[This Question Paper contains -------------- printed pages(s)]

Sr. No. of Question Paper: *2263*

F-4

Unique Paper Code: **2581201**

Name of the Paper: **Principles of Genetics**

Name of the Course: **B.Sc (Hons) Biomedical Science**

Semester: **FYUP-II**

Duration: **3 Hours**   Maximum Marks:**75**

Instructions for Candidates

Write your Roll No. on the top immediately on receipt of this question paper.

Attempt five questions in all. Question No. 1 is compulsory. Give illustrations and examples wherever required.

Sub-parts of the questions should be attempted together

Q1. (a) Define the following terms: (attempt any 5)   (1X5=5)

(i) Test Cross

(ii) Karyotype

(iii) Nonsense mutation

(iv) Hemizygous

(v) Dominant gene

(vi) Pedigree

(b) Give significant contributions of the following scientists   (1X4=4)

(i) Morgan and Sturtevant

(ii) Sutton and Boveri

(iii) Jacob and Wollman

(iv) Carl Correns

(c) Give one/two word answers for the following: (1X4=4)

(i) Any chromosome other than sex chromosome.

(ii) Site on chromosome where spindle fibers attach.

(iii) A type of chromosome with arms of about equal lengths.

(iv) Any gene that when homozygous results in death of individual prior to sexual maturity.

(d) State whether the given statement is **TRUE** or **FALSE**.

Also, justify your answer. (attempt any 2)   (3X2=6)

(i) Variations in sex chromosome numbers is tolerated better than autosomal numerical aberrations in humans.

(ii) In double stranded DNA, the two polynucleotide strands are parallel.

(iii) Mutations are essential for evolution.

Q2. (a) Write short notes on the following: (attempt any 4)   (4X3=12)

(i) Kappa particles

(ii) Chromosomal theory of inheritance

(iii) F factor

(iv) Hardy-Weinberg Law

(v) *Drosophila melanogaster* as model organism

(b) Which of the following matings can occur and why?   (1X2=2)

(i) F^+ x F'

(ii) F^+ x F^-

Q3. (a) Differentiate between: (attempt any four)   (4X3=12)

(i) G bands and Q bands

(ii) Sex influenced and Sex limited inheritance

(iii) Transduction and transformation

(iv) Co-dominance and incomplete dominance

(v) Transition and Transversion

(b) Name the chromosomal aberrations in the following human karyotype.   (2X1=2)

(i) 47, +21

(ii) 47, +13

Q4. (a) Name the three conformations of dsDNA and describe their distinguishing features.   (6)

(b) Draw and discuss the observations of Meselson and Stahl after the density equilibrium centrifugation that made them conclude that DNA replication is semi conservative.   (6)

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

(i) 9:6:4

(ii) 9:7 (1X2=2)

Q5 (a) Below is a partial pedigree of an X-linked gene in the British Royal Family descended from Queen Victoria, who is believed to be the original "carrier" in this pedigree. Analyze the pedigree and indicate:
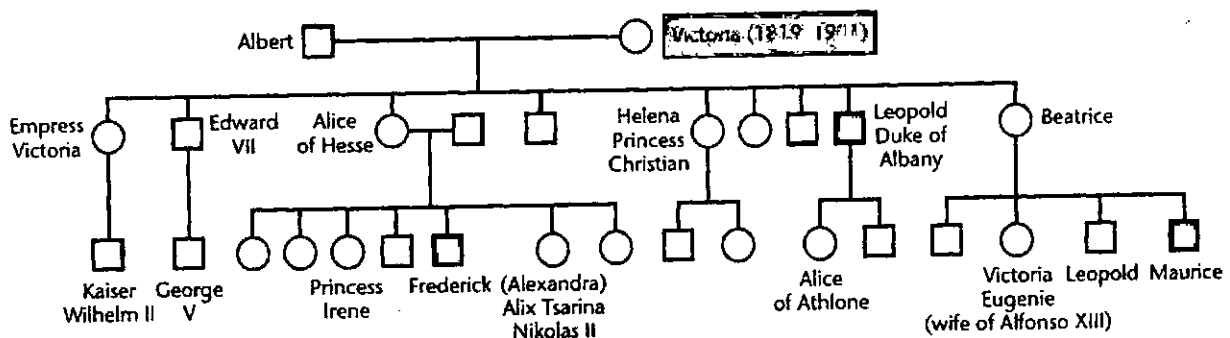
(i) Predict the name of the disease.

(ii)Is Queen Victoria a carrier?

(iii) Which one is homozygous normal: Alice of Hesse or her husband?

(iii) What is the probability that Princess Irene is a carrier? (4)

(b) How was the first mammal cloned using the nucleus of a somatic cell? (5)

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

Q6. (a) Mention the different types of chromosomal aberrations in living organisms. Give examples of each. (6)

(b) What is the molecular basis of Tay-Sach'sdisease. (4)

(c) In a particular family one parent has Blood group type A and the other has type B. Give all the possible genotypes of their children. (4)

Q7(a) In maize, the genes v (virescent seedlings), pr (purple aleuron) and bm (brown midrib) are all on chromosome 5 but not necessarily in the same order.

The cross $\dfrac{v^+ pr^+ bm^+}{v\ pr\ bm}$ X $\dfrac{v\ pr\ bm}{v\ pr\ bm}$

produces progeny with the following phenotypes:

$v^+\ pr\ bm$	209
$v\ pr^+\ bm^+$	213
$v^+\ pr\ bm^+$	175
$v\ pr^+\ bm$	181
$v^+\ pr^+\ bm$	69
$v\ pr\ bm^+$	76
$v^+\ pr^+\ bm^+$	36
$v\ pr\ bm$	41

Total progeny: 1000

    (i)   What is the correct order of these three genes on the chromosome ?
    (ii)   What are the genetic map distances between v and pr, pr and bm, and v and bm?
    (iii)   What is the coefficient of coincidence and interference?   (8)

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

(c) Describe plastid inheritance in *Mirabilis jalapa*.   (4)