

**M.Sc. 4th Semester Examination, 2024**

**HUMAN PHYSIOLOGY**

**PAPER — PHY-403(A,B,C,D)**

*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*

**Spl. Paper : (Microbiology & Immunology)**

**PHY— 403A.1**

*( Microbial Genetics : Advanced Studies )*

*[ Marks : 20 ]*

GROUP – A

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

1. What is 'gene silencers' ? 2
2. What are 'hfr' cells ? 2
3. What is genetic recombination ? 2
4. Define transformation. 2

GROUP – B

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

5. Describe the mechanism of 'attenuation' in regulation of gene expression with reference to tryptophan operon. 4
6. In the light of Griffith's experiment describe the 'transforming principle'. 4

7. Describe the importance of  $-10$  and  $-35$  promoter consensus sequence in prokaryotic transcription mechanism. 4
8. Write notes on : 2 + 2
- (i) Teleomere
- (ii) Satellite DNA.

GROUP – C

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

9. What is transduction ? Give a brief account of 'specialized transduction' to promote genetic recombination. What is abortive transduction ? 2 + 5 + 1
10. How the transcription initiates in prokaryotic cell ? Describe the mechanism of intrinsic termination of transcription in prokaryotic cells. What are Rho factors ? 2 + 4 + 2

**PHY— 403A.2**

( *Clinical Immunology* )

[ Marks : 20 ]

**GROUP – A**

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

1. What are oncogenes and protooncogenes ? 1 + 1
2. What is ADCC ? 2
3. Write the principle of chip assay. 2
4. Write the principle of flow cytometry. 2

**GROUP – B**

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

5. Classify Cell Adhesion Molecules (CAMs) with example. 4
6. Write the steps involved in induction of cancer. 4

7. How direct ELISA differs from competitive ELISA ? Write their applications. 3 + 1
8. What is anaphylaxis ? Briefly discuss the type-I hypersensitivity reaction. 1 + 3

GROUP – C

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

9. (i) Briefly explain the mechanism of inflammation.
- (ii) Classify vaccines with one example of each. 4 + 4
10. (i) Write the cause and clinical manifestation of any two autoimmune disease.
- (ii) What is AIDS ? What are opportunistic infections ? 3 + 3 + 1 + 1

**[ Internal Assessment – 10 Marks ]**

**Spl. Paper :** (*Biochemistry, Molecular Endocrinology and Reproductive Physiology*)

**PHY— 403B.1**

( *Advance and Applied Biochemistry* )

[ Marks : 20 ]

**GROUP – A**

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

1. Define karyotyping. 2
2. What is redundancy of cytokines ? 2
3. Define nanocrystallite. 2
4. What are functional plasma enzymes ? 2

**GROUP – B**

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

5. Write a note on the reverse transcription of RNA. 4
6. Describe the steps of formation of pre-RC in the initiation process of eukaryotic replication. 4
7. Describe the cross linking process of enzyme immobilization. 4
8. Write a note on Quantum Confinement. 4

### GROUP – C

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

9. What are different types of interferons and their biologic function ? Write notes on Type I and Type II cytokine receptors. 4 + 4
10. State the sources and medical importance of non-functional plasma enzymes. Mention the name of some diagnostically important enzymes. Mention the advantages and disadvantages of enzyme immobilization.  $(1 + 2) + 1 + (2 + 2)$

**PHY— 403B.2**

*( Applied Molecular Endocrinology and  
Reproductive Physiology )*

[ Marks : 20 ]

**GROUP — A**

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

1. What is essential hypertension ? 2
2. Mention the antiatherogenic effects of insulin. 2
3. What are stimulant drugs ? Give examples. 1 + 1
4. What is meant by aging in Sertoli and Leydig cell ? 1 + 1

**GROUP — B**

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

5. Write down the components of remin-angio-tension system. Describe the metabolism of angiotensinogen. 1 + 3



6. Mention the effects of alcohol on gamma-glutamyl transpeptidase (GGT). Discuss briefly the effects of alcohol on the endocrine functions. 2 + 2
7. How are salt and water homeostasis maintained in human body ? 4
8. How does aging influence on testosterone synthesis and male sexual functions ? 2 + 2

### GROUP – C

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

9. What do you know about angiotensin-converting enzyme and angiotensin receptors ? State the functions of angiotensin II.  $2\frac{1}{2} + 2\frac{1}{2} + 3$
10. How intramuscular triglycerides and mTOR are associated with insulin resistance ? Discuss the pathophysiologic features of microvascular complications seen in diabetes mellitus.  $(2 + 2) + 4$

**[ Internal Assessment – 10 Marks ]**

**Spl. Paper :** (*Biophysics and Electrophysiology  
with Structural Biology*)

**PHY – 403C.1**

( *Electrophysiology of Cells &  
Radiation Physics* )

[ Marks : 20 ]

**GROUP – A**

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

1. Mention the fundamental motion concept of osteokinematics. 2
2. Write the Goldman equation for the resting membrane potential. 2
3. What do you mean by phototransduction potential? Define lateral inhibition. 1 + 1
4. What is meant by 10-20 electrode system in EEG? 2

GROUP – B

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

5. What is taste papillae ? Describe its structure with a diagram. 1 + 3
6. Illustrate the cellular mechanism of photo-transduction with a labelled diagram. 4
7. With a neat diagram describe the molecular structure of the voltage gated sodium channel. 4
8. How could you calculate activity (A) and specific activity (a) of an atom during radiation. Briefly explain the role of different factors influencing stability of atoms. (1 + 1) + 2

GROUP – C

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

9. Provide an overview of the Hodgkin-Huxley model of action potential. Mention the principle

of voltage clamp technique. Mention different taste abnormalities.

4 + 2 + 2

10. Define ionizing radiation. Classify it. Briefly characterize the features of alpha ( $\alpha$ ) particle emission. What do you mean by electron capture? Establish the relationship in between decay energy ( $Q_\alpha$ ) and binding energy ( $E_B$ ) of alpha ( $\alpha$ ) particle.

1 + 2 + 2 + 1 + 2

### PHY— 403C.2

( *Non-Ionizing Radiation, Photophysics & Experimental Methods in Structure Elucidation* )

[ Marks : 20 ]

GROUP — A

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

1. Define Relative Centrifugal Force (RCF). 2

2. What is Beer's law of photochemistry ? 2
3. Define Molar ellipticity ? 2
4. What do you mean by Magneto encephalography (MEG) ? 2

**GROUP – B**

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

5. Write the principle of circular dichronism. Mention the difference between circular dichronism and optical rotatory dispersion. 2 + 2
6. Write the factors that affect sedimentation coefficient. Mention the difference between differential centrifugation and density gradient centrifugation. 2 + 2
7. Mention the different elements of radiation protection programme. 4

8. Explain different types of photochemical reactions with examples. What is Lambert's law ? 3 + 1

**GROUP – C**

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

9. Write down the principle of column chromatography. What is isopycnic centrifugation ? Define Miller indices and Bravais lattice. Mention the application of circular dichroism in biology. 2 + 2 + 2 + 2
10. Define bio-electromagnetism. Mention its important field components. Explain types of current produced during bio-magnetism. Write down the role of calcite and magnetite against migraine and stress. 1 + 2 + 2 + 3

**[ Internal Assessment – 10 Marks ]**

**Spl. Paper : (Neurophysiology)**

**PHY— 403D.1**

*( Neurophysiology of Brain )*

[ Marks : 20 ]

**GROUP — A**

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

1. What is the relation between Merkel cell and Piezo2 receptor ? 2
2. In a racing competition, the players stood on the starting line as the referee says "on your mark.....", which motor area is active when the individual prepares for the run ? What is the name of the type of these neurons ? And as the referee says "go", the individual starts running. Mention the name of the motor area that elicits the movement ? What are Betz cells ?  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

3. Define conditional response. 2
4. What is meant by split brain ? 2

GROUP – B

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

5. Describe the EEG, EMG and EOG characters of REM sleep. What is desynchronized sleep ? 2 + 2
6. How does the recent investigation on TRP channels help in understanding the molecular mechanism of sensory functions ? 4
7. Describe briefly on instrumental conditioning. 4
8. Describe the asymmetric functions of cerebral hemispheres. 4



**GROUP – C**

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

9. (a) Describe in detail the visual pathway from retina to the visual cortex, with suitable diagram(s).
- (b) Discuss the peculiarities of the projections of the fovea centralis on the receptive field of primary visual cortex. 5 + 3
10. (a) Describe elaborately the role of vestibular nuclei in the maintenance of body posture.
- (b) Discuss the functions of any four areas of limbic system. 6 + 2

**PHY— 403D.2**

*( Applied and Clinical Neurophysiology )*

[ Marks : 20 ]

**GROUP – A**

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

1. What is anorexia nervosa ? 2
2. What are Zeitgebers ? 2
3. Name a neurotoxic substance which can influence the neurotransmission. Mention it's cite of action. 1 + 1
4. Name the types of neurons degenerated and gene involved in Huntington's chorea. 1 + 1

**GROUP – B**

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

5. How does the postnatal refinement of synaptic contacts occur in neostriatum and hippocampus during the human brain development ?
6. Which parameters can be used to determine the neural plasticity in the experimental neurophysiological study.

7. With the help of relevant diagram(s) briefly discuss the neural basis of circadian rhythm.
8. Briefly describe the alteration of cognitive functions during aging.

**GROUP – C**

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

9. Discuss two histological markers of synaptic plasticity that alter the early phase of human brain development ?  $4 + 4$
10. (a) What are the hall mark of Alzheimer's disease(AD)
- (b) Describe the central amyloid hypothesis for neurodegeneration in AD.  $2 + 6$

**[ Internal Assessment – 10 Marks ]**

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