

B. Sc. V Semester Botany

Code: BOT-502

Contact Hours: 50 Hours

Credit Points:

Univ Code:

Workload: 4 hours per week

Evaluation: Continuous Internal Assessment - 30 marks

Semester and Examination- 70 marks

Paper- 5.2 – Cell Biology and Cytogenetic

Theory	:	50 Hrs
Maximum Marks	:	70
IA Marks	:	30
No of teaching hours per week	:	06
Duration of examination	:	03

Unit 1: The Cell: Ultra structure of plant cell, organization, function & its components – cell wall, membranes (fluid mosaic model) Endoplasmic reticulum, Golgi apparatus, Lysosomes, Peroxisomes, Ribosomes, Mitochondria, Plastids, Cytoplasm, Vacuole, Cell sap. Non living inclusion, Nucleus, Nucleoplasm, Nuclear membrane, pores & Nucleolus and structure of Chromosomes **10Hrs**

Unit 2: Variation in Chromosomal number: Polyploidy (Aneuploidy, euploidy, autopolyploidy, allopolyploidy with reference to *Raphano Brassica*) Character of Polyploidy & significance of Polyploidy. **05Hrs**

Unit 3: Nucleic Acids: Chemical composition of DNA & RNA. **RNA** - Occurrence, types, structure & functions. **DNA**:-Occurrence, types, structure (double helix model), mechanism of DNA replication (semi conservative method). **06Hrs**

Unit 4: Gene: Concept of Gene: Gene expression & regulation – exons, introns, inducible & repressible genes; the operon concept; lac operon (inducible) & repressible operon (tryptophan). **Gene Mutations:** Mutations & Mutagens (Spontaneous, induces, Point mutations). **Genetic Code:** Code dictionary, properties of genetic code. **Protein Synthesis:** Central dogma: mechanism of protein synthesis, transcription & translation: colinearity. **09Hrs**

Unit 5: Mendelian genetics: Biography of Mendel in brief: Mendel's experiments: Monohybrid cross – law of dominance , law of segregation, purity of gametes . Homozygous, heterozygous, phenotype, genotype, monohybrid test cross, Dihybrid cross-law of independent assortment, dihybrid test cross, incomplete dominance (*Mirabilis jalapa*, Snapdragon). **Modification of Mendelian Ratios:** (With reference to plant examples). Interaction of genes epistasis (dominant & recessive); supplementary factors, complementary factors: Polygenic inheritance in Maize (Self Sterility in *Nicotiana*), Linkage & Crossing over (in Maize). **Sex determination:** Chromosomal mechanism of sex determination methods. XX –XY, ZZ – ZW & XX – XO (Sex determination in Melandrium). **10Hrs**

List of Genetic Problems.

1. In garden peas the effect of the tall allele (T) is dominant over that of dwarf (t) & the effect of the smooth seeded allele (S) is dominant over that of wrinkled (s). These two gene pairs also are known to assort independently of each other.
 - a. What proportions of phenotypes would be expected among the progeny of tall smooth seeded F1 Plants crossed to each other, if each such F1 plant was derived from a cross between pure breeding tall smooth seed variety (TTSS) & dwarf wrinkled seeded variety (ttss)?
 - b. What proportions of phenotypes in the F2 generation be changed if the F1 plants of (a) were crossed between a tall wrinkled seeded variety & a dwarf smooth variety.
 - c. What phenotype results would be expected if the F1 plants (a) were crossed to a dwarf seeded plant.
2. A round seeded, Dwarf pea plant was crossed with a wrinkled seeded, tall one. In the F2 32 round tall, 115 round dwarf 120 wrinkled tall & 36 wrinkled dwarf were produced. Decide whether these characters are showing independent assortment.
3. In tomatoes, yellow fruit & dwarf characters are due to recessive alleles of genes which the more common red fruited tall plant. If the pollen from a pure dwarf plant bearing red fruit placed on the pistil of a pure tall plant bearing yellow fruit, what type of offspring be expected in the F1? If these are crossed among themselves, what offspring would be expected in the F2.
4. A tall red when crossed with dwarf red plant produce a dwarf white plant. Give the genotypes parents.
5. What type of gametes will be formed by the pea plants involved in the following crosses? Determine the phenotype ratio of the offspring.
 - i. Yy Rr x yyrr ----- Yy RR X yyrr
 - ii. YyRr X YyRR ----- YyRr X Yyrr
 - iii. Yyrr X yyRR ----- Yy Rr X Yy RrNote : Select any two pairs for setting
6. In pea tallness (T) is dominant over dwarfness (t). A tall plant crossed with dwarf, produces offspring of which about 50% are tall & 50% are dwarf. What are the genotypes of the progeny?
7. In tomatoes red fruit colour (R) is dominant over yellow (r). A pure red fruited plant is crossed to a yellow fruited one. What will be the appearance of F1? The F1 are interbred & produce 320 offspring in the F2. How many of them will be red & how many yellow? What will be genotype of F2 & in what number?
8. 9:7 Ratio.

The two non-allelic dominant genes C & P alone produce white flowers in pea plants. When both the dominant genes at least in single dose are present together in a genotype they produce

 - i. Purple flowers parent X white flowered parent
 - ii. White flowered plant X white flowered plant
9. 12:3:1
The white fruit colour in summer squash is controlled by a dominant gene (W) & coloured controlled by its recessive allele (w). Yellow fruit is governed by an independently assorting hypostatic gene (G) & green by its recessive allele (g). When dihybrid plants are crossed, the offspring appear in the ratio of 12 white : 3 yellow : 1 green. What fruit colour ratios are expected from the crosses given below?

