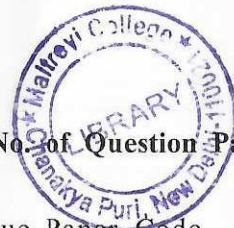7. (a) Elaborate on the experiment performed by Seymour and Benzer to understand the fine structure of gene. (8)

(b) What is sex linked inheritance? Explain with a suitable example. (7)

[This question paper contains 8 printed pages.]

04.01.2024 (M)

Your Roll No................

Sr. No. of Question Paper : 4509 **G**

Unique Paper Code : 32161303

Name of the Paper : Genetics

Name of the Course : **B.Sc. (Hons.) Botany**

Semester : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **All** Questions carry equal marks.

3. Question No. **1** is compulsory.

4. Attempt **five** questions in all including Question No. **1**.

P.T.O.

1. (a) Define the following **(any five)** :

      (i) Criss-cross inheritance

      (ii) QTL inheritance

      (iii) Transposons

      (iv) Penetrance

      (v) Lethal alleles   (1×5=5)

  (b) (i) What are linkage groups? How many linkage groups are present in Drosophila?

      (ii) What are the antigen and antibody components of blood groups A and B?

      (iii) Name a manmade cereal crop.

      (iv) What do you understand by genetic drift?

      (v) Define speciation.   (1×5=5)

6. (a) In poultry, the genes for rose comb R and pea comb P together produce a walnut comb. Alternate alleles of both in a homozygous condition (rrpp) produce a single comb. What would be the possible phenotypes and their ratios in the following crosses :

      (i) RrPp X RrPp

      (ii) RrPp X Rrpp

      (iii) Rrpp X rrpp

      (iv) RRPP X Rrpp

      (v) rrPP X RRpp   (5)

  (b) What are Barr bodies? What would be the number of such bodies in the human cells of normal male, Turner's syndrome and a female with Down's syndrome.   (5)

  (c) Differentiate between para-and pericentric inversions with suitable diagrams.   (5)

4. (a) What are mutagens? Briefly explain the use of physical mutagens in crop improvement.   (5)

    (b) Explain the mechanism of inheritance in shell coiling of snails.   (5)

    (c) Explain the cytological basis of crossing over in maize.   (5)

5. Differentiate between the following **(any five)**

    (i)   Deletion and duplication

    (ii) Auto and allopolyploidy

    (iii) Test cross and back cross

    (iv) 2-point and 3-point test cross

    (v)   Segregational and neutral petites

    (vi) Gene and genotype frequency $(3\times5=15)$

    (c) A man with blood type O marries a woman with blood type AB. Among their children, what proportion would you expect to have blood types parents of either of the two. What proportion would you expect to have blood types different from both parents. Explain.   (5)

2. A mutant stock of *Drosophila* homozygous for three sex linked genes -*sc(scute)*, *ec(echinus)* and *cv(crossveinless)* was crossed to a wild type. A female F_1 heterozygous for all the three genes when test crossed with a homozygous recessive parent, gave the following result :

P.T.O.

+++	370
ec + sv	45
++ cv	75
+ sc +	50
ec sc cv	385
ec sc +	70
+sc cv	2
ec ++	3

(i) Which classes represent the parental types, single cross overs and double cross overs? (3)

(ii) Determine the recombination frequencies between each pair of genes, their order and map the distance between the genes on the chromosome. (6)

(iii) Define coefficient of coincidence and interference. Calculate the value of coefficient of coincidence for the given data. (6)

3. (a) Explain the genic balance theory of sex determination in *Drosophila*. What is the expected sex of an individual with the following chromosome arrangements? (8)

(i) 4X4A

(ii) 2X3A

(iii) 1X3A

(iv) 3X4 A

(v) 2X1A

(b) What is epistasis? Explain dominant and recessive epistasis with one suitable example each.

(7)

P.T.O.