostatistical analysis. Zar, JH. Pearson Education.
6. Fundamentals of Biostatistics. Khan and Khanum; Ukaas publications
7. Biostatistics-How it works. Steve Selvin;Pearson Education
8. Bioinformatics. BaxevanisAD & Quellette BFF, John Wiley & Sons Inc.
9. Bioinformatics. Sequence and Genome anlysis, Mount DW, Cold Spring Harbour Laboratory Press, New York
10. Bioinformatics. A beginner's guide by Jean-Michel Claverie, John Wiley & Sons.
11. Bioinformatics. Methods and applications, Rastogi,S.C. Mendiratta, N. and Rastogi P, Prentice. Hall of IndiaPvt. Ltd, New Delhi
12. Essential Bioinformatics. Jin Xiong, Cambridge University Press
13. Evolutionary computations in Bioinformatics. Fogel & Corne, Morgan Kafman publishers
14. Introduction to Bioinformatics. Attwood & Parry-Smith, Pearson Education
15. Introduction to Protein structure. Brandel C. and Tooze, J.
16. Structural Bioinformatics by Philip E. Bourne and Helge Weissing, Wiley
17. Structure and Mechanism in Protein science. Fersht WH freeman & Co

MBG3C09: FOOD AND AGRICULTURE MICROBIOLOGY [Contact hours: 54]

Module I: 2 hrs

The trajectory of food microbiology. Parameters affecting microbes in foods. Spores and their significance. Detection and enumeration of microbes in food. Rapid and automated microbial methods. Indicator microorganisms and microbiological criteria.

Module II: 8 hrs

Gram-positive food borne pathogenic bacteria: *Listeria monocytogenes, Staphylococcus aureus, Bacillus cereus, B. anthracis, Clostridium botulinum, C. perfringens.* Gram- negative food borne pathogenic bacteria: *Salmonella* spp, *Campylobacter* spp, *Escherichia coli* 0157:H7, *Yersinia enterocolitica, Brucella* spp. Viruses: Hepatitis and Rotaviruses. Prions: new variant CJD. Tapeworms: *Taenia* spp. Roundworms: *Trichinella* spp. Protozoa: *Toxoplasma* spp, *Sarcocystis* spp. Case study of food and water borne outbreaks.

Module III: 9 hrs

Biochemical basis of food fermentation. Dairy fermentations. Fermented vegetables. Meat fermentations. Other fermented foods *viz*., bread, beer, wine, vinegar. Regionally important fermented foods like soy sauce, miso and tempeh.

Module IV: 8 hrs

Origin of micro flora in meat, poultry, sea food. Spoilage and control of muscle foods. Milk and dairy products as growth media. Psychrotrophic spoilage, spoilage by fermentative nonsporeformers, yeasts and molds. Microbiological spoilage of vegetables, fruits, grains and grain products.

Module V: 8 hrs

Food preservatives. Naturally occurring antimicrobials. Bacteriocins and probiotic bacteria. Physical methods of food preservation-physical dehydration process, cool and frozen storage, heat treatments and irradiation. Good manufacturing practices (GMPs) and the Hazard Analysis Critical Control Point (HACCP). FDA guidelines and regulation compliance.

Module VI: 7 hrs

Microorganisms of soil. Rhizosphere and phyllosphere microflora. Brief account of Microbial interactions: antagonism, symbiosis, mutualism, commensalisms, synergism and parasitism. Nutrient cycle: Carbon cycle, nitrogen cycle, phosphorous cycle and sulphur cycle. Nitrogen fixation in free living and associative symbiotic bacteria. Microbial products influencing plant growth. Azolla-anabaena system. Mycorrhizae: applications in agriculture and forestry.

Module VII: 12 hrs

Plant pathology- Categorization and general symptoms of plant diseases. Physiology of parasitism. Plant disease management-fungicides, biological control of pathogens. Plant disease resistance-morphological, functional and protoplasmic resistance. Disease resistant transgenic plants. Molecular diagnosis of plant diseases. Bacterial diseases of plants-citrus canker, blight of rice. Phytoplasma diseases-little leaf of brinjal, sandal spike. Fungal diseases-downy and powdery mildew, cereal rusts and smuts, wilt diseases. General account of important virus and viroid diseases of plants.

References

1. Food Microbiology. William C Frazier, Dennis C Westhoff. Tata McGraw-Hill edition.
2. Food Microbiology. Thomas J Montville, Karl R Mathews. ASM Press.
3. Food Microbiology. M R Adams, M O Moss. Panima Publishing Corporation.
4. Biotechnology: Food fermentation. V K Joshi, Ashok Pandey.Educational publisher and distributors.
5. Comprehensive Biotechnology. Murray Moo Young. Elsevier.
6. Plant pathology. Agarios GN. Academic Press.
7. Agricultural Microbiology.G Rangaswami, D J Bagyaraj.Prentice Hall.
8. Plant Disease.R S Singh. Oxford& IBH Publishing Co Pvt Ltd.

MBG3C10: MEDICAL BACTERIOLOGY [Contact hours: 54]

Module I: 8 hrs
Specimen collection, transport, storage and processing. Laboratory procedures for the epidemiologic analysis of microorganisms. Immunoassay diagnosis of infectious disease. Molecular detection and identification of pathogens. Automated system for microbial identification.

Module II: 8 hrs
Principles of antimicrobial action: inhibitor of cell wall synthesis, cell membrane function, protein synthesis, DNA and RNA synthesis, other metabolic processes. Laboratory method and strategy for antimicrobial susceptibility testing. Mechanisms of antibiotic resistance: resistance to β lactam antibiotics, glycopeptides and aminoglycosides. MRSA and NDM-1.

Module III: 3 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of spore forming Gram positive Bacilli: *Bacillus anthracis, Clostridium tetani,* and *Cl. perfringens*.

Module IV: 2 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of non spore forming Gram positive Bacilli: *Corynebacterium,* Actinomycetes and related pathogens.

Module V: 2 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of *Staphylococci* and the *Streptococci.*

Module VI: 14 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of enteric Gram-negative rods: *Escherichia coli, Enterobacter aerogenes, Klebsiella pneumoniae, Proteus mirabilis, Shigella sonnei, S. dysentriae, S. flexneri, S. boydii. Pseudomonas aeruginosa, Vibrio cholerae, Helicobacter pylori, Haemophilus influenzae, Bordetella pertusis.*

Module VII: 2 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of *Yersinia* and *Pasteurella*.

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Module VIII: 3 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of *Neisseriae* and *Legionellae*.

Module IX: 3 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of *Mycobacteria.*

Module X: 3 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of spirochetes & other spiral microorganisms: *Treponema pallidum, Leptospira interrogans.*

Module XI: 2 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of Mycoplasmas & cell wall-defective bacteria
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Module XII: 4 hrs
Morphology and identification, pathogenesis, laboratory diagnosis, epidemiology, prevention and control of *Rickettsiae* and *Chlamydiae*: *Coxiella burnetii, Chlamydia trachomatis, C. pneumonia, C. psittaci.*

References

1. Medical Microbiology. Geo F Brooks, Janet S Butel, Stephen A Morse. Mc Graw Hill.
2. Manual of Clinical Microbiology. Patrick R Murray, Ellen Jo Baron, Michael A Pfaller, Fred C Tenover, Robert H Yolken.ASM Press.
3. Textbook of Microbiology. R Ananthanarayanan and C K Jayaram Paniker. Orient Longman.
4. Microbiology. Lansing M Prescott, John P Harley, Donald A Klein. McGraw-Hill.
5. Diagnostic Microbiology. Betty A Forbes, Daniel F Sahm,Alice S Weissfeld. Mosby Elsevier.
6. District laboratory practice in tropical countries. Monica Cheesbrough. Cambridge University Press. Medical Bacteriology. Peter Hawkey, Deidre Lewis. Oxford.
7. Bergey's Manual of Determinative Bacteriology. John G Holt, Noel R Krieg, Peter H A Sneath, James T Staley, Stanley T Williams. Lippincott Williams& Wilkins.
8. Bacterial Pathogenesis. Abigail A Salyers, Dixie D Whilt. ASM Press.

MBG3C11: VIROLOGY, MYCOLOGY & PARASITOLOGY [Contact hours: 54]

Module I: 3 hrs
Taxonomy & classification of viruses. Virus cultivation: cell culture, embryonated eggs, laboratory animals.

Module II: 9 hrs
Virus Structure: Protective coat, nucleic acid genome packaging, virus envelope components, virion enzymes and other viral protein. Mechanisms of virus entry into cells: uncoating at plasma membrane, endocytic pathway, entry of nonenveloped virus into cells. Genome replication strategies of DNA viruses. Intracellular transport of viral components, assembly maturation and exit of progeny virion.

Module III: 10 hrs
Polio and vaccination , small pox and eradication, chickenpox and latency, influenza and genomic diversity, rubella and childhood infection, ebola and emerging infection, rabies and infection of the brain, HPV and cancer causing viruses, HIV and viral treatment, viral hepatitis and chronic infection, prions and diseases of life style.

Module IV: 5 hrs
Morphology of yeasts and molds: ultra structure and function of fungal cells, fungal nutrition and cellular biosynthesis, fungal metabolism, growth and reproduction.

Module V: 5 hrs
Fungal diseases of humans: superficial mycoses and causative agents- *Malassezia furfur*, *Hortea werneckii*, *Trichosporon* and *Microsporon* spp., *Trichophyton rubrum, Sporothrix schenkii*. Opportunistic mycoses- *Candida* sp., *Aspergillus sp., Cryptococcus neoformans*, *Pneumocystis jiroveci*. Endemic systemic mycoses- *Histoplasma capsulatum, Blastomyces dermatitidis, Coccidioides immitis*. Mycotoxicoses – *Aspergillus flavus , Claviceps purpurea.*

Module VI: 5 hrs
Antifungal agents and its mechanism of action: Polyene antifungal agents – Amphotericin B and Nystatin. Azole antifungal agents – imidazole, triazole and echinocandins. Mechanism of antifungal drug resistance, antifungal susceptibility testing.

Module VII: 4 hrs
Taxonomy and classification of human parasites. Antiparasitic agents and susceptibility tests.

Module VIII: 9 hrs

Protozoa (intestinal, blood and tissue)– *Entamoeba histolytica*, *Giardia lamblia*, *Balantidium coli, Cryptosporidium parvum, Plasmodium Sp*., *Leishmania donovani*, *Trypanosoma brucei*, *Trypanosoma Cruzi*.

Module IX: 4 hrs

Nematodes, cestodes and trematodes– *Ascaris lumbricoides, Wuchereria bancrofti, Fasciola hepatica, Taenia solium.*

References

1. Principles of Virology. S J Flint, L W Enquist, R M Krug, V R Racaniello, A M Skalka. ASM Press.
2. Manual of Clinical Microbiology. Patrick R Murray, Ellen Jo Baron, Michael A Pfaller, Fred C Tenover, Robert H Yolken. ASM Press.
3. District laboratory practice in tropical countries. Monica Cheesbrough. Cambridge University Press.
4. Textbook of Microbiology. R Ananthanarayanan and C K Jayaram Paniker. Orient Longman.
5. Diagnostic Microbiology. Betty A Forbes, Daniel F Sahm, Alice S Weissfeld. Mosby Elsevier.
6. Medical Mycology. N C Dey, H L E Grueber, T K Dey. Mc Graw Hill.
7. Human Parasitology. Burton J Bogitsh, Clint E Carter, Thomas N Oeltmann. Elsevier.
8. Animal Parasitology. J D Smyth. Cambridge University Press.

MBG3E04: BIOSAFETY, BIOETHICS AND INTELLECTUAL PROPERTY RIGHTS

[Contact hours: 55]

Module I: 10 hrs

Biosafety- Objectives, Recombinant DNA safety, classification of pathogenic microorganisms. Biosafety practices - code of practice, containment laboratory design and facilities. Biological containments and physical containments. Biosafety levels.

Module II: 10 hrs

Guidelines for rDNA research activities- largescale experiments, release to environment, import and shipment, mechanism of implementation of biosafety guidelines. Quality control of biologicals produced by rDNA technology. Revised guidelines for research in transgenic plants.

Module III: 8 hrs

Bioethics - Ethical aspects of interfering in natural processes and hidden dangers in altering the genetic makeup.

Module IV: 8 hrs

Intellectual property rights - copyright, patents, trademarks. Copyright- subject matter, criteria for protection, duration, infringement and defences. Trade secret.

Module V: 10 hrs

Patents - nature of patents and general requirements, patentable subject matter, procedure for grant of patent and patent infringement, patentability of microorganisms, plant patent, animal patent, patentability of genes and vectors - FDA, trade related aspects of intellectual property rights (TRIPS) and GATT, transfer of technology and benefit sharing.

Module VI: 9 hrs

Legal protection for plants and other higher organisms. Life patents, plant breeders' rights and farmers' rights. Sui-generis plant variety protection - traditional knowledge protection. IPR and plant genetic resources.

References

1. Intellectual Property laws: containing Acts, rules & regulations. Universal Law Publishing Co.
2. CRC Handbook of Laboratory Safety. A Keith Furr, CRC Press

3. Recombinant DNA Safety Guidelines.1990. Department of Biotechnology, Ministry of Science and Technology, Govt. of India
4. The Practice of Medicinal Chemistry. Camille Georges Wermuth. Academic Press.
5. Molecular Modelling and Drug Design. K Anand Solomon. MJP publishers
6. Intellectual Property law. A Chandrashekaran, C Sitaraman and Co Pvt. Ltd.
7. Intellectual Property Protection and Sustainable Development, Philippe Cullet
8. Bioethics. Shaleesha. A Stanley, Wisdom Education Services.

MBG3E05: MEDICINAL CHEMISTRY

[Contact hours: 52]

Module I: 12 hrs

Brief study on classification of drugs. Developments leading to various medical classes of drugs: Hypnotics and analgesics, antipyritics, antiseptics, cardiac stimulants, infectious disease drugs etc. Natural products as potential drugs. Alkaloids as a source of drugs.

Module II: 10 hrs

Physico-chemical properties of drugs, receptors and drug action, distribution and elimination of drug. Peptide and protein drugs.

Module III: 15 hrs

Brief account of drugs affecting neurotransmission, central nervous system, cardiovascular system, immune system- nonsteroidal anti inflamatory agents, antihistamine. Drugs affecting hormonal system- insulin and oral hypoglycemic drugs, adrenocorticoids, estrogen, progesterone, androgens, thyroid drugs.

Module IV: 15 hrs

Chemotherapeutic agents. Antibacterial and antimicrobial agents, antiparasitic agents, antifungal drugs, antiviral drugs, protease inhibitors and chemotherapy.

References

1. Foye's Principles of Medicinal Chemistry. David A Williams and Thomas L Lemke, Lippincott Williams & Wilkins.
2. The Practice of Medicinal Chemistry. Camille Georges Wermuth, Academic Press.
3. Medicinal Chemistry. Thomas Nogrard and Donald F Weaves, Oxford University Press. Medicinal Chemistry. G Patrick, Viva Books Pvt. Ltd.
4. Principles of Medicinal chemistry. William O & Foye BI , Waverks Pvt. Ltd

MBG3E06: ALGAL BIOTECHNOLOGY [Contact hours: 52]

Module I: 10 hrs

Introduction to algal biotechnology: commercial utility of algae. Distribution of economically important algae in India.

Module II: 10 hrs

Occurrence, nutrition, general features and uses of *Spirulina, Chlorella, Scenedesmus, Gelidium, Sargassum, Laminaria, Macrocystis, Botrycoccus* and *Porphyra.*

Module III: 12 hrs

Algal production systems: Strain selection, Culture media, indoor cultivation methods and scaling up. Large-scale cultivation of algae. Harvesting algae, drying.

Module IV: 10hrs

Chemical composition: proteins, amino acids, lipids, waxes, glycerol, vitamins and pigments. Algae as food and fodder. Blue-green algal bio-fertilizer: method of preparation and applications.

Module V: 10 hrs

Biodiesel from algae. Phycoremediation. Role of algae in nanobiotechnology. Algal culture collection centers in India and abroad and their importance

References

1. Algae-Anatomy, Biochemistry and Biotechnology. Barsanti, Laura and Paolo Gualtieri.2005. Taylor & Francis, London, New York.
2. Algal Biotechnology. Trivedi PC. 2001. Pointer publishers, Jaipur, India.
3. Microalgae-Biotechnology and microbiology. Becker EW. 1994. Cambridge University Press.
4. Algae. James E Graham. 2008. Benjamin Cummings Publication.

MBG3P06: PRACTICAL VI [Contact hours: 42]

(Practicals of MBG3C09)

1. APC and SPC for determination of microbial load in food samples.
2. Isolation of food borne pathogenic bacteria from contaminated foods.
3. Extraction and detection of afla toxin from mold contaminated foods.
4. Preservation of potato/onion by UV radiation.
5. Production of fermented milk by *Lactobacillus acidophilus.*
6. Production and estimation of lactic acid by *Lactobacillus* Sp.& *Streptococcus* Sp.
7. Sauerkraut fermentation.
8. Isolation, cultivation and identification of *Rhizobium, Azospirillum* and *Azotobacter.*
9. Screening of phosphate solubilising organisms and estimation of phosphate.
10. Plant growth promoting pseudomonads: Siderophore production.
11. Study of various plant diseases.
12. Evaluation of fungicides.
13. Biological control agents: *Bacillus thuringiensis, Trichoderma.*
14. Biological seed treatment.

MBG3P07: PRACTICAL VII [Contact hours: 42]

(Practicals of MBG3C10 and MBG3C11)

1. Grams staining, acid fast staining, endospore staining, Albert staining.
2. Specimen collection and processing.
3. Phenotypic characterization of bacteria.
4. Isolation of normal bacterial flora of the human body.
5. Determination of etiological agents of urinary tract infection.
6. Antibiotic sensitivity test by Kirby-Bauer method.
7. *In vitro* antifungal susceptibility testing of bacteria by NCCLS: broth macro dilution and microdilution.
8. Rapid detection test for *Enterobacteriaceae* by dehydrated media kit.
9. Embryonated eggs for cultivation of viruses.
10. Isolation of bacteriophages.
11. Viral haemagglutination.
12. HIV detection: latex agglutination, ELISA, Western blotting.
13. Study of pathogenic yeasts and molds with special emphasis on *Candida albicans, Cryptococcus neoformans and Aspergillus fumigatus.*
14. Isolation and cultivation of opportunistic pathogenic yeasts from clinical samples.
15. *In vitro* antifungal susceptibility testing of yeasts by NCCLS: broth macrodilution and microdilution.
16. Identification of eggs and cysts of parasites from stool sample: saline wet mount, iodine wet mount, sedimentation and flotation technique.

MBG4C12: RECOMBINANT DNA TECHNOLOGY [Contact hours: 55]

Module I: 2 hrs
Enzymes involved in genetic engineering: Nucleases, Ligases and polymerases. Restriction digestion and restriction mapping. Nucleic acid labelling and blotting

Module II: 8 hrs
Cloning vectors: Plasmid vectors, Phage vectors and Cosmids. Expression vectors: pET based vetors, plant based vectors, Ti and Ri as vectors, shuttle vectors. Introduction of DNA into living cells: Transformation and transfection, identification of transformants and recombinants. Selectable markers and reporter genes. Genomic and cDNA libraries, identification of desired clone.

Module III: 6 hrs
PCR: Primer design- Fidelity of thermostable enzymes, types of PCR- Multiplex, Nested, Reverse transcriptase, Real time. Cloning of PCR products in T vector, applications of PCR. DNA sequencing methods.

Module IV: 5 hrs
Fusion proteins and recombinant protein purification (His tag, GST tag, MBT tag etc.). Heterologous protein production in eukaryotes - Yeast expression system, mammalian cell expression system.

Module V: 9 hrs
Random and site directed mutagenesis. Gene silencing techniques: Antisense RNA technology, introduction to siRNA technology, micro RNA, construction of siRNA vectors and applications of gene silencing. Gene targetting and gene knock-out. Cloning of yeast genes by complementation strategy.

Module VI: 9 hrs
Genetic engineering in plants: *Agrobacterium* mediated gene transfer, direct gene transfer methods. Applications of plant genetic engineering in crop improvement. Genetic engineering in animals: Gene transfer methods in animals, gene cloning vectors, gene transfer and expression of induced genes.Transgenic animal models.

Module VII: 8 hrs
Recombinant DNA in medicine: Recombinant insulin, monoclonal antibodies and vaccines. Applications of recombinant DNA in Forensic science. Gene therapy. DNA based diagnosis of genetic disorders

Module VIII: 8 hrs

Common tools in recombinant DNA technology: Electrophoresis of DNA and RNA - Pulse field gel electrophoresis of DNA - Nucleic acid staining - Gel elution - mRNA purification - RACE - RFLP - RAPD - AFLP - Micro and mini satellites - SNP - ARMS - SSCP - DNA microarrays.

References

1. Recombinant DNA. James D. Watson, Scientific american books.
2. Gene Cloning and DNA analysis. TA Brow. Balckwell publishing.
3. Molecular Biotechnology. Bernard R Glick, ASM press.
4. Molecular Cloning Vol 1-3. Sambrook and Russel, CSHL press.
5. Recombinant DNA. Genes and Genomes. James D Watson, CSHL press.
6. PCR primer. Carl W Dieffenbach, CSHL Press.
7. Principles of gene manipulations and Genomics. SB Primrose and RM Twyman, Blackwell publishing.

MBG4C13: ENVIRONMENTAL MICROBIOLOGY [Contact hours: 55]

Module 1: 3 hrs
Microbial behavior in ecosystems: Microbial biodiversity, interaction among microbial populations. Animal- microbe and plant-microbe interactions.

Module II: 5 hrs
Microbiology of soil: Soil types, soil as habitat for microorganisms. Soil micro flora. Decomposition of organic matter- Humus. Biogeochemical cycling of C, N, S, P, and iron.

Module III: 6 hrs
Aquatic microbiology: Fresh water and marine ecosystems. Different kinds of microorganisms, their distribution and importance. Physiology, morphology and biochemistry of microbial biofilms. Ecological classification of water pollution- physical, chemical and biological. Eutrophication. Anthropogenic carbon and ocean acidification.

Module IV: 6 hrs
Microbiology of air: Composition and significance of air microflora. Airborne diseases. Sampling of air- Gravity settling, impingement, filtration, electrostatic precipitation. Biological weapons, their regulation and precautions.

Module V: 6 hrs
Microorganisms in extreme environments: Environment determinants that govern extreme environments, extremes of pH, temperature, salinity, hydrostatic pressure and nutrient limitation.

Module VI: 8 hrs
Wastewater microbiology: Municipal wastewater treatment- Small scale: cesspools, septic tank, and imhoffs tank. Large scale treatment- primary, secondary and tertiary treatment. Biological treatment- Trickling filters, oxidation ditches, aerated lagoons, waste stabilization ponds, biological contractor systems, activated sludge process, sludge digestion and disposal.

Module VII: 5 hrs
Water quality analysis: BOD, COD, indicator microorganisms. Qualitative and quantitative analysis of water. Drinking water purifications. Emerging water borne pathogens and risk assessment.

Module VIII: 8 hrs

Solid waste management: need and importance. Different methods of solid waste disposal-composting; microbiology and biochemical aspects of composting, large scale urban composting, sewage sludge composting. Landfills. Anaerobic sludge digesters and biogas plant. Management of hazardous and radioactive waste.

Module IX: 8 hrs

Bioremediation, recalcitrants, biomagnifications. Degradation of xenobiotics-pesticides, hydrocarbons, chlorinated solvents and other halogenated aliphatic hydrocarbons, chlorinated aromatic hydrocarbons. Biosurfactants and its application. Environmental monitoring- Biosensors.

References

1. Microbial ecology. Atlas and Bartha. Pearson education Ltd.
2. Environmental microbiology. Raina M Maier, Ian et al. Elsevier publication.
3. Environemtal biotechnology. Principles and application. Bruce E Rittmann PerryLemicCarty. McGraw-Hill Higher education.
4. Environmental biotechnology. Indushekar Thakur, I K International Pvt Ltd.
5. Global Environmental Biotechnology. D L Wise. Elsevier Science B.V.
6. Environmental Microbiology and Biotechnology. D P Singh, S K Dwivedi. New Age International publishers.
7. Environmental Biotechnology. Alan Scragg. Oxford University Press.
8. Environmental Biotechnology. M H Fluekr. Oxford and IBH publishing Co.

MBG4C14: MICROBIAL TECHNOLOGY [Contact hours: 55]

Module I: 8 hrs
Basic principles of bioprocess fermentation, solid state and submerged fermentation, isolation and screening, strain improvement and preservation of industrially important microbes. Application of modern biotechnological tools for strain improvement.

Module II: 15 hrs
Bioreactors- design and types, bioprocess control and monitoring- variables (pH, temp, pressure, DO). Bioprocess media- formulation and sterilization of media and development of inoculum. Scale up in bioprocess. Downstream processing.

Module III: 12 hrs
Microbial production of amino acids (glutamic acid, lysine, threonine), vitamin (vitB12, vitA), antibiotics (penicillin, tetracycline, streptomycin), enzymes (amylase, protease), organic acids (citric acid, acetic acid), fermented foods and beverages.

Module IV: 5 hrs
Immobilization of cells and enzymes, biotransformation.

Module V: 5 hrs
Microbes in food and agricultural biotechnology: bio-insecticides, biofertilizers, SCP, Probiotics and its application.

Module VI: 10 hrs
Biofuels: Production of bioethanol, biogas, biodiesel, lignocellulosic material for ethanol production. Biorefineries and bioleaching.

References

1. Microbial Biotechnology. Fundamentals of applied microbiology. Alexander N Glazer, Hiroshi Nikalido. Cambridge University Press.
2. Principles of fermentation technology. Stanbury PF, A Whitaker and S J Hall. Pergmon Press
3. Microbial Technology. Fermentation Technology. Peppler HJ$ D Perlman, published by Academic Press (An imprint of Elsevier).
4. Fermentation microbiology and biotechnology. E M T. E I- Mansi, C F A Bryee, A L Demain and A R Allman.
5. Industrial microbiology. A H Patel. MacMillian.

6. Bioprocess technology. P T Kalaichelvan, I Arun Pandi. MJP publishers.
7. Industrial microbiology. Prescott and Dunn. A V I Publishing Co USA.
8. Biotechnology. A textbook of Industrial Microbiology. Wulf Crueger and Annelies Crueger. Panima Publishing Co.
9. Comprehensive Biotechnology. The principles, application and regulation of biotechnology in industry.Murray Moo-Young. Elsevier publication.
10. Industrial Microbiology. L E Casida. AGE International Publications.
11. Industrial Microbiology: An Introduction. Michael J Waites, Neil L Morgan, John S Rockey, Gary Higton. Blackwell science.

MBG4E07: DIAGNOSTIC TECHNIQUES IN MICROBIOLOGY [Contact hours: 55]

Module 1: 10 hrs

Basic concepts of infectious disease diagnosis; collection and transport of specimen; examination and processing of cultures, reporting of results.

Module II: 15 hrs

Conventional and Rapid methods for identification of bacteria and fungi: extremely rapid biochemical and enzymatic tests, conventional biochemical tests, modification of conventional biochemical tests.

Module III: 15 hrs

Molecular methods in clinical microbiology: Nucleic acid hybridization, direct detection probes, Nucleic acid amplification methods. Genotyping bacteria by using variable number tandem repeats. Microarray-based microbial identification and characterization.

Module IV: 15 hrs

Diagnostic immunological methods: principles of serologic tests, Immunoassays for the diagnosis of infectious diseases, detection technologies of antigen and antibody- classical and contemporary immunoassays.

References

1. Advanced Techniques in Diagnostic Microbiology. Yi-Wei Tang and Charles W. Stratton springer.
2. Textbook of Diagnostic Microbiology.Connie R. Mahon, Donald C. LehmanGeorge Manuselis. Saunders publishers.
3. Diagnostic Microbiology. Betty A Forbes, Daniel F Sahm. Mosby publishers.
4. Manual of Clinical Microbiology. Patrick R Murray, Ellen Jo Baron, Michael A Pfaller, Fred C Tenover, Robert H Yolken. ASM Press.

MBG4E08: GENE THERAPY [Contact hours: 53]

Module 1: 8 hrs

Introduction to gene therapy. Use of DNA as a drug. Gene therapy- An overview. Benefits of human genome project.

Module II: 10 hrs

Methods of gene delivery: Physical methods-electroporation, hydrodynamic intravascular injection, sonoporation. Chemical methods- liposomes and cationic lipids (lipofaction), cationic polymers, protein. Viral vectors for DNA delivery.

Module III: 15 hrs

Gene therapy for single gene disorders: Cystic fibrosis., severe combined immunodefeciencies (SCIDS), Gene therapy of neurological diseases: Parkinson's disease, Alzheimer's disease. Cancer gene therapy strategies. Gene therapy for the vascular system.

Module IV: 10 hrs

Gene therapy for infectious diseases: gene therapy for HIV-1 infection, Hepatitis viruses, Herpes viruses.

Module V: 10 hrs

Ethical and social problems of gene therapy. Safety of clinical experimentation. Gene therapy of germ cells and embryo.

References

1. Gene therapy: The use of DNA as a drug. Gavin Brooks. Viva Books private limited. New Delhi.
2. Friedman T. 1999. *The Development of Human Gene Therapy*. Cold Spring Harbor,NY: Cold Spring Harbor Lab. Press.
3. Knipe DM, Howley PM, eds. 2001. *Fields Virology.* Philadelphia, PA: Lippincott Williams & Wilkins.
4. Hackett NR, Crystal RG. 2000. Adenovirus vectors for gene therapy. In *Gene Therapy*, ed. NS Templeton, DD Lasic, pp.17-39. New York: Marcel Dekker

MBG4E09: BIOMOLECULAR MODELLING AND DRUG DESIGN

[Contact hours: 54]

Module I: 10 hrs

Structural parameters in drugs, proteins and nucleic acids. X-ray crystallography and homology modelling. Molecular mechanics-energy minimisation (local & global). Solvent simulation.

Module II: 15 hrs

Molecular dynamics & conformational energy searching (Montecarlo Stochastic simulation). Aims of Drug Design, steps in Drug Design - Computer aided Drug Design. Drug targets-enzymes, receptors, carrier proteins, structural proteins etc. Pharmacokinetics.

Module III: 5 hrs

Drug Discovery - The lead compound - sources of lead compounds. Pharmacophore - SAR & QSAR.

Module IV: 12 hrs

Agonist and antagonist - biological activity (intrinsic activity) & efficacy. Stimulus-response relationships. Ion-channels. Interactions - Intermolecular interactions - Hydrogen bonding, hydrophobicity etc. Intramolecular interactions - intramolecular flexibility & conformation.

Module IV: 12 hrs

Effect of solvent on drug receptor interactions - energy changes during drug binding - stability of drug receptor complex - Drug docking - Design of drug with increased activity based on molecular docking information in conjunction with protein and knowledge (homology modelling) engineering.

References:

1. Molecular Modelling and Simulation - An Interdisciplinary Guide; Tamar Schlick
2. Molecular Modelling - Principles and Applications; Andrew Leach; Prentice Hall.
3. Medicinal Chemistry - A Molecular and Biochemical Approach; Thomas Nogardy, Donald F.Weaver; Oxford University Press.
4. An Introduction to Medicinal Chemistry; Graham L.Patrick; Oxford University Press.
5. Intellectual Property laws: containing Acts, Rules & Regulations 2008; Universal Law Publishing Co.

MBG4P08: PRACTICAL VIII [Contact hours: 44]
(Practicals of MBG4C13)

1. Study of air and soil microflora.
2. Studies on halophiles isolated from seawater (pigmentation and Salt tolerance).
3. Detection of coliforms for determination of the purity of potable water.
4. Determination of dissolved oxygen concentration of water sample by Winkler's method.
5. Determination of biological oxygen demand (BOD) of sewage sample.
6. Determination of chemical oxygen demand (COD) of sewage sample.
7. Estimation of nitrate in drinking water.
8. Isolation, of cellulose degraders.
9. Isolation of pesticide degraders.

MBG4P09: PRACTICAL IX [Contact hours: 44]
(Practicals of MBG4C14)

1. Screening and isolation of antibiotic and enzyme producers.
2. Production and characterization of wine (estimation of alcohol), citric acid.
3. Comparison of ethanol production using various organic waste/ raw material (free cells and immobilized cells).
4. Microbial production of dextran by *Leuconostoc mesenteroides.*
5. Production of SCP.
6. Biogas production.
7. Immobilization of microbial cell and enzymes.
8. MIC determination of antibiotics by broth dilution technique and filter paper disc assay.
9. Test for the degradation of aromatic hydrocarbons by bacteria.

Sd/-
Dr. SARALA GOPALAKRISHNAN,
Chairperson, Board of Studies

Pattern of Question papers

KANNUR UNIVERSITY

I SEMESTER M.Sc. DEGREE EXAMINATION, 2014

Microbiology (KUCBCSS-PG)

Course Code: Name of the course (2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11.
12.
13.
14.
15.
16.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17.
18.

Model Question papers

KANNUR UNIVERSITY

I SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014

Microbiology (KUCBCSS-PG)

MBG1C01: Biochemistry– Model Question Paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What are the features of peptide bond?
2. Mention the forces stabilizing the structure of protein
3. Name two purines and draw their structure.
4. What are epimers? Give one example
5. What are the structural differences between glucose and fructose?
6. Define stereoisomerism. What is its significance in protein chemistry?
7. Define isoelectric pH.
8. Explain chargaff's rule.
9. Define vitamins. Give examples.
10. What are neurotransmitters? Give example.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Describe the structure of t RNA.
12. Give a brief account on heteropolysaccharides.
13. Write short notes on protein hormones.
14. Describe the sequence of events which leads to the origin of life.
15. Write short notes on polysaccharides.
16. Explain DNA polymorphism.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Describe the chemistry and functions of lipids.
18. Explain the mechanisms of neurotransmission.

KANNUR UNIVERSITY
I SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS-PG)

MBG1C02: Biophysics – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define enthalpy.
2. Differentiate between nucleoside and nucleotide.
3. What is meant by mutarotation?
4. Define redox potential.
5. What are the functions of rubisco?
6. Define osmotic pressure.
7. Explain glycosidic linkage.
8. Define free energy of a system.
9. What are detergents?
10. What is meant by energy of activation?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

11. Describe surface tension and its application
12. Explain DNA supercoiling.
13. Discuss on membrane transport.
14. Explain the structure of lysozyme.
15. Give an account of secondary structure of protein.
16. Write a short note on membrane potential.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Describe the laws of thermodynamics.
18. Explain the structure and properties of water.

KANNUR UNIVERSITY
I SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG1C03: Cell Biology– Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What are the features of collagen type 1?
2. Write down the importance of cyclins
3. Mention the functions of peroxisomes
4. Write a note on barr bodies
5. Highlight the role of microtubule in the formation of mitotic apparatus
6. What are tomour suppressor genes
7. What are heterophagosomes
8. Explain the types of oncogenes
9. What is heteropicnosis
10. Describe the role of histones in chromosome organization

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Schematically represent the different stages of cell cycle.
12. Write short notes on proteoglycan and fibronectin.
13. Describe the functions of golgi bodies.
14. Explain various types of ribosomes. Mention its role in protein synthesis.
15. What is apoptosis? Explain its significance.
16. Describe active transport in detail.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. What is cell cycle check point? Where do checkpoints occur in cell cycle? How do cell cycle check points regulate cell cycle
18. Describe the structure and functions of rough endoplasmic reticulum.

KANNUR UNIVERSITY
I SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS-PG)

MBG1C04: General Microbiology– Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What are bacteriophages?
2. Explain the functions and types of flagella
3. What are Koch postulates?
4. Briefly describe three domain classifications.
5. Describe the features of slime molds.
6. Briefly describe the spread plate method.
7. What is lyophilization?
8. Describe the influence of pH on microbial growth.
9. Explain the principle of spore staining.
10. What is phenol coefficient?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. What are the different criteria used in bacterial classification?
12. Explain the features of archaebacteria and how they differ from eubacteria.
13. Describe the classification of fungi.
14. Explain in detail on growth curve.
15. Discuss different types of culture media.
16. Explain the ultra structure of Gram positive bacterial cell wall.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Explain the physical and chemical methods used to control microbial growth.
18. Describe the principle and functions of different types of microscopes.

KANNUR UNIVERSITY
II SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG2C05: Immunology – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Explain TATA.
2. List the four characteristics attributes of adaptive immunity.
3. Define the structure and function of class I MHC molecules.
4. List some of the roles of cytokines.
5. What are haptens and its role in antigenicity?
6. What are adjuvants and its types?
7. Write two applications of western blotting.
8. Explain MHC restriction and how it helps in the differentiation of T cells.
9. What are the types of T cells?
10. What are the characteristics of Hasimottos thyroiditis?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

11. What are the pathways of B cell tolerance?
12. What is hypersensitivity? Write a note on its types.
13. Explain classical and alternative pathways of complement activation.
14. Discuss the technique ELISA and mention its application.
15. Explain different types of vaccines.
16. Describe the role of NK cells and macrophages against tumor.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Explain in detail the processing and presentation of exogenous and endogenous antigen?
18. What are the mechanisms involved in transplant rejection? Describe some of the immunosuppressive therapy in organ transplantation.

KANNUR UNIVERSITY
II SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG2C06: Microbial Physiology & Metabolism – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What is synchronous culture?
2. What is P/O ratio?
3. How is glycolysis regulated?
4. What are mixotrophs. Give example.
5. Define gluconeogenesis and its significance.
6. What are trace elements? Give examples.
7. What is photoheterotrophy?
8. What are ribozymes?
9. What is a prosthetic group? Give an example.
10. What are isomerases?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

11. Explain the metabolism of aromatic amino acids.
12. Describe in brief about the biochemistry and pathway of methanogenesis.
13. What is quoroum sensing? Add a note on its types and regulations.
14. Outline the role of chlorophyll and other accessory pigments in photosynthesis.
15. Briefly describe the biosynthesis of antibiotics.
16. Explain the chemiosmotic mechanism of ATP generation.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Explain the various steps involved in urea cycle and state its significance.
18. Explain the various nutrient uptake mechanisms observed in microbes.

KANNUR UNIVERSITY
II SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG2C07: Molecular Biology– Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What are repressor proteins?
2. What is the importance of sigma factor in transcription initiation?
3. Give two post translational modifications in eukaryotes.
4. Explain the role of enhancer in gene regulation.
5. What are RNA probes?
6. What are the enzymes involved in 5′ capping?
7. Write two functions of TATA binding protein.
8. What are the constituents of spliceosome complex?
9. Explain the role of T7 RNA Polymerase in regulation of phages.
10. What are DNA microarrays?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

11. Give an account of inhibitors of transcription.
12. Explain the salient features of genetic code.
13. Write an account on structure and function of tRNA.
14. Explain the enzymes involved in DNA replication.
15. Briefly explain the different repair mechanisms.
16. Describe the structure of chromatin.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Discuss the basic principles involved in bacterial operons. Explain the mechanism behind repressible and inducible system with example.
18. Discuss the various stages of translation in eukaryotes. Explain each stage with specific diagrams.

KANNUR UNIVERSITY
II SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG2E01: Genetics – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What is Lyon hypothesis?
2. Explain genetic map.
3. Differentiate idiogram and karyotype.
4. What are auxotrophs?
5. Highlight the importance of *Arabidopsis thaliana.*
6. Distinguish deletion and inversion.
7. Explain principle of segregation.
8. Define penetrance.
9. Write the properties of z-DNA.
10. What is chiasma?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

11. Discuss the significance of meiosis.
12. What is cytoplasmic inheritance? How does it differ from mendelian inheritance?
13. Write a note on multiple alleles.
14. Discuss various mechanisms of sex determination.
15. Write a note on human genetic disorders.
16. What are transpons? Explain various mechanisms of transposition.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. What is Hardy-Weinberg law? Discuss various sources that change the gene frequencies of population.
18. Describe the genetic transfer mechanisms in bacteria.

KANNUR UNIVERSITY
II SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG2E02: Enzymology – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Explain alosteric control of enzymes.
2. What are ribozymes?
3. Explain specific activity of the enzyme.
4. Comment on turnover number of the enzymes.
5. What is isoelectric focussing?
6. What do you understand by zymogens?
7. Give two examples of microbial enzymes along with name of organism.
8. Explain multienzyme complexes.
9. What is feedback inhibition?
10. Explain enzyme catalysis in solution.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Discuss briefly on enzyme nomenclature.
12. Describe the experimental aspects of determination of Km of an enzyme.
13. Write an account on coenzymes structure and function.
14. Write short note on noncompetitive inhibition.
15. Describe the determination of 3-D structure of enzyme active site.
16. What are different sources of enzymes? Discuss various advantages of enzymes as compared to conventional chemical catalysts.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Describe the physical methods of immobilization of enzymes and add a note on the industrial application of immoblized enzymes.
18. Describe the steps for the purification of enzyme.

KANNUR UNIVERSITY
II SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG2E03: Bioinstrumentation – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define sedimentation.
2. What is electrode potential (or) half cell potential?
3. Explain HEPA.
4. Comment on peptide mass fingerprinting.
5. What is isoelectric focussing?
6. Give the characteristics of ionizing radiations.
7. What is NMR?
8. Explain Beer–Lambert law
9. What is ultrafiltration?
10. Explain Geiger-Muller counters.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Define electrophoresis and explain different types of electrophoresis.
12. Describe the principle and operation of colorimeter.
13. Write an account on autoradiography and its safety guidelines.
14. Write short note on X-ray crystallography
15. How a pH meter works?
16. Explain common types of centrifugation.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Give an account of different types of chromatography with special reference to HPLC.
18. Describe the different spectroscopic techniques you have studied.

KANNUR UNIVERSITY
III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)
MBG3C08: Biostatistics and Bioinformatics– Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define frequency distribution of a random variable.
2. Define SAGE.
3. Why is arithmetic mean considered as the best among the other averages?
4. Explain genome and proteome.
5. What are the desirable properties of a good measure of dispersion?
6. State the addition and multiplication theorems of probability.
7. Distinguish between census and sample survey.
8. What is DNA microarray?
9. What are the advantages of completely randomized experimental design?
10. What is boot strap analysis?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. What are the uses of graphs and diagrams? Explain different methods of presenting data graphically.
12. Explain different measure of central tendency.
13. Write a note on oligonucleotide design.
14. The probability that a student passes statistics test is 2/3 and the probability that he passes both statistics and mathematics test is 14/45. The probability that he passes at least one test is 4/5. What is the probability that he passes mathematics test?
15. Describe the similarity-based approaches to gene prediction.
16. How does the maximum likelihood method work?

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Write a note on the following: relative and cumulative frequency, coefficient of variation, permutation and combination, paired t- test, ANOVA.
18. Discuss various methods for protein identification through database searching.

KANNUR UNIVERSITY
III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG3C09– Food and Agriculture Microbiology – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define water activity.
2. Differentiate rusts and smuts diseases.
3. How do bacteria reproduce?
4. What are the two most common causes of a foodborne outbreak?
5. List three important factors that differentiate foodborne infection from foodborne intoxication.
6. Name two viroid diseases of plants.
7. List out the pychrotrophic bacteria in raw milk.
8. Explain the nature of wilt diseases.
9. Highlight the importance of *Escherichia coli* 0157:H7.
10. Define rhizosphere.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Explain the role of molecular diagnostic techniques in managing crop diseases.
12. Describe what you believe are the main function(s) and goal(s) of food microbiologists?
13. Define toxins and explain their role in disease development.
14. Define the following terms: redox potential, generation time, canning, HACCP, proteolytic.
15. Many vegetables are eaten raw. Discuss what microbiological concerns the consumer should have for these vegetables.
16. Discuss the need for using indicator bacteria for enteric pathogens in food.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Discuss the importance of Gram positive bacteria in food fermentations.
18. Explain biogeochemical cycling and significance of nitrogen and carbon. Also write a note on production of bacterial biofertilizers.

KANNUR UNIVERSITY
III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG3C10: Medical Bacteriology – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Name any two organisms causing bacterial meningitis?
2. Mention toxic shock syndrome and its clinical features
3. Differentiate MDR and X MDR TB
4. Mention the action and therapeutic use of Streptokinase
5. What are Relapsing fever and its types?
6. Explain ASO test and its significance?
7. What is EHEC and its clinical features
8. What is Mantoux test?
9. What is ophthalmia neonatorum?
10. What is Eleks gel precipitation test?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Describe infectious disease cycle. Explain the sources and reservoirs of infections.
12. Write notes on the virulence factors of *Staphylococcus aureus*
13. Explain the clinical features of tuberculosis
14. Give an account of the syphilis
15. Describe the infections of any one anaerobic spore forming bacteria.
16. Describe the infections of *Bordetella pertussis.*

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Discuss the morphology, pathogenesis, lab diagnosis and other significant features of the bacterium *Bacillus anthracis.*
18. Discuss the significant features including morphology, pathogenesis, and lab diagnosis of the bacterium *Vibrio cholera.*

KANNUR UNIVERSITY
III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014
Microbiology (KUCBCSS -PG)

MBG3C11: Virology, Mycology and Parasitology – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What are continuous cell lines?
2. What are aflatoxins?
3. Mention the importance of HBIG.
4. What is enterotest?
5. What is the role of reverse transcriptase in retroviral replication?
6. Which are the drugs used for the treatment of trypanosomiasis?
7. Differentiate between homothallic fungi and heterothallic fungi.
8. What are dermatophytes? Write an example.
9. What are prions? Mention names of any two prion diseases.
10. Mention any two characteristic features of a microfilaria?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5=20 marks)

11. Describe the mechanism of virus entry into cells.
12. Write in detail, the classification of human parasites.
13. Give an account of the ultra structure of fungal cells with neat diagram.
14. Give an account of the pathogenesis and clinical features of influenza in humans. Add note on the genomic diversity of influenza viruses.
15. Explain the life cycle of malarial parasites with neat labelled diagram.
16. Give an account of the opportunistic fungal infections encountered in immunocompromised patients.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Explain in detail the genome replication strategies of DNA viruses.
18. Give an account of the mechanism of action of antifungal agents. Add a note on the mechanism of antifungal drug resistance.

KANNUR UNIVERSITY

III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014

Microbiology (KUCBCSS -PG)

MBG3E04: Biosafety, Bioethics and Intellectual Property Rights – Model Question Paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define biopiracy.
2. What are the benefits of GATT?
3. Explain euthanasia.
4. Comment on trademarks.
5. What are vectors?
6. Explain xenotransplantation.
7. What are the main features of TRIPS?
8. What is bioremediation?
9. List out three advantages of cloning.
10. What is meant by biosafety?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Discuss the concerns of environmental ethics.
12. Explain the indigenous and local people's rights.
13. How microorganisms are classified based on hazards?
14. What are the main objectives of human genome project?
15. What are the ethical implications of prenatal diagnosis and sex selection?
16. What is DNA fingerprinting? Discuss the merits and demerits of DNA fingerprinting.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. What are the prospects of stem cell research in medicine?
18. Discuss the benefits of genetically modified plants.

KANNUR UNIVERSITY

III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014

Microbiology (KUCBCSS -PG)

MBG3E05: Medicinal Chemistry- Model Question Paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Differentiate hypnotics and analgesics.
2. What are nutraceuticals.
3. What is qunines.
4. List out few cardiac stimulants.
5. Comment on peptide mass fingerprinting.
6. What is prodrug?
7. What are antihistamines?
8. Explain the use of thiabendazole.
9. Give the factors affecting drugs metabolism.
10. What are the antiretroviral drugs used in the treatment of HIV infection?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Write in detail about the occurrence, chemistry and biosynthesis of Penicillin.
12. Discuss about drug receptor interactions.
13. Give an account on the natural products as potential drugs.
14. Write short note on chemistry of insulin.
15. Explain in detail various process such as drug absorption, metabolism, distribution and elimination.
16. Describe briefly on the drugs affecting neurotransmission.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Give an account of polyene and azole drugs used in the treatment of pathogenic fungi.
18. Discuss the salient features involved in the isolation, identification and purification of peptide drugs.

KANNUR UNIVERSITY

III SEMESTER M.Sc. MICROBIOLOGY DEGREE EXAMINATION, 2014

Microbiology (KUCBCSS -PG)

MBG3E06: Algal Biotechnology– Model Question Paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Name two marine macroalgae..
2. What are blue green algal biofertilizers?
3. Explain cryopreservation of algae.
4. List out general features of *Chlorella*.
5. Comment on seaweed liquid fertilizers.
6. What is SCP?
7. What are phycocolloides?
8. Explain the use of pigments from algae.
9. Give the parameters to assess algal growth in culture.
10. Name two culture collection centres of algae in India.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Explain with appropriate examples how phycoremediation is a major process of bioremediation.
12. Discuss in brief the utilization of Algae in industry.
13. Give an account on Algae as resources for production of biofuel.
14. Write short note on nutritional value of microalgae.
15. Explain appropriate examples the scope and application of algal technology.
16. Describe briefly the similarities between bacteria and cyanobacteria.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Explain the scale up of algal culture of any two economically important species.

18. Justify the necessity of culture of algae. Mention the types of culture. Explain the initiation and maintenance of any one type of algal culture.

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Microbiology (KUCBCSS -PG)

MBG4C12: Recombinant DNA Technology– Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What is the significance of restriction endonuclease?
2. What are shuttle vectors?
3. What is knock out mouse?
4. Describe real time PCR.
5. What are monoclonal antibodies?
6. Explain Linkers and Adaptors.
7. Expand RAPD.
8. What are micro and minisatellites?
9. Explain HRT.
10. Differentiate SiRNA and miRNA.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(5x4 = 20 marks)

11. Explain *Agrobacterium* mediated gene transfer.
12. What is site directed mutagenesis? Write notes on its types.
13. Explain antisense RNA technology and gene silencing.
14. Describe the role of rDNA technology in medicine and forensic science.
15. What are selectable markers and reporter genes? How it helps in identification of desired gene?
16. Discuss the enzymes involved in genetic engineering.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. What are the different types of vectors involved in rDNA technology? Describe the significance of plasmid vectors.
18. Discuss the technique of RFLP and mention its applications.

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MBG4C13– Environmental Microbiology – Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. What are biosurfactants?
2. Define humus.
3. Differentiate BOD and COD.
4. Explain the concept of aerosol & droplet nuclei.
5. Comment on indicators of water pollution.
6. What is filter sterilization?
7. Enlist any two examples of commensalism.
8. What are hyper thermophiles?
9. Explain microbial biofilms.
10. What are biosensors?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Explain the mechanisms of establishment of symbiosis.
12. Describe water-borne pathogens as bioterrorism weapons.
13. Write about anthropogenic carbon and ocean acidification.
14. Enlist the different techniques used to study aerobic microflora.
15. Describe the growth and distribution patterns of marine microplanktons and its regulation by environmental conditions
16. Discuss the role of microorganisms in the degradation of pesticides.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Discuss the animal-microbe and plant- microbe interactions.
18. Explain the various processes involved in the treatment of sewage. Add a note on the significance of microorganisms.

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MBG4C14: Microbial Technology– Model Question Paper
(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Which method is adopted for the isolation of growth factor producers?
2. Define SCP with two examples.
3. Name two probiotic bacteria.
4. Define whey.
5. Write a note on heap leaching.
6. What is membrane filtration technique?
7. What are the two biochemical processes involved in the production of vinegar?
8. What is scale-up process?
9. Mention the role of hops in beer brewing.
10. What are biosensors?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Explain the production and recovery of penicillin.
12. Describe the steps involved in the separation of solids from culture media.
13. What is mean by enzyme immobilisation? Describe the different methods used for enzyme immobilisation.
14. Explain the method of production of biogas.
15. Give a detailed account on different strain improvement programme.
16. What are bioinsecticides? Write a note on mode of action of BT toxin.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Comment on the effect of aeration, temperature, pH and dissolved oxygen on bioprocess.
18. With the help of a neat labelled diagram describe the important parts of a bioreactor. Discuss various types of bioreactors.

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Microbiology (KUCBCSS -PG)

MBG4E07: Diagnostic Techniques in Microbiology– Model Question Paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A (*Write about each of the following in 2 or 3 sentences. Each question carries 1 mark).* (1x10 = 10 marks)

1. Define maintenance media. Give an example.
2. What is anamnestic immune response?
3. What are anticoagulants?
4. What is latex agglutination test?
5. What are infectious diseases?
6. What is ribotyping?
7. Define benchmarking.
8. Mention the use of Moeller decarboxylase base medium.
9. State the difference between O/F pattern in bacteria.
10. What are incomplete antibodies?

Section B (*Write notes on or discuss any four of the following. Each question carries 5 marks.)*

(4x5= 20 marks)

11. Write down the principle and procedure for calcofluor white staining.
12. What is liposome mediated agglutination. Add a note on its advantages.
13. Compare the various automated methods for the rapid identification of bacteria.
14. Describe the principle and application of immunofluorscent assay.
15. Explain in brief about the various methods adopted for the collection, transport, and processing of respiratory specimens.
16. Write a note on the immunological diagnosis of viral diseases.

Section C (*Write an essay on any one of the following. The question carries 10 marks.)*

(1x10=10 marks)

17. Discuss the concept of nucleic acid amplification reaction. Explain how these techniques can be applied in a microbiology laboratory.
18. Describe the important physiological and biochemical tests used in medical bacteriology.

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Microbiology (KUCBCSS -PG)

MBG4E08: Gene Therapy– Model Question Paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define apoptosis.
2. What is sonoporation?
3. What are hematopoietic stem cells?
4. Explain the use of hydrodynamic intravascular injection?
5. Define transgene.
6. What is lipofaction?
7. Explain germ-line gene therapy.
8. Mention the advantages of immunotherapy.
9. State two advantages of electroporation.
10. What are tumor suppressor genes?

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Write a note on cancer gene therapy strategies.
12. What are the different methods for gene delivery?
13. Give an account of viral vectors used in gene therapy.
14. Describe the gene therapy of infectious diseases with special emphasis on HIV-1 infection.
15. Explain gene therapy for the vascular system.
16. Write a note on ethical and social problems of gene therapy.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. Give a detailed account on the recent advancements in the gene therapy with an example.
18. Discuss on how gene therapy is successfully employed in treating: Cystic fibrosis, Parkinson's disease.

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Microbiology (KUCBCSS -PG)

MBG4E09: – Biomolecular Modeling and Drug Design– Model Question paper

(2014 Admission)

Time: 3 Hrs **Maximum marks: 40**

Section A

Write about each of the following in 2 or 3 sentences. Each question carries 1 mark.

(1x10 = 10 marks)

1. Define Buckingham potential.
2. What is triple-dipole correction?
3. What constraint dynamics?
4. What are polymers?
5. What are Vander Waals interactions?
6. What is probability density?
7. Define SAR & QSAR.
8. Mention the radial distribution system.
9. State the predictor-corrector methods.
10. Explain Lorentz-Bertelot mixing rules.

Section B

Write notes on or discuss any four of the following. Each question carries 5 marks.

(4x5= 20 marks)

11. Write a note on X-ray crystallography.

12. Describe briefly the importance of electrostatic interactions in modelling a molecule.

13. Explain the concept of phase space in molecular simulation.

14. Describe the effect of solvent on drug receptor interactions.

15. Explain the interactions between aromatic systems with Hunter and Saunders model.

16. Write a note on stability of drug receptor complex.

Section C

Write an essay on any one of the following. The question carries 10 marks.

(1x10=10 marks)

17. What is a block method in a molecular simulation program? Describe its use and importance in improving the molecular simulation programme.
18. Describe the Monte Carlo simulation of rigid molecules.

Sd/-

Dr. SARALA GOPALAKRISHNAN

Chairperson