

Course: MICROBIOLOGY PG

Semester	4
Paper Number	MMCB 4411
Paper Title	GENETICS & VIROLOGY
No of credits	6
Non composite/composite	Composite
No. of periods assigned	6
Course description/objective	<ul style="list-style-type: none"> • To know Mendelian Genetics • To know Microbial Genetics • To characterize viruses • To know the aspects of Biosafety
Reference List	<ol style="list-style-type: none"> 1. Klug and Cummings-Genetics 2. Larry Snyder and Wendy Champness- Molecular genetics of bacteria 3. David Freifelder- Molecular biology 4. Russel- Biology, the dynamic science 5. Griffth-Molecular biology 6. Snustad and Simmons- Principles of Genetics 7. S.J. Flint, L.W. Enquist, V.R. Racaniello, A.M. Skalka -Principles of Virology 8. Edward K. Wagner, Martinez J. Hewlett- Basic Virology 9. Larry Snyder and Wendy Champness, 10. David Freifelder, 11. Russel, 12. Griffth, 13. Snustad and Simmons 14. Larry Snyder and Wendy Champness
Evaluation	<p>Theory: 70 (60 End sem + 10 CIA) Practical: 30 (10 End sem + 20 CIA)</p> <p>Question Paper format: theory end semester</p> <p>Module 1: 30 marks SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5X2=10 LONG QUESTION: FROM 6 QTNS ANSWER 4 (EACH 5 MARKS)= 4X5=20</p> <p>Module 2: 30 marks SHORT QUESTION: FROM 7 QTNS ANSWER 5 (EACH 2 MARKS) = 5X2=10 LONG QUESTION: FROM 6 QTNS ANSWER 4 (EACH 5 MARKS)= 4X5=20</p> <p>Viva: End sem 10 marks</p>

MMCB4411

GENETICS & VIROLOGY

THEORY 70

❖ **MODULE 1: Genetics (35 MARKS)**

Mendelian Genetics:

Physical basis of heredity; cell division, Mendel's Laws, gametogenesis, life cycle (Yeast, C.elegans); structure and organization of some special chromosomes like polytene and lampbrush chromosome single gene inheritance, terminology, allelic relationship, single gene crosses, pedigree analysis; two or more gene, independent assortments, dihybrid cross, genetic interactions; two factor interaction, epistatic interaction, non epistatic interaction, interaction with three or more factors. Doses compensation and sex determination and sex linked inheritance, Linkage and chromosome mapping: linkage, cross over, chi square test for linkage, recombination frequency and map construction, tetrad analysis in yeast and recombination mapping with tetrad, mapping with molecular marker. [AKM]

Microbial Genetics:

Transformation: Natural Transformation, Discovery of Transformation, Competence, Uptake of DNA during natural transformation, Mechanism of DNA uptake during transformation, genetic evidence for single stranded uptake, Plasmid transformation and transfection of naturally competent bacteria, Mapping by transformation, artificially induced competence, Calcium ion induction, Electroporation. [MMG]

Conjugation: Interrupted mating and time of entry mapping, linkage mapping, Mechanism of DNA transfer during conjugation in Gram-negative bacteria, Chromosome transfer by plasmids, Genetic mapping with Hfr Crosses, Chromosome mobilization, Prime factors, Transfer systems of Gram positive bacteria, Interrupted mating and time of entry mapping, linkage mapping. [MMG]

Transduction: Recombination and complementation tests with phages, Experiments with the rII genes of phage T4, Constructing genetic linkage map of a phage, Generalized transduction, Cotransduction and linkage, Mapping by Cotransduction, Properties of specialized transducing particle, Specialized transducing phage as a cloning vehicle. [MMG]

DNA damage and repair: Factors affecting DNA bases, identification and molecular characterization of repair enzymes in photoreactivation, excision, recombination and SOS pathways. Photoreactivation, excision, recombination, mismatch, SOS, **Mutation:** Mutation, spontaneous and induced, mutagenic agents, Luria-Delbruck fluctuation test; replica plating [SSC]

Bio Ethics Basic principles and application and laws pertaining to patenting and it's protection. General concepts of patents related to biological research products Definition and types, Medical Ethics, Environmental Ethics, Christian Ethics, Feminist Ethics. Concept of Gene therapy, Animal ethics, Biotic ethics. Blood transfusion, Body modification, Euthanasia (human, non-human animal) Genetically modified food, Genetically modified organism, Life extension, Life support, Medical malpractice, Organ donation, Organ transplant, Pain management, Reproductive rights, Reproductive technology, Reprogenetics, Research ethics. Basic principles and application and laws pertaining to patenting and it's protection. General concepts of patents related to biological research products. [AKM]

❖ **MODULE 2: Virology and Biosafety (35 MARKS)**

Classification (Baltimore and ICTV) and modes of propagation of virus particles; morphology and ultrastructure; assay, cultivation, and purification of viral particles; life cycle of lytic and temperate bacteriophages; Lysogenic conversion; antiviral compounds. Bacteriophages: DNA bacteriophages- Lambda, T4, T7, M13, PhiX174; RNA bacteriophages-MS2, QB, Phi6 .Animal viruses: Polio, Influenza, Retroviruses, Coronaviruses, Oncogenic viruses. Plant viruses: TMV [KS]

Biosafety: Concept, levels and transgenic uses [AKM]

Practical: 30

Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique

Biometry experiments involving plant seed

Presentation of Case Studies on Bio Ethics.

References:

Campbell- Biology.

Klug and Cummings-Genetics

Larry Snyder and Wendy Champness- Molecular genetics of bacteria

David Freifelder- Molecular biology

Russel- Biology, the dynamic science

Griffth-Molecular biology

Snustad and Simmons- Principles of Genetics

[S.J. Flint](#), [L.W. Enquist](#), [V.R. Racaniello](#), [A.M. Skalka](#) -Principles of Virology

[Edward K. Wagner](#), [Martinez J. Hewlett](#)- Basic Virology

Larry Snyder and Wendy Champness,
David Freifelder,
Russel,
Griffth,
Snustad and Simmons

Larry Snyder and Wendy Champness

Biomedical Ethics O Thomas Elsevier

Bare Act, 2007. Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., New Delhi.