Mode of Examination: Open Book Examination

Unique Paper Code	**: 32231502**
Name of the Paper	**: Principles of Genetics**
Name of the Course	**: B.Sc. (H) Zoology (CBCS-LOCF)**
Semester	**: V**
Duration	**: 3 Hours**
Maximum Marks	**: 75**

Instructions for Students

1. Write your Roll No., Name and Code of the paper, Course, Semester, and Date of examination on the first page of the answer sheet.

2. Attempt **ANY FOUR** questions.

3. All questions carry equal marks.

Q1. In mice, a locus for hair colour has two alleles, **A** and **a**. '**A'** is a dominant allele producing Agouti colouration (bands of black and white) while '**a'** is a recessive allele and produces brown colouration. At another locus, presence of recessive allele '**h'** in homozygous condition leads to albino colouration of the mice.
An **albino female** was mated to a **brown male** and all the **offspring** were **Agouti**. The **male** and **female** Agouti offspring were then mated. What will be the phenotypic ratio of the product of these mating? Explain your finding. Also, provide an example in humans where a similar modification in the Mendelian dihybrid ratio is seen. **18.75**

Q2. Differentiate between the lytic and lysogenic cycle of phages. What are the different types of transduction? With the help of examples, explain, how transduction can be used in bacterial gene mapping. **18.75**

Q3. Explain the molecular basis of spontaneous mutations. With the help of suitable examples, describe the different types of structural chromosomal aberrations. **18.75**

Q4. How is polygenic inheritance different from Extra-chromosomal inheritance? Explain. Describe the inheritance of shell coiling pattern in *Limnaea* (with illustration). If an oocyte from a *Limnaea* female with genotype Dd is injected with antibody against D protein (thus rendering it non-functional), just before fertilization with a sperm carrying D allele, what will be the phenotype of the progeny? Explain. **18.75**

Q5. Female Drosophila with cinnabar eye (cn) and vestigial wings (vg) were mated to males with roof wings (rf). The F1 were all wild-type. When the F1 females were test crossed with males homozygous for all three traits the following result were obtained.

cinnabar,vestigial	382
roof	401
cinnabar	3
roof, vestigial	4
cinnabar, roof, vestigial	59
wild	67
cinnabar, roof	44
vestigial	40

Based on this data justify the statement "these genes are linked". What is the order of these genes? Calculate the coefficient of coincidence and interference. What are the different categories of progeny obtained and what are their genotypes? If the F1 female was a coupling heterozygote, then what would be the phenotypes of Single crossover and Double crossover progeny? **18.75**

Q6. What are the different types of transposable elements found in prokaryotes? Explain their structure and mechanism of transposition. A male Drosophila with P elements (P+) mates with a female Drosophila that lacks P elements (P-). What is the expected outcome of this cross and what is the reason behind the outcome? **18.75**