



MCC, Department of Botany

**Paper 6a MOLECULAR BIOLOGY AND GENETICS**

M.Sc. va (Candidates admitted from academic year 2008-2009)

**Core Theory**

## Paper 6a MOLECULAR BIOLOGY AND GENETICS

M.Sc. va (Candidates admitted from academic year 2008-2009)

### Core Theory

#### UNIT I

Internal compartmentalization of prokaryotic and eukaryotic nucleic acids.

**Terminology:** Histones, histone octamer, non-histones, nucleosome, euchromatin and heterochromatin, constitutive and facultative heterochromatins, telomeric, centromeric and interstitial constitutive heterochromatins and SAT - DNA.

Replication of double helix.

**Terminology:** Helicase, SSB, preprimosome, primosome, primase, DNA Pol I, DNA Pol II, DNA Pol III, RNA Primer, Okazaki fragment, leading and lagging strands.

#### UNIT II

Gene action: transcription, post transcriptional modification of Pre mRNA, translation of genetic message into polypeptide and post-translational modification of polypeptides.

Genetic code-properties.

Protein folding, modification and degradation of proteins.

**Terminology:** Gene, cistron, RNA Pol II, enhancer, promoter, Pribnow box, TATA box, sense strand, antisense strand, exon, intron, spliceosome, snRNP, polyadenylation, aminoacyl synthetase, aminoacyl transferase, peptidyl transferase, leader sequence, codon, start and stop codons, anticodon, signal peptide and transit peptide, chaperone, chaperonin and molten globule.

#### UNIT III

Allelic exclusion and gene rearrangement.

Structure of immunoglobulin heterotetramer. Classification and function of immunoglobulins. B - lymphocyte and humoral immune system. T - lymphocyte and cell mediated immune response.

**Terminology:** Antigen/agglutinin, antibody/agglutinin, agglutination, antigenic determinant, plasmoblast, memory cell, cytotoxic T-cell, helper T-cell and suppressor T-cell.

#### UNIT IV

Regulation of gene action in Prokaryotes with reference to Lac operon.

**Terminology:** Operon, polycistronic mRNA, operator, operator constitutive, regulator, regulator constitutive, regulator super repressor, repressor, super repressor and inducer.

Regulation of gene action in eukaryotes with reference to Britten and Davidson model of gene regulation.

**Terminology:** Producer gene, structural gene, sensor gene, integrator gene and integrator RNA.

#### UNIT V

Gene regulation and Floral morphogenesis in *Arabidopsis thaliana*.

**Terminology:** LEAFY (LFY), APETALA 1, APETALA 2, FLIP 1, FLIP 2 and UFO genes.

Organelle genomes: Organisation and functions of chloroplast and mitochondrial DNA.

**Terminology:** Helicase, Gyrase, Topoisomerase, Ori site, Ori A and Ori B sites, D-loop and Direct and Inverted repeats.

#### UNIT VI

Construction of antisense gene and the application of antisense RNA.

**Terminology:** Sense gene, Sense RNA, Sense Suppression, Palindrome, restriction endonuclease, RFLPs, reverse transcriptase, reverse transcription, cDNA and rDNA.

UV induced mutation and its repair mechanism. Mismatch DNA repair mechanism.

Mutation types-frame shift mutation

,addition,deletions,substitution,transition and transversion.

**Terminology:** Thymine-dimer, photoreactivase, UVRA and UVRB.

### Suggested Reading

- WATSON, J.D. *et al.* 2003. Molecular Biology of the Gene. Fourth Edition. The Benjamin Cummings Pub. Co.
- LEWIN, B. 2003. Genes VIII. Oxford University Press.
- LEWIN, B. 2001. Genes VII. Oxford University Press.
- FRIEFELDER, D. 2005. Molecular Biology. Second Edition. Narosa Pub. House.
- LEWIN, B. 1994. Genes V. Oxford University Press.
- SOBTI R.C. and GOBE. 1991. Eukaryotic chromosomes. Narosa Publishing House.
- SMITH-KEARY, P. 1991. Molecular Genetics. Macmillan Pub. Co. Ltd. London.
- STEWART M.W. 1984. Antibodies: Their structure and function. Chapman and Hall Ltd.
- STRICKBERGER, M.W. 1990. Genetics. Third Edition. Macmillan Publishing Company.

MCC, Department of Botany