12.12.18 (M)

This question paper contains 5 printed pages.

Your Roll No. .....

Sl. No. of Ques. Paper: **129** I

Unique Paper Code : **32231502**

Name of Paper : **Principles of Genetics**

Name of Course : **B.Sc. (H) 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, including Question No. 1, which is compulsory.

Simple non-programmable calculators are allowed.

1. (i) Define the following terms (any *five*):

   (a) Proband

   (b) Hemizygous

   (c) Episome

   (d) Pleiotropy

   (e) Tautomers

   (f) Chiasma. 5

   (ii) Differentiate between the following (any *four*):

   (a) Sexduction and Transduction

   (b) Reciprocal cross and Test cross

P. T. O.

(c) Continuous and Discontinuous variation

(d) Composite and Non-composite transposons

(e) Cis and Trans phase. 8

(iii) Mention the contribution of following geneticists (any *five*):

(a) Barbara McClintock

(b) Bernard Davis

(c) Joshua Lederberg

(d) G. Karpechenko

(e) Curt Stern

(f) Alfred Sturtevant. 5

(iv) Justify the following statements (any *two*):

(i) Y-chromosome does not determine sex in *Drosophila.*

(ii) Humans with blood group O negative are universal donors.

(iii) A *Neurospora* poky female crossed with a wild type male will produce all poky progeny. 3

(v) (a) A cross between Red and White coloured flowers of a hypothetical plant results in 64 progenies in F2 generation. Out of these 64, one plant has white flowers. If flower colour in this plant shows polygenic inheritance, calculate the number of genes that are involved in deciding the flower colour.

(b) How many chromosomes would be found in somatic cells of an allotetraploid derived from two plants, one with N=7 and the other with N=10? 4

(vi) Expand the following abbreviations:

(a) QTL

(b) Hfr

(c) HGPRT

(d) SRY. 2

2. (i) State the Mendelian postulates and add a note on the reasons for success of his work. 4

(ii) How do epistatic interactions modify the Mendelian dihybrid ratio? Explain with suitable examples. 8

3. (i) Give an experimental proof for cytological basis of crossing over. 5

(ii) In *Drosophila*, three genes are linked in one chromosome. Assume one parent is dominant and the other one is recessive. In a test cross, the following results were obtained:

XYZ	225
xyz	245
xYZ	14
Xyz	16
xYz	98

XyZ	102
XYz	144
xyZ	156
Total	1000

(a) How do you say that these genes are linked?

(b) What is the order of genes?

(c) Determine the map distance and construct the chromosomal map.

(d) Calculate the coefficient of co-incidence and interference. 1+2+2+2=7

4. (i) Briefly discuss the various types of chromosomal structural aberrations. 8

(ii) Explain the molecular basis of mutations caused by UV rays. 4

5. (i) Explain the use of interrupted mating technique in bacterial chromosomal mapping using selected strains, genetic markers and nutrient media. 8

(ii) Three mouse-human cell lines were scored for the presence (+) or absence (−) of human chromosomes, with the results as follows:

Clone	Human Chromosomes							
	1	2	3	4	5	14	15	18
A	+	+	+	+	−	−	−	−
B	+	+	−	−	+	+	−	−
C	+	−	+	−	+	−	+	−

If a particular gene is located on chromosome 3, which clones should be positive for the enzyme from that gene? 4

6. (i) What are P elements? Comment on their significance. 4

(ii) Write a note on sex-influenced traits with suitable examples. 4

(iii) Explain Benzer's complementation test in bacteriophages and give its significance. 4

7. Write short notes on any *three*:

(i) CIB method for detection of mutation

(ii) Dosage compensation in humans

(iii) Extra-chromosomal inheritance in *Paramecium*

(iv) Retrotransposons. 4+4+4