

**Sl. No. of Ques. Paper : 659**

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**Unique Paper Code : 216/223/589**

**Name of Paper : Genetics and Genomics I / GGHT 501**

**Name of Course : B.Sc. (Hons.) Anthropology / Botany / Biochemistry / Microbiology /  
Zoology**

**Semester : V**

**Duration : 3 hours**

**Maximum Marks : 75**

*(Write your Roll No. on the top immediately on receipt of this question paper.)*

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

**Q1. (a) Define the following terms (any five)**

- (i) Chiasmata
- (ii) Pleiotropy
- (iii) Back cross
- (iv) Base Analogue
- (v) Holandric genes
- (vi) Phenocopy

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**(b) Expand the following abbreviations (any five)**

- (i) PKU
- (ii) mu
- (iii) QTL
- (iv) TDF
- (v) TK
- (vi) F<sub>1</sub>

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(c) State an important contribution of the following scientists (any five)

- (i) C.B. Bridges
- (ii) H.S. Creighton
- (iii) Reginald Punnett
- (iv) Karl Landsteiner
- (v) Nilson-Ehle
- (vi) H.G. Muller

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(d) Answer the following (any five)

- (i) Explain why did Mendel not detect linkage?
- (ii) What will be the genetic ratio obtained if a polygenic trait is controlled by two genes?
- (iii) In human blood groups, which of the following progeny is not possible?
  - An O child from A x O mating
  - An AB child from A x O mating

(iv) What do the Roman numerals represent in a pedigree tree?

(v) Why a recessive mutation has more chances of expression in males than in females?

(vi) A normal woman, whose father had hemophilia, married a normal man. What is the chance of hemophilia in their children?

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(e) Write down the chromosomal formulae (karyotype) of the following (any three)

- (i) Turner's Syndrome
- (ii) Klinefelter's Syndrome
- (iii) Down's Syndrome
- (iv) Patau's Syndrome

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Q2 (a) Differentiate between the following (any four)

- (i) Trisomics and Tetrasomics
- (ii) Genotype and Phenotype
- (iii) Incomplete dominance and Co-dominance
- (iv) Maternal effect and Maternal inheritance
- (v) Sex influenced and Sex limited traits

2x4=8

(b) Explain the mode of inheritance of multiple alleles by giving a suitable example. 5

Q3. (a) Write short notes on (any two)

(i) Gynandromorphs

(ii) Extra Chromosomal Inheritance

(iii) Reciprocal Translocation

2x4=8

(b) Describe an experiment done to prove the cytological basis of crossing over. 5

Q4. (a) What are epistatic gene interactions? In a tabulated form, give the different ratios, genotypes and types of interactions with an example of each 8

(b) Differentiate between X-linked dominant and X-linked recessive traits with reference to human pedigree. 5

Q5. (a) What are Alkylating and Intercalating agents? Represent the substitutions with the help of molecular structure, giving one example each. 5

(b) Discuss CIB method for detection of mutations. 5

(c) What are lethal genes? Briefly explain the inheritance of yellow body lethal in mice. 3

Q6. (i) What is dosage compensation and its significance? Give the molecular mechanism of compensation in mammals 5

(ii) In *Drosophila*, scarlet eyes (*st*), ebony body (*e*) and spineless (*ss*) are recessive to normal wild type red eyes (*st*<sup>+</sup>), gray body (*e*<sup>+</sup>) and normal bristles (*ss*<sup>+</sup>).

Wild homozygous females were crossed with homozygous mutant males producing heterozygous flies in F<sub>1</sub> generation. The F<sub>1</sub> generation females were crossed with homozygous recessive males in a test cross and the following observed numbers of F<sub>2</sub> flies are as:

Wild type	347
Scarlet, ebony, spineless	368
ebony, spineless	77
scarlet	78
ebony	54
Scarlet, spineless	58
Spineless	08
Scarlet, ebony	10

Answer the following:

- (i) Are these genes linked? 1
- (ii) Categorize the different cross overs and F<sub>2</sub> phenotypes and genotypes 3
- (iii) Determine the map distance between the genes and draw a linkage map 2
- (iv) Calculate the coefficient of coincidence 2

**Q7 (a)** Using a forked line method, enumerate the genotypes and phenotypes for a tri-hybrid cross

**DdGgWw X DdGgWw**

D-/dd : Plant height (Tall/Dwarf)

G-/gg : Seed color (Yellow/Green)

W-/ww : Seed texture (Smooth/Wrinkled)

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**(b)** Discuss the technique of somatic cell hybridization. Add a note on its significance. On the basis of the data given below, which human chromosome carries gene for Chymotripsinogen activity?

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Cell line	Chymotripsinogen Activity in Humans	Human Chromosomes						
		1	2	X	Y	15	17	21
A	+	-	+	+	+	+	+	+
B	+	+	+	+	-	+	+	-
C	+	+	+	-	-	-	+	-
D	+	+	-	-	-	-	+	+
E	-	-	+	+	-	+	-	-

+ Present; - Absent