[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1126 **I**

Unique Paper Code : 2232013503

Name of the Paper : Fundamentals of Genetics

Name of the Course : **B.Sc. (H) Zoology (NEP)**

Semester : V

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions, including Question No. **1,** which is compulsory.

1. (a) Distinguish between the following **(Any three)** (2×3=6)

(i) Co-dominance and Incomplete dominance

(ii) Coupling and Repulsion

(iii) Sex-influenced and sex-limited inheritance

(iv) Conservative and replicative transposons

(b) Define the following **(Any three)** (1×3=3)

(i) Multiple alleles

(ii) Episome

(iii) Heterosis

(iv) Pleiotropy

(c) Give the significant contribution of the following scientists **(Any three)** (1×3=3)

(i) Alfred Sturtevant

(ii) William Bateson

(iii) C B Bridges

(iv) Barbara McClintock

(d) Give reasons for the following **(Any two)** (1.5×2=3)

(i) Some XX humans were found to be males and XY humans were found to be females.

(ii) A cross between pure line sinistrally-coiled shell female *Limnaea* and dextrally coiled shell male *Limnaea* yielded all sinistrally-coiled shell progeny.

(iii) For a paracentric inversion, with rare exceptions, recombinant chromosomes are not stable and will not lead to viable offspring.

2. (a) What do you understand by gene interactions? Discuss any two types of gene interactions (with suitable examples) that cause deviation from the Mendel's dihybrid ratio. (10)

(b) Explain the sex-linked inheritance with any one example. (5)

3. (a) A female *Drosophila* heterozygous at three loci- cu/cu^+ (curved vs. straight wings), e/e^+ (ebony vs. gray bodies), st/st^+ (scarlet vs. red eyes) was test crossed with completely homozygous recessive males. The following progeny were observed.

cu	e	st^+	=	366
cu^+	e^+	st	=	380
cu	e	st	=	24
cu^+	e^+	st^+	=	30
cu^+	e	st	=	89
cu	e^+	st^+	=	105
cu	e^+	st	=	2
cu^+	e	st^+	=	4

(i) Are the three genes linked? Give reason for your answer.

(ii) What is the order of genes?

(iii) Determine the map distance and construct a linkage map.

(iv) Calculate the coefficient of coincidence and interference. (2+2+3+2=9)

(b) Explain the cytological basis of crossing over with the help of an experiment. (6)

4. (a) Discuss the molecular basis of spontaneous and induced mutations. Differentiate between aneuploidy and polyploidy with suitable examples. (5+4=9)

(b) Describe the Ac-Ds elements in maize. Comment on the significance of P elements. (4+2=6)

5. (a) Compare the mechanisms of dosage compensation in humans and *Drosophila*. How many Barr-bodies will be observed in the individuals with Klinefelter syndrome and with Patau syndrome? (7+2=9)

(b) Compare the phenomena of nuclear and extranuclear inheritance. Explain the inheritance of pigmentation in *Ephestia*. (3+3=6)

6. Write short notes on **any three** of the following: (3×5=15)

(a) CIB method of detection of mutations

(b) Retrotransposons

(c) Infective heredity in *Paramecium*

(d) Penetrance and Expressivity