**B.Sc. Botany- III Year**
**Semester-V: Paper-V**
**Cell Biology and Genetics**

**Practical Syllabus**

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies. (4 h)

2. Study of various stages of mitosis using cytological preparation of Onion root tips. (4 h)

3. Study of various stages of meiosis using cytological preparation of Onion flower buds. (2 h)

4. Solving genetic problems related to monohybrid, dihybrid ratio incomplete dominance and

interaction of genes (minimum of six problems in each topic). (8 h)

5. Construction of linkage maps; two and three point test cross. (4 h)

6. Study of ultra structure of cell organelles using photographers.

Chloroplast, Mitochondria, Nucleus, Ribosomes, Endoplasmic reticulum, and Golgi complex. (4 h)

7. Study of Special types of Chromosomes (Polytene chromosome and Lampbrush chromosomes-

Permanent slide) (4 h)

**B.Sc. Botany- III Year**
**Semester-V**
**Paper-V: Cell Biology and Genetics**

**Practical Question Bank**

**1 (A).** (8 Marks)

i). Prepare a cytological slide of the given material (A), Identify & describe any two mitotic stages with well labeled diagrams.

**2 (B).** (6 Marks)

i). *Drosophila melanogaster* long wings (vg+) is dominant over vestigial wings (vg) and gray body (g+) is dominant over black body (g). A fully F1 heterozygous long wings with gray body crossed with vestigial wings and black body. The progeny obtained as follows.

A) Long wings gray body – 415
B) Vestigial wings black body – 405
C) Vestigial wings gray body – 92
D) Normal wings black body – 88

i) These two genes are segregating independently or not
ii) Construct a genetic map in this region of chromosome
iii) What is the arrangement of genes, *cis* or *trans*
*iv)* Calculate the genetic distance in between these two genes.



ii). *Drosophila melanogaster* long wings (vg+) is dominant over vestigial wings (vg) and gray body (g+) is dominant over black body. A fully F1 heterozygous long wings with gray body crossed with vestigial wings and black body. The progeny obtained as follows.

A) Long wings gray body – 92
B) vestigial wings black body – 88
C) vestigial wings gray body – 415
D) Normal wings black body – 405

i) These two genes are segregating independently or not

ii) Construct a genetic map in this region of chromosome

iii) What is the arrangement of genes, *cis* or *trans*

iv) Calculate the genetic distance in between these two genes.

iii) A gene called "forked" **(f)** produces shortened, bent, or split bristles and hairs in *Drosophila*. Another gene called "outstretched" **(od)** results in wings being carried at right angles to the body. A third gene called "garnet" **(g)** produces pinkish eye colour in young flies. Wild-type females heterozygous at all three loci were crossed to wild-type males. The $F_1$ data appear below. Marks : (11)

| | | |
|---|---|---|
| **$F_1$:** | Females: | all wild type |
| | Males: | 57 garnet, outstretched |
| | | 419 garnet, forked |
| | | 60 forked |
| | | 1 outstretched, forked |
| | | 2 garnet |
| | | 439 outstretched |
| | | 13 wild type |
| | | 9 outstretched, garnet, forked |
| | | 1000 |

(a) Which gene is in the middle? (b) What was linkage relationship between allele at the forked and outstretched loci in the maternal parent? (c) What was the linkage relationship between alleles at the forked and garnet loci in the maternal parent? (d)

On what chromosome do these three genes reside? (e) Calculate the map distances.(f) construct a genetic map for this region of the chromosome (g) How much interference is operative?

iv). In a snap dragon Red colour of flower (R) is incompletely dominant over white (r) of flower. The heterozygous condition being pink (Rr). Tallness (T) is completely dominant over dwarfness (t). A heterozygous tall red flower plant is crossed with dwarf and white flowered plant. Find out phenotype & genotype of progeny of $F_1$& $F_2$ generations.

v). When a tall plant is selfed, it produced 64 plants having tall & dwarf phenotypes how many are tall and how many dwarf?

vi). In 4'O clock plant flower, red colour flowers (RR) is incompletely dominant over white (rr), the heterozygous plant being pink flowers. When a cross is made between a red flowered 4'0 clock plant with a white flowered one, Find out the phenotypic progeny in F1 and F2 generations?

vii). What will be the result of selfing F1 generation in a cross when round and yellow seeded pea plants (YYRR) are crossed with green and wrinkled (yyrr) seeded pea plants?

viii). In garden peas, tall plant habit (T) is dominant over dwarf (t), green peas (G) over yellow (g), bring out a cross between tall yellow and dwarf green and obtain F1 & F2, give the percentage of tall green homozygous among F2. Give the F2 genotypic ratio?

ix). In a snap dragon, red flower (RR) is incompletely dominant over white (rr). The heterozygous condition being (Rr). The normal broad leaves (BB) is incompletely dominant over narrow leaves (bb). The heterozygous condition being the intermediate (Bb). When red flowered broad leaves plant is crossed with white flowered narrow leaf plant, find the phenotype of progeny of F1 and F2 generation?

x). In a cross between red flowered plant and white flowered plant yields plants of both the colours in equal proportion, but a cross between two white flowered plants yields only white flowered plants. What could be the genotypes of the parents and which phenotype is recessive?

xi). In a pea tall plant with round seeds is crossed with a dwarf plant having wrinkled seeds. The progeny obtained is in the ratio of one tall plant with round seeds, one tall plant with wrinkled seeds, one dwarf plant with round seeds, and one dwarf plant with wrinkled seeds. Find out the genotypes of two parents in pea plants. Round is dominant over wrinkled. Tall is dominant on dwarf.

**3 (C).** **5 Marks**

i). Mating between black rats of identical genotypes produced offsprings as follows

14-cream coloured
47-black
19-albino
a) What are the genotypes of the parents & the offspring? ( Use your own symbols )
b) What epistatic ratio is approximated by these offsprings?
c) What type of epistasis is operative?

ii). Coat colour of dog's depend upon the action of at least 2 genes. At one locus a dominant epistemic inhibitor of coat colour pigment (I-) prevents the expression of colour alleles at another independently assorting locus producing white coat colour. When the recessive condition exists at the inhibitor locus (ii), the alleles of the hypostatic locus may be expressed, iiB- producing black & iibb producing brown. When dihybrid white dogs are mated together, determine,



a) The phenotypic proportions expected in the progeny

iii). Two white flowered strain of the sweat pea (*Lathyrus odoratus*) were crossed, producing an $F_1$ with only purple flowers. Random crossing among the F1 produced 96 progeny plants, 53 exhibiting purple flowers & 43 with white flowers.

a) What phenotypic ratio is approximated by the F2?
b) What type of interaction is involved?
c) What were the probable genotypes of the parental strains?

iv). A plant of the genus *capcella* commonly called as shepherds purse produces a seed capsule. The shape of which is controlled by two independently assorting genes, represented by symbols A and

B. When dihybrid plants were inter pollinated, 6% of the progeny were found to posses ovoid shaped seed capsule. The other 94% of the progeny had triangular shaped seed capsules.
a) What two factors epistatic ratio is approximated by the progeny?
b) What type of interaction is operative?

v) In corn, a dominant gene **C** produces colored aleuroue; its recessive allele **c** produces colorless. Another dominant gene **Sh** produces full plump kernels; its recessive allele **sh** produces shrunken kernels due to collapsing of the endosperm. A third dominant gene **Wx** produces normal starchy endosperm and its recessive allele **wx** produces waxy starch. A homozygous plant from a seed with colorless, plump, and waxy endosperm is crossed to a homozygous plant from a seed with colored, shrunken, and starchy endosperm. The $F_1$is testcrossed to a colorless, shrunken, waxy strain.
The progeny seed exhibit the following phenotypes:

113 colorless, Shrunken, starchy :
4 colored,Plump, starchy :
2708 colorless,plump,Waxy :
626 colorless,Plump, starchy :
2 colorless,Shrunken, waxy :
116 colored,Plump, waxy :
2538 colored,Shrunken, starchy :
601 colored,Shrunken, waxy .

(a) construct a genetic map for this region of the chromosome. Round all calculations to the nearest tenth of a percent. (b) Calculate the interference in this region.



4. **Slides** (2x2=4 marks)

C) Cell organelles

i) Mitochondria

ii) Choroplast

iii) Golgi Complex

D) Chromosomes

i) Polytene Chromosome

5. **Record** (2 marks)

**B.Sc. (CBCS) Botany-III Year**
**Semester-V**
**Elective-I: Ecology & Biodiversity**
**Practical Syllabus**

1. Study of plant communities by Quadrat Method (8h)

2. Estimation of carbonates and bicarbonates in the given water sample. (4h)

3. Determination of soil texture (composition of clay, sand silt etc.) and pH. (2h)

4. Study of morphological and anatomical characteristics of plant communities using locally (8h) available plant species: Hydrophytes (Eichhornia, Hydrilla, Pistia, Nymphaea, Vallisneria), Xerophytes: (Asparagus,Opuntia, Euphorbia melii), (Casuarina, Calotropis) .

5. Value of biodiversity (8h)

a) Medicinal value: Catharanthus, Tinospora and Emblica

b) Timber Value: Acacia, Tectona and Azardirachta

c) Aesthetic Value: Mangifera, Ficus, Ocimun

d) Assessment of local biodiversity.

**B.Sc (CBCS) Botany-III Year**
**Semester-V : Elective-I**
**Time: 2 1/2 hrs Ecology & Biodiversity Max. marks : 25**

**Practical Question Bank**

1. (1x6=6M)

i) Caliculate frequency and density of the given Quadrates

2. (1x4=4 M)

i) Estimation of carbonates in the given water sample

ii) Estimation of Bicarbonates in the given water sample

iii) Determination of soil texture ( composition of clay & silt ) and PH.

3. (3×2=6 M)

a) i) Hydrilla, ii) Calotropis, iii) Opuntia

b) i) PIstia, ii) Euphorbia melii, iii) Casaurina

c) i) Eichornia, ii) Asparagus iii) Calotropis

d) i) Vallisneria, ii) Opuntia, iii) Casurina

4. (2×2=4M)

a) i) Nymphaea, ii) Casurarina, iii) Pistia, iv) Asparagus

b) i) Eichornia, ii) Asparagus

5. (3x1=3M)

a) i) Emblica, ii) Tectona, iii) Ocimum

b) i) Catharanthus, ii) Acacia, iii) Ficus

c) i) Tinospora, ii) Azadirachta, iii) Mangifera

6. Record 2 Marks

**B.Sc. (CBCS) BOTANY: III YEAR**
**Semester-V**
**Elective – II: Horticulture**
**Practical Syllabus**

1. Garden tools and implements. (2h)
2. Identification and economic values of any two of tropical and subtropical vegetable, fruit, flower and ornamental crops. (2h)
3. Propagation practices by seed, Vegetative propagation (Rhizome, bulb, corm), cutting, layering, budding, grafting with two examples. (6h)
4. Seed propagation- seed treatments, sowing and seedling production. (4h)
5. Nursery practices, transplanting, field preparation, sowing/planting, use of herbicides, top dressing of fertilizers and use of growth regulators. (4h)
6. Nursery containers, media, potting and repotting of plants, hardening of plants in nursery, shade regulation in nursery, plant protection in nursery plants (Demonstration) (4h)
7. Packing nursery plants for local and long distance markets. (Demonstration) (2h)
8. Making of organic-compost. (6h)

**B.Sc (CBCS) BOTANY: III YEAR**
**Semester-V**
**Elective - II: Horticulture**
**Time: 2 1/2 hrs** **Practical Question Bank** **Max. marks : 25**

1. Major Experiment-(**A**) (1x8Marks)
   i) Air Layering
   ii) Grafting
2. Minor Experiment-(**B**) (1x6Marks)
   i) Identification, Nutritive and Economic value of vegetable or fruit
      Vegetables: a) Cabbage b) Beans c) Capsicum
      d) Egg Plant e) Okra f) Potato
      Fruit : a) Pine Apple b) Papaya c) Jack Fruit
      d) Coconut e) Annona f) Watermelon
   ii) Making of organic compost-Flow chart

3. Spotters: ( **C,D,E**) (3×3=9Marks)
   (C) Vegetative propagative organ :
      i) Rhizome ii) Runners iii) Tubers
      iv) Corms v) Suckers
   (D) Horticulture Garden toos:
      i) Rake tool ii) Trowel iii) Shovel
      iv) Lawn mower v) Edger vi) Pruning knives
   (E) Growth hormones:
      i) Bonsai specimen ii) Auxins
      iii) Cytokynins iv) Gibberellins

5. Record (2 Marks)