[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6387 **D** **Your Roll No.....**

Unique Paper Code : 216/223/589

Name of the Course : **B.Sc. (Hons.) Anth./Bot./Biochem./Bio-Med./ Micribiology/Zoology**

Name of the Paper : Genetics and Genomics – I (GGHT–501)

Semester : V

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. Attempt **five** questions in all including Question No. **1** which is compulsory.

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

(i) Phenocopy

(ii) Silent mutation

(iii) Holandric gene

(iv) Pseudodominance

(v) Nonds junction

(vi) Alleles

(vii) Idiogram (1×5=5)

(b) Expand the following :

(i) TDF

(ii) QTL

(iii) TK (1×3=3)

P.T.O.

(c) Give important contributions of the followings scientists in the field of genetics :

(i) A. H. Sturtevant

(ii) J. H. Tijo and A. Levan

(iii) C. Stern

(iv) Lucien Cuenot (1×4=4)

(d) Answer the following :

(i) Assume that height of a plant is controlled by two genes and each additive allele contributes 5 cm to a base height of 20 cm.

(a) Determine the height of a plant with genotype AABB.

(b) List all possible genotypes that give rise to plants that are 25 cm in height. (2)

(ii) Determine the degree(s) of freedom when testing ratios are :

(a) 3:1 (b) 9:3:3:1

(c) 1:2:1 (d) 9:3:4 (½×4=2)

(iii) A male *Drosophila* inherits its X chromosome from the male parent and Y chromosome from the female parent. Write the genotypes of the parents. (2)

(iv) Name the chromosomal aberrations in the following human karyotypes.

(a) 45, XO (b) 47, 21+ (1)

2. (a) Differentiate between the following terms :

(i) Sex limited and Sex-influenced inheritance

(ii) *cis* and *trans* gene arrangements

(iii) Autopolyploidy and Allopolyploidy

(iv) Paracentric and Pericentric inversion

(v) Base substitution and Frameshift mutation (2×5=10)

(b) A panel of cell lines was created from human-mouse somatic cell fusions. Each line was examined for the presence of human chromosomes and for the production of a human protein. The following results were obtained :

Cell Line	Human protein	Human chromosomes						
		1	2	3	14	15	16	18
P	–	+	–	+	–	+	–	–
Q	+	+	–	+	–	–	+	–
R	+	+	–	–	–	+	+	–
S	–	+	+	–	–	+	–	–

Which of the human chromosomes carries the gene for the above protein ? Explain. (4)

3. (a) Describe chromosomal theory of sex determination in *Drosophila.* (8)

(b) Explain the genetic basis of continuous variation. (6)

4. (a) What are physical mutagens ? With suitable examples, explain the molecular basis of mutations caused by them. (9)

(b) Explain the C*l*B method for detection of mutation in *Drosophila.* (5)

5. Female *Drosophila* heterozygous for three recessive mutations *e (ebony* body), *st (scarlet* eyes), and *ss (spineless* bristles) were testcrossed, and the following progeny were obtained :

Phenotype	Number
wild-type	67
ebony	8
ebony, scarlet	68
ebony, spineless	347
ebony, scarlet, spineless	78
scarlet	368
scarlet, spineless	10
spineless	54

(a) Are the above genes linked ? Give reasons for your answer. (2)

(b) Diagram the crosses giving the genotypes of parents and F_1. (3)

(c) What is the order of the genes ? (2)

(d) Calculate the map distance between the genes and construct the linkage map. (3)

(e) Calculate the coefficient of coincidence. (2)

(f) Calculate the interference and comment on its significance. (2)

6. (a) Explain the mechanism of inheritance of *poky* mutations in *Neurospora crassa.* (7)

(b) In a dihybrid cross two randomly selected plants with purple flowers were crossed and following results were obtained :

94 purple 31 red 43 colourless

Find out the probable segregation ratio. Write the genotypes of parents, F_1 and genotypes and phenotypes of F_2 plants. Explain the genetic basis of inheritance. (7)

7. Write short notes on **any four** of the following :

(i) Criss cross inheritance

(ii) Pleiotropy

(iii) Penetrance and Expressivity

(iv) Translocation

(v) Inheritance of kappa particles in *Paramoecium* (3.5×4=14)

(1000)