

**M.Sc. 1st Semester Examination, 2024**

**HUMAN PHYSIOLOGY**

PAPER — PHY-102

*Full Marks : 25*

*Time : 1 hour*

Answer all questions

*The figures in the right hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

**GROUP—A**

Answer any **two** questions of the following :  $2 \times 2$

1. What is DNA supercoiling of bacterial chromosome ? 2

( Turn Over )

2. What is incomplete dominance and co-dominance ? 1 + 1
3. Define spliceosome. What are the types of it ? 1 + 1
4. If two RNA molecules have complementary base sequences, they can hybridize to form a double-stranded helical structure, just as DNA can. Imagine that, in a particular region of the genome of a certain bacterium, one DNA strand is transcribed to give rise to the mRNA for protein A and the other DNA strand is transcribed to give rise to the mRNA for protein B.
- (i) Would there be any problem in expressing these genes ?
- (ii) What would you see in protein B if a mutation occurred that affected the structure of protein A ? 1 + 1

( 3 )

GROUP-B

Answer any **two** questions of the following :  $4 \times 2$

5. Write a critical note on eukaryotic chromatin compaction. What are 'Highly repetitive sequences' ? 3 + 1
6. Write briefly the mechanism and functions of 5'-capping of mRNA. 2 + 2
7. How the siRNA and miRNA form ? What are the roadblocks in using siRNA in clinical practices ?  $1\frac{1}{2} + 1\frac{1}{2} + 1$
8. Write down critically about the geometry of DNA with suitable diagrams. 4

GROUP-C

Answer any **one** question of the following :  $8 \times 1$

( 4 )

9. What is gene mapping? How do you calculate crossover frequencies?

Assume the crossover frequency between gene A and B is 12%, between B and C is 7%, and between A and C is 5%. Draw the chromosome. Elaborate the process of G-banding technique of Karyotyping.

$$1 + 2 + 2\frac{1}{2} + 2\frac{1}{2}$$

10. What does the intron and exon mean? How an intron is recognized in a pre-mRNA sequence? What is alternative splicing? What are the combinations an intron might possess during alternative splicing? How the peptide bond forms among the amino acids during elongation of protein synthesis?

$$1 + 1 + 1 + 2 + 3$$

**[ Internal Assessment -- 5 Marks ]**