

# FACULTY OF SCIENCE

B.Sc. III Year ( PRACTICAL) Examination

Subject : BOTANY

Paper – IV

(Physiology, Cell Biology, Genetics, and Biotechnology )

(QUESTION BANK)

Time 3 Hours

Max. Marks. 50

**Note :** Answer All questions. Draw well labelled diagrams wherever necessary.

- I. Conduct the physiology experiment allotted to you. Give procedure, results and inference. (Procedure –5, Conduction of experiment –5, results and inference – 5) (15)

## Physiology ( Live Experiments )

1. Measurement of osmotic potential by incipient plasmolysis method.
2. Interaction of factors in photosynthesis by  $O_2$  evolution.
3. Separation of chloroplast pigments by paper chromatography.
4. Hydrolysis of starch-amylase activity.
5. Estimation of proteins by Biuret Method.
6. Estimation of titrable acidity in oxalis / Lemon leaves.
- II. Prepare a suitable cytological preparation of given material and show two stages to the examiners. (Preparation –3, Identification – 2, Description –2. Fixative and stain-1). (8)
7. Onion root tip squash.
- III. Work out the given genetic problem. (8)
8. When a tall plant is selfed it produced 64 plants, having tall and dwarf phenotypes. How many are tall and how many are dwarf ?

**Note :** In four-o'clock plant, red flowers color 'R' is incompletely dominant over white 'r', the heterozygous plant being pink flowered. If a red flowered four-o'clock plant is crossed with a white flowered one, what will be the flower color of the  $F_1$ , of the  $F_2$ , of the offspring of a cross of the  $F_1$  with its red parent, with its white parent.

9. What will be the result of selfing  $F_1$  generation in a cross when round and yellow seeded pea plants (YYRR) are crossed with green and wrinkled (yyrr) seeded pea plants.
10. When round and yellow seeded pea plants (YYRR) are crossed with green wrinkled (yyrr) seeded plants  $F_1$  are yellow and round seeded plants (YyRr). What will be the result when this  $F_1$  is crossed with round and yellow seeded plants ?
11. In Garden peas tall plant habit 'T' is dominant over dwarf 't' Green pods 'G' over yellow 'g'. Bring out a cross between Tall yellow with dwarf Green and obtain  $F_1$  and  $F_2$  give the percentage of Tall green Homozygous among  $F_2$ . Give the  $F_2$  genotypic ratio.



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12. In snapdragon Red flower 'R' is incompletely dominant over white 'r' the heterozygous being pink. The normal broad leave 'B' are incompletely dominant over narrow leaves 'b'. The heterozygous being intermediate leaf breadth. Find out the phenotype of the following crosses.

(a) Red flowered broad leaved plant crossed with white flowered narrow leaved plant what will be  $F_1$  and  $F_2$ .

13. In a pea plant the allele 'T' for Tallness is dominant over the allele 't' for dwarfness and the allele 'R' for round seeds is dominant over allele 'r' for wrinkled seeds.

Give the phenotypes of the progeny of the following crosses.

$TtRr \times ttrr$

$TTRR \times ttrr$

$TtRr \times TtRr$

14. In a plant 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 ?

15. In pea a tall plant with round seeds is crossed with a dwarf plant having wrinkled seeds.

The progeny obtained is in the ratio of

1 tall plant with round seeds

1 tall plant with wrinkled seeds

1 dwarf plant with round seeds

1 dwarf plant with wrinkled seeds

Find out the genotypes of two parents.

In pea tall is dominant over dwarf and round is dominant over wrinkled.

16. A fully heterozygous grey bodied ( $b^+$ ) normal winged ( $Vg^+$ ) female  $f_1$  of fruit fly was crossed with black bodied (b), vestigial (Vg), male gave the following results.

Grey Normal - 126

Grey Vestigial - 24

Black normal - 26

Black Vestigial - 124

(a) Does this indicate linkage ?

(b) If so what is the percentage of crossing over ?

(c) Diagram the cross showing the arrangement of the genetic markers on the chromosome.



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17. The recessive gene 'sh' produces Shrunken Corn kernels and its dominant allele sh<sup>+</sup> produces full plump kernels. The recessive gene 'c' produces colourless endosperm and its dominant allele (c<sup>+</sup>) produces coloured endosperm. A pure plum kernels and coloured endosperm is crossed with shrunken kernels and colourless endosperm. The F<sub>1</sub> is crossed with recessive parent and produced the following progeny.

Shrunken coloured - 149  
 Shrunken colourless - 4035  
 Plump colourless - 152  
 Plump coloured - 4032

- (a) Does this indicate linkage?  
 (b) What is the crossing over percentage?  
 (c) Construct the genetic map.

18. In corn a dominant gene 'C' produces coloured aleurone, its recessive allele produces colourless aleurone. Another dominant gene 'SH' produces full, plump kernels, its recessive alleles 'sh' produces shrunken kernels, due to collapsing of endosperm. A third dominant 'Wx' produces normal starchy endosperm and its recessive allele 'wx' produces waxy starch.

A homozygous plant from a seed with colourless, plump and waxy endosperm is crossed to a homozygous plant from a seed with coloured, shrunken and starchy endosperm.

The F<sub>1</sub> is test crossed to a colourless, shrunken, waxy stain. The progeny seed exhibit the following phenotypes.

1. Colourless, Shrunken, Starchy	- 113
2. Coloured, Plump, Waxy	- 116
3. Coloured, Shrunken, Waxy	- 601
4. Colourless, Full, Starchy	- 626
5. Colourless, Plump, Waxy	- 2708
6. Coloured, Shrunken, Starchy	- 2538
7. Colourless, Shrunken, Waxy	- 2
8. Coloured, Plump, Starchy	- 4

a. Construct a genetic map of this region of Chromosome.

b. Calculate the coefficient of coincidence.

19. A kidney-been shaped eye is produced by a recessive gene 'k' on the third chromosome of *Drosophila*. Orange eye colour called, 'cardinal' is produced by the recessive gene 'cl' on the same chromosome. Between those two loci is a third locus with a recessive allele 'e' producing ebony body colour. Homozygous Kidney, cardinal females are mated to homozygous ebony males. The tri-hybrid F<sub>1</sub> females are then test crossed to produced the F<sub>2</sub>. Among 4000 F<sub>2</sub> progeny are of the following.

1761 Kidney, cardinal	97 kidney
1773 Ebony,	89 ebony, cardinal
128 Kidney, ebony	6 kidney, ebony, cardinal
138 Cardinal,	8 Wild type

- (a) Determine the linkage relationship in the parents and F<sub>1</sub> tri-hybrid.  
 (b) Estimate the map distances.



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- IV. Conduct the experiment allotted to you and write procedure. (8)
20. Isolation of DNA (from Tomato fruits).
21. Determination of pollen viability (Evan blue method)
- V. Comment on the spots (2x3 = 6)

**(Plant Physiology – I)**

22. Differential transpiration by cobalt chloride method.
23. Potato Osmoscope
24. Phototropism
25. Evaluation of CO<sub>2</sub> in aerobic respiration by direct current method
26. Effect of temperature on membrane permeability . (Beet root)

**(Biotechnology – I)**

27. Callus formation (specimen / diagram)
28. Micro propagation (specimen / diagram)
29. Autoclave
30. Hot air oven
- VI. Record. (5)

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