[This question paper contains 7 printed pages.]

5116   **B**

B.Sc. Prog. / II
LS-204 GENETICS, GENOMICS AND
MOLECULAR BIOLOGY

Time : 3 *Hours*   *Maximum Marks* : 75

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

Attempt *Five* questions in all.

Question No. **1** is compulsory.

All questions carry equal marks.

1. (*a*) Attempt any *ten* (write only the answers) : 1×10=10

    (*i*) Replication begins at the .... end
    of template strand.

    (*ii*) If a polypeptide chain contains 25 different
    amino acids, how many nucleotide base pairs
    would be there in the corresponding gene?

    (*iii*) From which parent (*i.e.*, mother, father or both)
    does a man receive his X chromosome).

    (*iv*) Give *two* examples of X linked recessive genes
    in man.

(v) How many possible phenotypes are there for ABO blood group?

(vi) What is the chromosomal constitution of an individual with Turner Syndrome?

(vii) In the Meselson and Stahl's experiment it was confirmed that DNA replication is .... as was predicted by Watson Crick's double helix model.

(viii) Of the 64 codons, how many code for amino acids?

(ix) How many linkage groups are there in man and *Drosophila*?

(x) If individuals of genotypes AaBb are intercrossed, how many different genotypes and phenotypes can appear in their progeny?

(xi) When red flowered snapdragons were crossed with white flowered snapdragons, their progeny had pink flowers. What would be this genotypic expression called?

(xii) Give *one* example each of an alkylating agent and a Base analogue that are mutagenic.

(b) Define any *five* of the following : 1×5=5

    (i) Hemizygous

    (ii) Centromere

    (iii) Crossing over

    (iv) Mutation

    (v) Operon

    (vi) Enchromatin.

2. (a) When a dihybrid individual AaBb is test crossed to aabb, the following progeny are produced :

      35% AaBb

      35% aabb

      15% Aabb

      15% aaBb

    (i) Classify the above progeny into parental and recombinant types.

    (ii) Find the distance between the genes A and B.

    (iii) What is the linkage relationship between the genes A and B in the dihybrid parent? Explain. 1+2+2=5

(b) Define genetic code. How was it established that the genetic code is triplet?   5

(c) Identify the following point mutations in DNA and RNA as :   1×5=5

   (i) transitions

   (ii) transversions

   (iii) reading frameshifts :

      (a) A to G

      (b) C to T

      (c) C to G

      (d) T to A

      (e) UAV ACC UAU to UAU AAC CUA.

3. (a) With the help of neat well labelled diagrams explain the process of DNA replication in prokaryotes.   7

   (b) Discuss the role of polyploidy in evolution of bread wheat.   8

4. (a) In poultry the genes for red comb (R) and pea comb (P) together produce walnut comb. The

alternative alleles of both in a homozygous condition (*i.e.,* rrPP) produce a single comb. Determine the phenotypes and proportions expected in the following crosses :

(*i*)   RRPp × rrPp

(*ii*)   rrPP × RrPp

(*iii*)   RrPp × RrPP

(*iv*)   RrPP × rrPP   2×4=8

(*b*)   (*i*)   What are the key properties of the genetic material?   3

(*ii*)   Give one experimental evidence to prove that DNA is the genetic material.   4

5.   (*a*)   Describe the role of the following in regulation of gene expression in the lac operon :

(*i*)   Promotor

(*ii*)   Operator

(*iii*)   Regulator

(*iv*)   Structural gene Z

(v) Structural gene Y

(vi) Structural gene A

(vii) Cyclic AMP.   1×7=7

(b) With the help of labelled diagrams show the different levels of chromatin organisation in Eukaryotes.   8

6. (a) Differentiate between the following :

   (i) Transcription in prokaryotes and eukaryotes. 7

   (ii) Mendelian inheritance and Cytoplasmic inheritance.   4

   (b) How is sex determined in *Drosophila*?   4

7. (a) If adenine makes up 18 percent of bases in a DNA molecule, what percentage of the bases is cytosine?   4

   (b) Give cytological evidence of crossing over (*i.e.*, Creighton and Mcllintock's experiment in maize).   6

   (c) The diploid number of an organism is 10. How many chromosomes would be expected in the

following. Write down the chromosome formulae also in each case :

(*i*)　Monoploid

(*ii*)　Double trisomic

(*iii*)　Monosomic

(*iv*)　Tetrasomic

(*v*)　Triploid.　　　　　　$1 \times 5 = 5$