M.Sc. 4th Semester Examination, 2025

PHYSIOLOGY

(*Human Physiology*)

PAPER – PHY-402.1 & 402.2

Full Marks : 50

Time : 2 hours

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

PHY – 402.1

GROUP – A

Answer any **two** questions of the following : 2×2

1. What are pleuripotent stem cells ? Give example. 1 + 1

2. Name the major phospholipids present in human plasma membrane. 2

3. What is meant by the 'trans-autophosphorylation' and 'covalent modification' in signal transduction ? 1 + 1

4. Name the major progenitors of hematopoietic stem cells. 2

GROUP – B

Answer any **two** questions of the following : 4 × 2

5. Discuss the factors responsible for maintaining membrane fluidity. 4

6. What are phosphoglycerides ? Discuss the role of glycolipids in association with cell membrane. 1 + 3

7. What are intermediate filaments ? Write down the actions of microtubule-based motor proteins found in a cell. 2 + 2

8. Discuss the MAP-Kinase pathway as an illustration of receptor-tyrosine-kinase activity in cell signaling. 4

GROUP – C

Answer any **one** question of the following : 8×1

9. What is meant by assembly and disassembly of microtubules ? Write a note on the actin-binding proteins and their role in cellular functions. $3 + 5$

10. What is second messenger ? Discuss about the G-protein-coupled receptor actions through cAMP as second messenger with an example. $2 + 6$

PHY – 402.2

GROUP – A

Answer any **two** questions of the following : 2×2

11. What are BACs ? 2

12. What is proto-spacer ? 2

13. Write the differences between genomic DNA and cDNA. 2

14. What is 'Reporter gene' ? 2

GROUP – B

Answer any **two** questions of the following : 4 × 2

15. Differentiate between the approaches of RNAi and CRISPR/Cas9 in biological research. 4

16. Suppose, *Drosophila* females of genotype Aa Bb Cc were crossed with males of genotype tt mm rr. This led to 1000 progeny of the following types :

ABC	abc	ABc	abC	aBC	Abc	AbC	aBc
252	228	81	89	148	152	25	25

(*Continued*)

Based on these data, find out the (*i*) parental, single crossover, and double crossover gametes (*ii*) their gene order, and (*iii*) map distance. 1 + 2 + 1

17. What is natural transformation ? 'Transformation, as an adaptation for DNA repair'– Justify it. $1\frac{1}{2} + 2\frac{1}{2}$

18. Define restriction endonuclease. How do bacteria protect their DNA from the action of their own restriction endonuclease ? Distinguish between type I, type II and type III restriction endonucleases. 1 + 1 + 2

GROUP – C

Answer any **one** question of the following : 8×1

19. What do you know about bacterial plasmids ? Write down about the 'selectable marker' of a cloning vector, mentioning its significance. State the significance of using a cosmid in cloning. 3 + 3 + 2

20. What are adult stem cells ? Discuss critically the use of stem cell therapy in diabetes mellitus. 2 + 6

[Internal Assessment — 10 Marks]
