2008

HUMAN PHYSIOLOGY

PAPER—XVI

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

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

Illustrate the answers whenever necessary

Write the answers Question of each Unit in separate books

(*Microbiology & Immunology*)

UNIT—31

Answer any *two* questions from the following

1. (*a*) What do you understand by Nitrogen Fixation ?

   (*b*) Discuss the structure and function of the key enzyme responsible for Nitrogen Fixation. 3 + 7

2. (*a*) What do you understand by 'Infection' and 'Virulence' ?

(*b*) Mention the different steps for a pathogenic agent to establish an infectious disease.

(*c*) What are microbial exotoxins ? Give example. (2 + 2) + 4 + 2

3. (*a*) What is PCR cycle ? Write down its significance.

(*b*) Mention the rate limiting enzyme for PCR cycle and describe its regulation. (2 + 2) + 6

4. (*a*) Why it is important to know the microbial flora of humans ?

(*b*) Give the major reason (s) for the occurrence of the following species of bacteria in their natural habitats :

(*i*) *Streptococcus mutans* on the teeth surface

(*ii*) *Propionibacterium acne* in skin.

(*c*) What is CAM ? What is its importance ? 3 + 4 + 3

UNIT — 32

Answer any *two* questions from the following

1. What do you mean by antibody diversity ? Describe briefly second messengers and their functions in the process of activation of the B-cell. 3 + 7

2. (*a*) What is antigen processing ? Write the cytosolic pathway of antigen presentation.

   (*b*) Describe the immunological function of interferon gamma (INFγ). 1 + 4 + 5

3. Describe the genetic rearrangement of TCR-genes. 10

4. Write short notes on the following : 2 x 5

   (*i*) T-cell and B-cell cooperation

   (*ii*) How do macrophages recognise microbes that have been coated with antibody ?

   (*iii*) What are the extrinsic and intrinsic pathways of apoptosis ?

   (*iv*) Role of costimulatory signals in T-cell activation

(*v*) Explain the difference between antibody affinity and antibody avidity.

(*Ergonomics and Sports Physiology*)

UNIT — 31

Answer any *two* questions

1. State the importance of glycogen loading. Describe glycogen loading procedure. Point out the limitations of glycogen loading. 3 + 5 + 2

2. (*a*) Write the merits and demerits of indirect method for measuring maximal O_2 consumption.

(*b*) Describe one indirect method for measuring maximal O_2 consumption without using bicycle ergometer and treadmill. 4 + 6

3. What is strength and muscular endurance ? Describe the cardio-respiratory factors influencing aerobic endurance capacity in athletes. 4 + 6

4. (*a*) Enzyme levels are altered in untrained, moderately trained and marathon runner. Explain.

(*b*) "TRIS buffer reduces fatigue." Write whether the statement is true or false. Justify your answer. 5 + 5

UNIT — 32

Answer any *two* questions

1. What are amphetamines ? Why 'pep pills' are used as ergogenic aids in atheletics ? 4 + 6

2. What is somatotyping ? Discuss the characteristics three major somatotypes. How is somatotype related to different types of sports ? 2 + 5 + 3

3. (*a*) Discuss the importance of psychomotor abilities in sports activities.

   (*b*) State the difference between high and low level performers in sports. 7 + 3

4. Write brief notes on the following : 5 + 5

   (*i*) Farklef training

   (*ii*) Common injuries of muscle among athelets.

(*Neurophysiology*)

UNIT—31

Answer any *two* questions

1. (*a*) How is the neural tube formed in human embryo?

   (*b*) What are the basal and alar plates? Describe different types of spina bifida. 4 + (2 + 4)

2. (*a*) Describe the electron microscopic structure of myelin sheath.

   (*b*) Discuss different proteins present in myelin of CNS and PNS, and mention the role of these proteins in myelin formation. What are Guillain-Barre syndrome and Charcot Marie tooth disease? 3 + (5 + 2)

3. (*a*) What do you mean by plasticity of brain? Describe the plasticity in visual and somatosensory cortex.

   (*b*) Discuss the mechanism of synaptic plasticity. (2 + 4) + 4

4. What is NCAM? Discuss different proteins present in the plasma membrane of neuron and mention their functional characteristics. 2 + 8

UNIT — 32

Answer any *two* questions from the following

1. (*a*) Describe the molecular mechanism of contraction in (*i*) cardiac and (*ii*) skeletal muscle.

   (*b*) Discuss the regulation of neuronal and glial differentiation. Briefly describe the molecular basis of action of these regulatory substances. $(2\frac{1}{2} + 2\frac{1}{2}) + (2\frac{1}{2} + 2\frac{1}{2})$

2. Mention the location of different monoaminergic and cholinergic neurons in brain stem and describe their axonal projections to different regions of brain and spinal cord. 4 + 6

3. (*a*) Name the locations of autonomic efferent neurons in brainstem.

(*b*) Describe the molecular structure of nicotinic and muscarinic acetylcholine receptors. Mention the molecular basis of action of these receptors in presence of acetylcholine. 2 + (5 + 3)

4. (*a*) Describe the process of adaptation during hair cell transduction.

(*b*) Write briefly about polymerase chain reaction. 6 + 4

(*Endocrinology, Reproductive Physiology and Family Welfare*)

UNIT — 31

Answer any *two* of the following

1. Write short notes on the following: $2\frac{1}{2} \times 4$

(*i*) Biological and molecular action of thymic hormone

(*ii*) Zollinger-Ellison syndrome

(*iii*) Bioactive molecules of prostate

(*iv*) Thyroid hormone receptors.

2. (*a*) Write the fundamentals of ELISA for hormone quantification.

(*b*) What are the enzymes used to label the antibody in ELISA.

(*c*) Why RIA is more reliable than ELISA ? 4 + 2 + 4

3. (*a*) Describe the major mutations occurred at the level of insulin receptor. What are the consequences of these mutations ?

(*b*) What types of molecular endocrinopathy are seen in case of stem cell growth factor ? (3 + 4) + 3

4. (*a*) What do you know about 'hormones of progression' and 'hormones of competency' in case of cell cycle ?

(*b*) Elaborate about the 'Estrogen-induced carcinogenesis'. (2 + 2) + 6

UNIT—32

Answer any *two* questions

1. Write short notes on the following: $2\frac{1}{2} \times 4$

(*i*) Blood-testis barrier

(*ii*) Cortical reaction of egg

(*iii*) Adreno-gonadal interaction

(*iv*) Aging and fertility.

2. (*a*) Discuss the commonly used markers for the assessment of male reproductive activities.

(*b*) Discuss how the testicular structural and functional integrity is maintained by the interactions of Leydig cell-Sertoli cell. 5 + 5

3. (*a*) Mention the causes of male infertility.

(*b*) What are the pathophysiological state when IUI is adapted.

(*c*) What are the condition that should be fulfilled for the success of IUI. 5 + 3 + 2

4. (*a*) How stress can affect the reproductive activity of male ?

(*b*) What are the important motility regulatory factors ? Elaborate the role of cAMP and phosphoprotein on sperm motility. 4 + (2 + 4)