

2025

M.Sc. 3rd Semester Examination

HUMAN PHYSIOLOGY

Paper : PHY - 307-A/B/C/D

Full Marks : 25

Time : One Hour

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Sp. Paper : Microbiology and Immunology

PHY - 307A

(Cellular and Molecular Immunology)

Group - A

Answer any *two* questions : $2 \times 2 = 4$

1. Define adjuvant with example. 2
2. What do you mean by hematopoietic stem cell? 2
3. Write the function of IL-1. 2
4. Distinguish between T helper cell and cytotoxic T cell. 2

Group - B

Answer any *two* questions : $4 \times 2 = 8$

5. Describe in detail the structure of IgG 4

P.T.O.

(2)

6. Differentiate the structure and functions of MHC-I and MHC-II molecules. 4
7. Describe the travel of neutrophil from the blood vessels to the zone of inflammation. 4
8. Describe the process of T-B lymphocyte interaction. 4

Group - C

Answer any *one* question : 8×1=8

9. Explain the detail on classical pathway of complement system. 8
 10. Write the role of histamine on inflammation. Write the role of any four types of interleukin. 4+4
-

(3)

**Sp. Paper : Biochemistry, Molecular
Endocrinology and Reproductive Physiology**

PHY - 307B

**(Molecular Endocrinology and Reproductive
Physiology)**

Group - A

Answer any *two* questions : $2 \times 2 = 4$

1. State Berthold's experiment. 2
2. What are autocrine and intracrine signaling mechanisms? 2
3. Write the principle of Sandwich ELISA. 2
4. Mention the phases of spermiogenesis. 2

Group - B

Answer any *two* questions : $4 \times 2 = 8$

5. Write brief notes on Ligand Binding and G Protein Coupling of GPCRs. 2+2
6. Describe the process of Spermatogenesis with special emphasis on the role of Sertoli cell. 4
7. Discuss critically the genetic control of male sex determination, mentioning the role of different transcription factors. 4
8. Write a brief note on the effect of oxidative stress in female reproduction. 4

P.T.O.

(4)

Group - C

Answer any *one* question : $8 \times 1 = 8$

9. Mention the principle and assay procedure of Radio Immuno Assay (RIA). Mention its advantages and disadvantages. $2+4+2$
 10. Describe the intrinsic apoptotic pathway during male germ cell development. Discuss the steps of in vitro fertilization (IVF) and mention its complications. $4+3+1$
-

(5)

**Sp. Paper : Biophysics and Electrophysiology with
Structural Biology**

PHY - 307C

(Advanced Cellular and Membrane Biophysics)

Group - A

Answer any *two* questions : $2 \times 2 = 4$

1. State different forms of energy. 2
2. Define zeta potential. 2
3. Mention the thermodynamic principles that govern passive transport versus active transport across cell in membrane. 2
4. Write down the biological importance of carbohydrates present in the cell membrane. 2

Group - B

Answer any *two* questions : $4 \times 2 = 8$

5. Describe the different components present in an enzyme with a suitable diagram. What is the allosteric site of an enzyme? 3+1
6. Describe briefly the Stern model for membrane potential. What are the limitations of Gouy-Chapman's model? 2+2
7. Explain the allosteric regulation in carrier proteins and how it relates to saturation kinetics. 2+2

P.T.O.

(6)

8. With a suitable diagram, briefly describe the features of amphipathic lipids present in the cell membrane. Mention the functions of cholesterol in biological membranes.

3+1

Group - C

Answer any *one* question : $8 \times 1 = 8$

9. Write down the development of the proton pump mechanism during oxidative phosphorylation through Complex V. Describe the structure and functions of Complex III in ETC. $(2+2)+4$
10. Write a note on the physical properties of water with reference to its structure. What is membrane impedance? $6+2$
-

(7)

Sp. Paper : Neurophysiology

PHY - 307D

**(Development of Brain and Molecular
Neurobiology)**

Group - A

Answer any *two* questions : $2 \times 2 = 4$

1. Name two chemoreceptors and two mechanoreceptors of human body. 2
2. Draw and label the *bicoid* deficient early embryo of *Drosophila*. 2
3. Show the distribution of different neurotransmitter enriched nucleus in a sagittal human brain stem region in a labelled diagram. 2
4. Define growth cone. 2

Group - B

Answer any *two* questions : $4 \times 2 = 8$

5. Relate between force and rate of action potential in slow and fast contracting muscle fibers. Mention contractile properties of motor units. 3+1
6. Write the pharmacological action of D-tubocurarine, neostigmine, physostigmine, nicotine and botulinum toxin on neuromuscular transmission. 1+1+1+1

P.T.O.

(8)

7. Name any four maternal effect genes and mention their roles in the regulation of anterior-posterior polarity of *Drosophila* embryo. 1+1+1+1
8. Describe how RT-PCR can be utilized as molecular neurobiology technique. 4

Group - C

Answer any *one* question : 8×1=8

9. State the roles of some crucial homeobox genes in the early development of brain. Describe the molecular signalling pathway in the determination of dorso-ventral polarity in *Drosophila* embryo. 2+6
10. Elaborate on the involvement of cytoskeletal proteins and extracellular cues in the growth cone advance. Name the pathological condition develops in the *Robo3*^{-/-}. 7+1

Internal Assessment : 5 marks
