

U.G. 6th Semester Examination-2026**ZOOLOGY****[MAJOR-VIII]****Course Code : ZOO-MJ-T-601****(Cytogenetics)****[NEP-2020]**

Full Marks : 40.

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five of the following: $2 \times 5 = 10$
- a) Differentiate between mutagens and carcinogens.
 - b) How does F plasmid differ from R plasmid?
 - c) What is XX male syndrome?
 - d) What are the chromosomal abnormalities associated with Klinefelter and Turner Syndrome?
 - e) What is competence in transformation?
 - f) Comment on the function of P element in the *Drosophila melanogaster*.

[Turn Over]

- g) What do you mean by genetic complementation?
- h) State the relationship between linkage and crossing over.
2. Answer any **two** of the following: $5 \times 2 = 10$
- a) Name two chemical and two physical mutagens. Describe the mechanism of mutation induced by UV rays. $2+3$
- b) Why Sickle cell anaemia is a classic example of pleiotropy caused by point mutation? Mention the characteristics features of multiple allele. $3+2$
- c) State the role of Xist gene in human's dosage compensation. Write down a short note on the significance of X:A ratio in sex determination in *Drosophila*. $2+3$
- d) Write down a short note on the alternative splicing of Sxl (early) protein in *Drosophila* development. What is X-chromosome inactivation (XCI)? $4+1$
3. Answer any **two** of the following: $10 \times 2 = 20$
- a) Write down the implications of SRY protein in human sex determination. What are the functions of DAX-1 and WNT-4? Comment on the generalized transduction in bacteria. $3+3+4$

- b) In *Drosophila*, Kidney Shaped eyes (k), Cardinal eye (cd), and Ebony body (e) are three recessive genes. If the homozygous kidney, Cardinal females are crossed with homozygous ebony males, the F1 offsprings are all wild type.

If heterozygous, F1 females are mated with Kidney, Cardinal, Ebony males, the following 2000 progeny appear.

Kidney Cardinal	880
Ebony	887
Kidney ebony	64
Cardinal	67
Kidney	49
Ebony Cardinal	46
Kidney Ebony Cardinal	3
Wildtype	4
Total	2000

- i) Construct the cross and determine the chromosomal composition of the F1 females. 4
- ii) What are the order of the genes? 2
- iii) Draw the genetic map of the genes? 2
- iv) Calculate the coefficient of coincidence for these three loci. 2

- c) i) What is extra chromosomal inheritance? Mention the criteria of such inheritance. How does it differ from the normal Mendelian inheritance. 1+2+2
- ii) Define "Killer Strain" in *Paramecium* and explain the mechanism of inheritance of Kappa particles. Illustrate your answer with a diagram/description of cross-breeding between killer and sensitive strains to show how this phenomenon represents cytoplasmic inheritance. 2+3
- d) State the role of Male-Specific Lethal (MSL) complex in *Drosophila* dosage compensation. Discuss about the inheritance pattern of Haemophilia with suitable crosses. State the characteristics of X-linked dominant and X-linked recessive mutation. 4+4+2
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