

SEMESTER-I
CORE COURSE DCS -1
THEORY-I
CELL BIOLOGY AND GENETICS

1. Unit : Cell structure and Functions

- 1.1. Cell as basic unit of living organisms-bacterial, fungal, plant and animal cells
- 1.2. Ultrastructure of prokaryotic cell (cell membrane and plasmids, Nucleoid)
- 1.3. Ultrastructure of eukaryotic cell (cell wall, cell membrane, nucleus, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, vacuoles)
- 1.4. Fluid mosaic model, Sandwich model, Cell membrane permeability
- 1.5. Structure of chromosome-morphology, components of chromosomes (histones and non-histones), specialized chromosomes (Polytene, Lampbrush)
- 1.6. Chromosomal aberrations- structural and numerical

2. Unit : Cell Division and Cell cycle

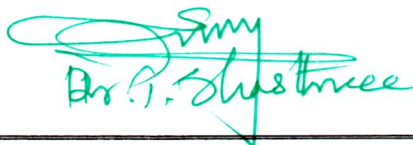
- 2.1. Bacterial cell division
- 2.2. Eukaryotic cell cycle –phases
- 2.3. Mitosis - Stages (spindle assembly)-significance
- 2.4. Meiosis- Stages (synaptonemal complex)-significance
- 2.5. Senescence and necrosis
- 2.6. Apoptosis

3. Unit : Principles and mechanism of inheritance

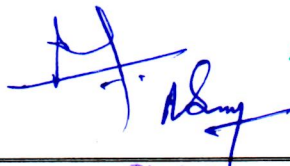
- 3.1. Mendel's experiments- factors contributing to success of Mendel's experiments
- 3.2. Law of segregation- Monohybrid Ratio; Law of independent assortment- Dihybrid Ratio, Trihybrid Ratio
- 3.3. Deviation from Mendel's laws- partial or incomplete dominance (eg: Flower Color in *Mirabilis jalapa*), Co-dominance (eg: MN Blood groups), Non allelic interactions-types of epistasis, modification of dihybrid ratios
- 3.4. Penetrance and Expressivity (eg: Polydactyly, Waardenburg syndrome), pleiotropism, phenocopy- microcephaly, cleft lip
- 3.5. Multiple allelism (eg: Coat color in Rabbits, eye color in *Drosophila* and ABO Blood groups)
- 3.6. X-Y chromosomes - Sex determination in *Drosophila*, Man, X-linked inheritance- Hemophilia and Color blindness; X-inactivation.

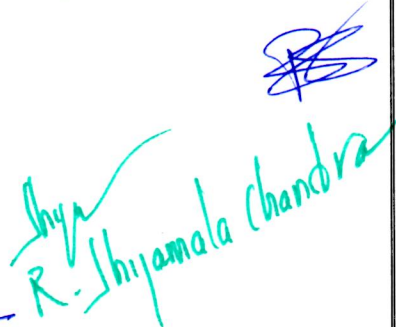
4. Unit : Linkage, Recombination and Extension to Mendel's Laws

- 4.1. Linkage and recombination- Cytological proof of crossing over, phases of linkage, recombination frequency, gene mapping and map distance
- 4.2. Non-Mendelian Inheritance – Maternal effect (Shell coiling in snail), variegation in leaves of *Mirabilis jalapa*
- 4.3. Cytoplasmic male sterility in Maize.
- 4.4. Mitochondrial inheritance in human and poky in *Neurospora crassa*
- 4.5. Chloroplast inheritance in *Chlamydomonas*
- 4.6. Hardy-Weinberg Equilibrium.


Dr. P. Shastri


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Dr. A.V. Rao


Chair Person


R. Shyamala Chandra

CORE-I: PRACTICALS

1. Microscopic observation of cells: bacteria, fungi, plant and animal
2. Preparation of different stages of Mitosis (onion root tips)
3. Preparation of different stages of Meiosis (grasshopper testis)
4. Preparation of Polytene chromosome from *Drosophila* salivary gland
5. Monohybrid and dihybrid ratio in *Drosophila*
6. Monohybrid and dihybrid ratio in Maize
7. Problems on co-dominance, epistasis, two point and three point test cross, gene mapping.
8. Statistical applications of Hardy-Weinberg Equilibrium

Spotters:

1. Prokaryotic Cell(Bacteria),
2. Mitochondria,
3. Chloroplast,
4. Polytene Chromosomes,
5. Test Cross,
6. Blood Grouping,
7. Hemophilia Pedigree,
8. Crossing Over
9. Synaptonemal Complex,
10. Nucleosome Model.

REFERENCE BOOKS

1. Cell & Molecular Biology. E.D.D De Robertis & E.M.F De Robertis, Waverly publication
2. An introduction to Genetic Analysis by Anthony, J.F. J.A. Miller, D.T. Suzuki, R.C. Richard Lewontin, W.M-Gilbert, W.H. Freeman publication
3. Principles of Genetics by E.J.Gardner and D.P. Snusted. John Wiley & Sons, New York
4. The science of Genetics, by A.G. Atherly J.R. Girton, J.F. Mcdonald, Saundern College publication
5. Principles of Genetics by R.H. Tamarin McGrawhill
6. Theory & problems in Genetics by Stansfield, Schaum out line series McGrawhill
7. Molecular Cell Biology Lodish, H., Baltimore, D; fesk, A., Zipursky S.L., Matsudaride, P. and Darnel. American Scientific Books. W.H. Freeman, New York
8. The cell: A molecular approach. Geoffrey M Cooper, Robert E Hausman, ASM press
9. Cell and Molecular Biology, Concepts and Experiments – Gerald Karp, John Wiley & Sons, Inc.
10. Cell Biology And Genetics by P.K. GUPTA