

B.Sc. Prog. / II

AS

LS-204 : GENETICS 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. Q. No. 1 is compulsory.
All questions carry equal marks.*

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

- (i) During DNA replication short segments of the lagging strand that are joined by DNA ligase are called
- (ii) From which parent (*i.e.*, mother, father or both) does a woman receive her X chromosome?
- (iii) How many amino acids would be there in a polypeptide chain translated from a DNA molecule having 120 nucleotide base pairs?
- (iv) What is the genotypic expression of the AB blood group called?
- (v) Why are there more colorblind men than women?
- (vi) What is the chromosomal constitution of an individual with Down Syndrome?

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- (vii) In replication, the two strands of a DNA molecule unzip as bonds between the are broken.
- (viii) What happens to mRNA after translation is completed?
- (ix) How many linkage groups are there in *Man.* and *Allium Cepa*?
- (x) Why did Mendel fail to observe linkage?
- (xi) Differentiate between a missense and a non-sense mutation.
- (xii) Differentiate between a Monoploid and a Haploid. $1 \times 10 = 10$
- (b) Define (any five):
- (i) Allele
 - (ii) Telomere
 - (iii) Linkage
 - (iv) Reverse transcription
 - (v) Heterochromatin
 - (vi) Codon. $1 \times 5 = 5$

2. (a) Give experimental evidence to prove that DNA replication is semiconservative. 7
- (b) What are inversions and why are they called crossover suppressors? Explain giving example. 8

3. (a) When a dihybrid individual AaBb is test crossed to aabb, the following progenies are produced:
- 30% AaBb
 - 30% aabb
 - 20% Aabb
 - 20% aaBb
- (i) Classify the above progenies into parental types 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) With the help of labelled diagram explain the photoreactivation repair mechanism of DNA. 5
- (c) Discuss the salient features of the genetic code. 5
4. (a) Define gene regulation. Discuss the positive and negative control of lac operon. 8
- (b) (i) Which are the key properties of the genetic material? 3
- (ii) Give an experimental evidence to prove that RNA is the genetic material. 4
5. (a) With the help of neat and well labelled diagrams show the different levels of chromatin organization in eukaryotes. 7

- (b) In humans, a series of alleles has been associated with the ABO blood types (*i.e.*, I^A , I^B and I^O). What phenotypic ratios are expected from the following crosses :

(i) $I^A I^A \times I^B I^B$

(ii) $I^A I^B \times I^O I^O$

(iii) $I^A I^O \times I^B I^O$

(iv) $I^A I^O \times I^O I^O$ 2×4=8

6. Differentiate between any *three* of the following:

(i) Dominance and epistasis

(ii) Mendelian inheritance and cytoplasmic inheritance

(iii) Complete and incomplete linkage

(iv) DNA and RNA. 5×3=15

7. (a) If the GC content of a DNA molecule is 54 per cent, what are the percentages of the four bases (A, T, G, C) in the molecule? 4

(b) Discuss Creighton & McClintock's experiment in maize. 6

(c) The diploid number of an organism is 20. How many chromosomes would be expected in the following? Write down the chromosome formula also in each case.

(i) Trisomic