[This question paper contains 4 printed pages.]

**Sr. No. of Question Paper : 7951** **F–2** **Your Roll No.....**

Unique Paper Code : 2581201

Name of the Course : **B.Sc. (Hons.) Biomedical Science** [DC–1.3]

Name of the Paper : Principles of Genetics [DC–1.3]

Semester : II

Duration : 3 Hours Maximum Marks : 75

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question No. **1** is compulsory.
4. Give diagrams and examples wherever required.
5. Subparts of the questions should be attempted together.

1. (a) Define the following terms : (attempt any **5**)

   (i) Auxotrophs

   (ii) Reciprocal Cross

   (iii) Hfr

   (iv) Frame shift mutation

   (v) Recessive gene

   (vi) Pseudodominance (1×5=5)

   (b) Give significant contributions of the following scientists :

   (i) Avery, MacLeod and McCarty

   (ii) Singer and Cornat

   (iii) Bateson and Punnett

   (iv) Griffith (1×4=4)

*P.T.O.*

(c) Give one/two word answers for the following :

(i) Phenomenon in which specific phenotypes at one locus can prevent the phenotypic expression of genotype at another locus.

(ii) Class of traits governed by autosomal genes whose dominance relationship is reversed in two sexes as a consequence of sex hormone differences.

(iii) Exchange of chromosomal segments between two non-homologous chromosomes.

(iv) Non-separation of chromosomes during anaphase stage of cell division. (1×4=4)

(d) State whether the given statement is **TRUE** or **FALSE** : (3×2=6)

Also, justify your answer. (attempt any **2**)

(i) Individual suffering from Turner Syndrome is female.

(ii) Human males are constitutionally hemizygous whereas females are functionally hemizygous.

(iii) Closely linked genes segregate according to Mendel's law of segregation and independent assortment.

2. (a) Write short notes on the following: (attempt any **4**)

(i) Zebra fish as a model organism.

(ii) Bombay Blood group

(iii) Photoreactivation repair

(iv) Competence

(v) Criss- cross inheritance (3×4=12)

(b) Which of the following matings can occur and why ?

(i) $F^+$ x Hfr

(ii) $F^+$ x $F^+$ (1×2=2)

3. (a) Differentiate between : (attempt any **four**)

(i) Edwards and Klinefelters syndrome

(ii) Duplicate gene effect and complementary gene effect

(iii) Paracentric and Pericentric inversion

(iv) Penetrance and expressivity

(v) Transduction and Transformation (3×4=12)

(b) Name the chromosomal aberrations in the following human karyotype.

(i) 47, +18

(ii) 45, XO (1×2=2)

4. (a) Describe the existing scientific data that helped Watson and Crick in elucidating the structure of B form of DNA double helical structure. (6)

(b) Give experimental evidence to show that replication of DNA is neither conservative nor dispersive. (6)

(c) Explain the basis of deviation from Mendelian dihybrid ratio and name the genetic effect.

(i) 15:1

(ii) 13:3 (1×2=2)

5. (a) What are the limitations of pedigree analysis in humans difficult ? (3)

(b) How was the human insulin gene cloned using recombinant DNA technology ? (6)

(c) How was conjugation discovered in bacteria ? (5)

6. (a) Explain different types of structural aberrations of chromosomes in human with examples of each. (8)

(b) What is the molecular basis of familial Down Syndrome ? (4)

(c) It was suspected that two babies had been exchanged in a hospital. Mr. and Mrs. Malik received baby no. 1 and Mr. and Mrs. Gupta received baby no. 2. Blood type testing showed the following result.

| S. no. | Individual | Blood Type |
|---|---|---|
| 1. | Mr. Malik | A |
| 2. | Mrs. Malik | O |
| 3. | Mr. Gupta | AB |
| 4. | Mrs. Gupta | O |
| 5. | Baby | O |

To which family this baby belongs : Malik or Gupta ? Justify your answer. (2)

7. (a) Singed bristles (sn), crossveinless wings (cv), and vermilion eye color (v) are due to recessive mutant alleles of three X-linked genes in *Drosophila melanogaster.* When a female heterozygous for each of the three genes was test crossed with a singed, crossveinless, vermilion male, the following progeny were obtained :

| **Class** | **Phenotype** | | | **Number** |
|---|---|---|---|---|
| 1 | sn | cv | v | 3 |
| 2 | + | cv | v | 392 |
| 3 | + | + | v | 34 |
| 4 | + | cv | + | 61 |
| 5 | sn | cv | + | 32 |
| 6 | sn | + | v | 65 |
| 7 | sn | + | + | 410 |
| 8 | + | + | + | 3 |
| | | | | Total : 1000 |

(i) What is the correct order of these three genes on the X chromosome ?

(ii) What are the genetic map distances between *sn* and *cv, sn* and v, and cv and v ?

(iii) What is the coefficient of coincidence and interference ? (7)

(b) An autosomal recessive condition affects 1 newborn in 10,000. What is the expected frequency of carriers ? (2)

(c) What is maternal inheritance ? Elucidate with example. (5)