2022

ZOOLOGY — HONOURS

Paper : CC-12

(Principle of Genetics)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***Question no.*** **1** and ***any four*** questions from the rest.

1. Answer ***any five*** of the following :

(a) What do you mean by cis-trans test? 2

(b) What are the direct and indirect effects of ionizing radiation? 2

(c) What is tandem duplication? 2

(d) Why Benzer selected rII locus for complementation study? 2

(e) Differentiate between Complete and Incomplete linkage. 2

(f) What are LINEs and SINEs? 1+1

(g) What are pseudoalleles? Give example. 1+1

(h) Give one example each for nullisomy and trisomy in human. 1+1

2. Write short notes on ***any four*** of the following : 2½×4

(a) Penetrance and Expressivity

(b) Interference and coincidence

(c) Non-disjunction of chromosome 21 in human

(d) Role of 'XIC' in dosage compensation in human females

(e) Alu elements

(f) Epistasis

(g) Haemophilia.

3. A *Drosophila* female heterozygous for the sex-linked recessive traits a, b and c were crossed to a male which was phenotypically a b c. The cross yielded following progeny phenotypes :

+ b c	450
a + +	450
a b c	32
+ + +	38
a + c	11
+ b +	9

(a) Find out the genotype of the female parent.

(b) Determine correct gene order.

(c) Construct a linkage map of a, b, c.

(d) Which progeny phenotypes are missing? Explain their absence. 2+2+4+(1+1)

4. (a) As per the theory of genic balance given by Calvin Bridges, mention the expected sex of the individuals with chromosome constitution as given below :

(i) 3X : 3A, (ii) 2X : 3A, (iii) 3X : 2A, (iv) 1X : 2A.

Justify your answer.

(b) Write down the salient features of kappa particles in *Paramoecium* sp.

(c) Explain the transmission of kappa particles during short duration and long duration conjugation in *Paramoecium* sp. with suitable diagrams. 4+2+4

5. (a) Alternative splicing plays a critical role during sex-determination of *Drosophila* sp. — Explain.

(b) What do you mean by Hybrid dysgenesis?

(c) Briefly describe the process of biochemical mutation detection in *Neurospora* sp. 4+2+4

6. (a) A colour blind man marries a phenotypically normal woman with no family history of colour blindness. They gave birth to a boy wih klinefelter syndrome and colour blindness. Karyotypes of both parents are normal. Explain the origin of klinefelter syndrome and colour blindness in the boy.

(b) What are transposable genetic elements?

(c) Explain 'complementation' in the light of Benzer's rII locus experiment. 4+2+4

7. (a) Differentiate between Pericentric and Paracentric inversion.

(b) What do you mean by alternate and adjacent segregation in a reciprocal translocation heterozygote? Explain with diagram.

(c) Explain 'tautomeric shift'. 3+4+3

8. (a) What do you mean by primary and secondary sex determination in human?

(b) What are IS elements?

(c) Explain the process of mutation detection in *Drosophila* sp. by 'attached X' method. 3+2+5