Practical – III : Cell Biology, Genetics, Ecology and Biodiversity
Practical Syllabus
QUESTION BANK

Time : 3 Hrs **Maximum : 50 Marks**

I. Major Experiments : 15 Marks

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.
2. Study of various stages of mitosis using cytological preparations of onion root tips.
3. Study of various stages of meiosis using cytological preparation of onion flower buds
4. Study of plant community by quadrate method
5. Estimation of chemical oxygen demand (COD) in a given water sample
6. Estimation of O_2 in given water samples
7. Estimation of chlorides in given water samples

II. Minor Experiments : 10 Marks

8. Karyotype study using cytological preparation of dividing root tip cells of onion/photographs/permanent slides
9. Solving genetic problems related to monohybrid, dihybrid ratio and interaction of genes (Minimum of six problems in each topic). **See annexure-I**
10. Demonstration of soil texture (composition of clay, sand silt etc.) pH.
11. Estimation of water purity in given water samples

III. Scientific Observations : 5 Marks

12. Study in the ultra structure of cell organelles using electron microphotographs.
13. Geographical spotting of certain endemic and endangered plant species of A.P.
14. Minimum of two field visits to local areas of ecological/ conservation of biodiversity Importance (Sacred grove/ Reserved Forest / Botanical garden/ Lakes etc.)

IV. Critical notes on spotters of scientific interest : 10 Marks

15. Salivary gland chromosome
16. Lampbrush chromosome
17. Solenoid model of chromosome structure
18. Operon model
19. *Mirabilis jalapa*
20. *Eichhornia*
21. *Hydrilla*
22. *Pistia*
23. *Nymphaea*
24. *Vallisnaria*
25. *Asperagus*
26. *Opuntia*
27. *Euphorbia antiquorum*
28. *Rhizophora*
29. *Avecenia*

V. Plant Collection from Botanical Tour : 5 Marks

VI. Record : 5 Marks

B.Sc. Botany Practical Syllabus
III Paper

ANNEXURE-I

9. Monohybrid cross:

(i). In pea, tall plant is dominant over dwarf plant. If a homozygous tall is crossed with a dwarf plant, describe (i) the genotypes and phenotypes of F_1 and F_2 progeny, (ii) the gametes produced by F_1 and (iii) the genotypes and phenotypes of test cross and back cross progeny.

(ii). In pea, yellow cotyledon is dominant over green cotyledon colour. A plant heterozygous for yellow cotyledon is crossed with a plant homozygous for green cotyledon colour. Determine the gametes produced by these plant, and the genotypes and the phenotypes of progeny obtained from their cross.

(iii). In a cross between two parents 22 plants are round and 8 plants are wrinkled. Find out the genotype of the parents involved in the above cross.

(iv). What gametes will be produced by the plants involved in the following four crosses and what will be the size of the offspring from the each cross.
(i) TT x Tt (ii) Tt xTt (iii) TT x tt (iv) Tt x tt.

(v). A tall plant is crossed with a dwarf plant. In the progeny, about one-half of the plants are tall and the renaming one-half dwarf. Determine the genotypes of the tall and dwarf plants.

(vi). In *Mirabilis* (Four 'O' clock), a plant hybrid for red ® and whiter flowers ® had pink flower (Rr). A plant with pink flowers is crossed with one having red flowers and with another having white flowers. Give the genotypic and phenotypic ratios expected in progenies from these crosses.

9. Dihybrid cross:

(vii) A dwarf pea plant with yellow seed is crossed with a tall plant with green seeds. Give the genotype and phenotype of F_1, the gametes produced by F_1, the genotypes and phenotypes of F_2 and testcross progeny.

(viii) In snapdragon, tall (DD) is dominant dwarf (dd) and red flowers (RR) are incompletely dominant over white (rr), the hybrid being pink. A pure tall white is crossed to a pure dwarf red and the F_1 are self-fertilised. Give the expected genotypes and phenotypes in F_1 and F_2.

(ix).Let Y,y, S and s represent yellow, green, round and wrinkled characters of the seed of *Pisum sativum*, what will be the colour and shape of the seeds produced by the offspring of the following crosses: (i) YYss x yySS, (ii) Yy Ss x Yyss.

(x). In man, brown eyes (V0 are dominant to blue (b) and dark hairs ® dominant to red hairs (r). A man with brown eyes and red hairs and marries a woman with blue eyes and dark hairs. They have two children, one with brown eyes and red hairs and the other with blue eyes and dark hairs. Give the genotypes of the parents and children.

(xi). In Guinea pigs rough coat colour (R0 is dominant over smooth coat ® and black colour (B) is dominant over white (b). when two pigs are mated the following offspring are formed. 28 rough black, 31 rough white, 11 smooth black, 10 smooth white. Find out the genotypic parents involve in the mating.

(xii). In summer squash white fruit colour id governed by a dominant allele W and yellow fruit colour by its recessive w. a dominant allele had another locus (s) produces disc shaped fruit and its recessive (s) is produces sphere shaped fruit. A homozygous white disc variety of genotype WWSS is crossed with a homozygous yellow sphere variety (wwss). What are the phenotypes expected in the F_1, F_2 backcross and test cross progenies?

9. Gene interactions:

(xiii). A pure Rose combed chicken is mated with a pure Pea combed chicken. All the F1 are Walnuts. Cross F1Wulnut with Rose and Pea separately and how phenotypes and genotypes.

(xiv). A cross between Rose combed chicken and Walnut combed chicken produced 15 Walnut, 14 Rose, 5 Pea and 6 Single comb offspring. Determine the genotypes of the parents.

(xv). In sweet pea, genes C&P are necessary for coloured flowers. The absence of either or both of these genes the flowers are white. What will be the ratio of the offsprings of the following crosses. (i) Cc xccPp (ii) Cc x Ccpp © CcPp x CcPp.

(xvi). Coloured flowered (purple) are dependent on dominant genes C & P. Presence of any one dominant gene fails to produce colour becoming white. A purple flowered plant is crossed with a white flowered plant. 17 Purple and 16 white flowered plants are produced. Give the genotypes of the parents.

(xvii). In mice, black colour of hair is determined by a dominant gene C. Agouti is a wild character which is dependent on dominant gene A. this wild character is expressed when ever it interacts with coloured gene. Albino micro mice are with recessive genes. Find out the ratios of F1 & F2 offsprings resulting from a cross between black and albino mice.

(xviii). In Shepherd purse, triangular fruits are dependent either one or two dominant genes. Top shaped fruits are recessive. A cross was made between two triangular fruited plants. What will be the first shape of offspringss?