B. Sc. V Semester Botany

Code: BOT-502 Univ Code:

Contact Hours: 50 Hours Workload: 4 hours per week

Credit Points:

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, Plastds, 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, 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).

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 (S0 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 off 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) we 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 decided 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 off springs be expected in the F1? If these are crossed among themselves, what off springs would be expected in the.
- 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 yyrr-----Yy RR X yyrr
- ii. YyRr X YyRR ----- YyRr X Yyrr
- iii. Yyrr X yyRR ----- Yy Rr X Yy Rr

Note: Select any two pairs for setting

- 6. In pea tallness (T) is dominant over dwarfness (t). A tall plant crossed with dwarf, produces off springs 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 interbread & Produce 320 offsprings 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 genses C & P alone produce white flowers in pea plants. When both the dominane genes at least in single dose are [present together in a genotype they produce

- 1. 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 goverened by an independently assorting hypostatic gene (G) & green by its recessive allele (g). When dihybrid plants are crossed, the offsprings appear in the ratio of 12 white: 3 yellow: 1 green. What fruit colour ratios are expected from the crosses given below?

10. Linkage & Crossing over.

In corn there is a dominant gene for colored gene for full seed. Then recessive alleles of these genes produce colorless seed & shrunken seed. Plants homozygous for colored full seed are crossed with colorless shrunkn & the test cross of the F1 yields the following results.

Colour full 190 Colour less 198

Colour Shrunken 01 Colourless full 05

Would you say that these two genes are linked? If so what is the percentage of crossing over?

11. Problems on Polygenic Inheritance

Note: - In tamato genotype aabbcc Produces 100gms of tamato and AABBCC Produces 160gms of tamato. So each gene (Capital Letter) raising an increasing of 10gms.

What is the wt of tamato in the Parents and Progenies in the following cross.

AAbbcc X aaBBcc
 AABBCC x AaBbcc

THIRD YEAR B.Sc. Botany Fifth Semester Practical- 5.2 Cell Biology & Cytogenetics Practical Question Paper – VI

1. Prepare Squash/ smear of Material 'A' sketch and label any two stages you	showed
to the examiner with reasons	10
2. Prepare of material 'B' and Identify	06
3. Identify the slides 'C' & 'D' 'E' (One from mitosis & two from meiosis)	09
4. Solve the genetic problem 'F' & 'G'	10
Record	05

THIRD YEAR B.Sc Botany Fifth Semester Practical- VI 5.2 Cell Biology & Cytogenetics Scheme of Evaluation

Q1-	Preparation	=	05	
	Sketch & Label	=	03	
	Reasons	=	02	
Q2.	Cytological examination of special type of chromosomes	s – bar	body, lampbrush,	
polytene chromosomes, and Ring chromosome in <i>Rhoeo</i>				
	Preparation	=	05	
	Identification	=	01	
Q3- Identify the slides 'C', 'D' & 'E' (3+3+3)				
	Identification	=	01	
	Characters	=	02	
Q4.	Genetic Problems			
Monohybrid / Dihybrid / Interaction Factors / Incomplete Dominance /			Oominance /	
	Crossing over, Polygenic inheritance F & G	=	05	
Q5.	Record	=	05	

Reference Books:-

- 1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, I.D. 1999. Molecular Biology of Cell. Garland Publishing Co., Inc., New York.
- 2. Atherly, A.G., Girton, J.R. and McDonald, J.F. 1999. The Science of Genetics. Saunders College Publishing, Fort Worth, USA.
- 3. Gupta, P.K. 1999. A Text-Book of Cell and Molecular Biology. Rastogi Publications Meerut.
- 4. Kleinsmith, L.J. and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd Edition). Harper Collins College Publishers, New York.