

U.G. 6th Semester Examination-2025**BOTANY****[HONOURS]****Course Code : BOT-H-CC-T-13****(Genetics)**

Full Marks : 40

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer any five of the following questions: $2 \times 5 = 10$

- a) Differentiate between multiple allele and polygene.
- b) What are Kappa particles?
- c) What do you mean by complete linkage? How it is related to crossing over?
- d) In a double stranded DNA molecule, the percentage of cytosine is 32. What would be the percentage of Adenine?
- e) Differentiate between basic chromosome number and haploid chromosome number.
- f) What are intercalating agents? Give an example.

[Turn Over]

g) Where does transcription and translation process occur in a eukaryotic cell and in what direction is the template read?

h) Among 205 Central American the frequencies of the L^M and L^N alleles were 0.78 and 0.22 respectively. Calculate the percentage of individuals with M, MN and N type blood.

2. Answer any two of the following questions: $5 \times 2 = 10$

a) Briefly describe the detection of crossing over with the help of McClintock's experiment. What is Kornberg enzyme? 4+1

b) The genetic code is 'nearly universal'. Explain with example.

c) What is the reason for getting a phenotypic F_2 ratio of 9:7 in a dihybrid cross instead of 9:3:3:1? Define pleiotropy. 4+1

d) Species 'A' has $2n=16$ chromosomes. How many chromosomes will be found per cell in each of the following mutants?

Monosomic, Trisomic, Double monosomic, Nullisomic, Tetrasomic. 1×5

3. Answer any two of the following questions:

$10 \times 2 = 20$

a) State the differences between rho-dependent and rho-independent termination process of RNA synthesis. Distinguish between eukaryotic and prokaryotic RNA synthesis. What are upstream and downstream elements? What is Pribnow box? 4+3+2+1

b) Describe Messelson and Stahl's experiment confirming the semi conservative nature of DNA replication. What is central dogma? Why is a RNA primer needed or initiation of DNA replication? What is nick translation? 5+2+2+1

c) Explain intragenic recombination in bacteriophage with the help of mutation in rII locus. How does chromosomal basis of inheritance justify Mendel's law? What factors affect the Hardy Weinberg's equilibrium? 4+4+2

d) In a plant there are three linked genes, all of which control fruit phenotypes. A recessive allele 'p' of the first gene determined purple fruit color in contrast to the yellow color of the wild type. A recessive allele 'r' of the second gene results

in a round fruit shape, as compared with an elongated fruit in the wild type. A recessive allele 'j' of third gene gives a juicy fruit instead of the wild type dry fruit. From a test cross of a triple heterozygote ($p^+r^+j^+/prj$) with a triple homozygous recessive (prj/prj) the following results were found:

Phenotypes	Number
Yellow, elongated, dry ($p^+r^+j^+$)	179
Purple, round, juicy (prj)	173
Purple, elongated, dry (pr^+j^+)	52
Yellow, round, juicy (p^+rj)	46
Purple, elongated, juicy (pr^+j)	22
Yellow, round, dry (p^+rj^+)	22
Yellow, elongated, juicy (p^+r^+j)	4
Purple, round, dry ($p r j^+$)	2
Total	500

Construct the linkage map showing correct order of loci and map distance in between them, along with coefficient of coincidence and interference.

$$6+2+2$$