2017

M.Sc.

3rd Semester Examination

HUMAN PHYSIOLOGY

PAPER—PHY-303

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

[*Microbiology and Immunology*]

(Unit—27)

Answer all questions from the following :

1. (a) Name the xenobiotic compound groups according to their chemical composition.

   (b) What is biomagnification ?

(c) Write down possible mechanisms for biodegradation of Xenobiotic Compounds.

(d) Name one microbial group responsible for biodegradation of nitroaromatic compounds.

1+1+2+1

Or

(a) What is meant by biohydrometallurgy ?

(b) Discuss in brief the influences of (i) microbial parameters and (ii) mineral properties on bioteaching.

1+(2+2)

2. (a) What is meant by microbial ecology ? What is indigenous microbiota ?

(b) Name the categories of normal flora of human.

(c) What is meant by opportunistic pathogen ? give example. (1+1)+1(1+1)

Or

(a) Briefly state two beneficial effects of normal flora.

(b) What do you mean by microbial pathogenecity ?

(c) What is infection ?

(d) What is metagenome ? 2+1+1+1

3. (a) What is PCR Cycle ?

(b) Mention the phases of PCR Cycle.

(c) Name the rate limiting enzyme of PCR cycle including its brief description. 1+1(1+2)

Or

(a) What is the advantage of C-4 Cycle over C3 Cycle ?

(b) Give a brief lay-out of C-4 pathway—$NADP^+$ Maleic enzyme mediated. 2+3

4. (a) Give a brief account of nitrification process of Nitrogen cycle including the bacterial involvement in each step. 4+1

Or

(a) What is the advantage of biological nitrogen fixation (BNF) over industrial nitrogen fixation.

(b) What are diazotrophs ? Name one free-living and are symbiont organism.

(c) Name the components of Nitrogenase enzyme.

2+(1+1)+1

(Unit—28)

Answer all questions from the following :

1. (a) What is immunological synapse ? Briefly point out the features of thymic selection during T-Cell development. How can you distinguish T_1 and T_2 B-Cells. 1+2+2

Or

(b) How T-Cell and B-Cell cooperate in the antiobody production ? 5

2. (a) Write a brief note on endocytic pathway of antigen processing and presentation. 5

Or

(a) What are the most polymorphic amino acid residues located in MHC molecules ? Mention the steps in allograft rejection. 2+3

3. (a) Describe the sensitization and effector phase of graft rejection. Write an anti-mitotic and an anti-inflammatory drugs for immunosuppression. 4+1

Or

(a) What do you mean by —

(i) T-Cell anergy ;

(ii) Plasticity of T-Cells ;

(iii) Negative selection of T-Cell. 2+1+2

4. (a) Discuss the mechanism of class switching. 5

Or

(a) Write the immunological functions of Tumor necrosis factor (TNF). 5

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[*Biochemistry, Molecular endocrinology and Reproductive Physiology*]

(Unit—27)

Answer all questions from the following :

1. (a) State the contribution of proteins and sugars in membrane heterogeneity.

   (b) What is receptor-mediated endocytosis ?

   (1½+1½)+2

   Or

   (a) What are cyclin-dependent kinases (CDKs) ? How are they regulated ?

   (b) Elaborate the mitogen-dependent and independent phases of cell cycle. (1+2)+2

2. (a) Describe the detailed structure of amylopectin.

   (b) Mention the regulation of glycogen synthase by reversible covalent modification.

   (c) How glycogen synthesis and breakdown are reciprocally regulated ? 2+1+2

   Or

(a) State different types of DNA polymorphism with special reference to single nucleotide polymorphism.

(b) What is micro RNA? (3+1)+1

3. (a) Discuss about the structures of different isoforms of superoxide dismutases mentioning their biological importance. 3+2

Or

(a) What is site-directed mutagenesis? State its basic mechanism.

(b) Write down the mechanism of action of chymotrypsin. (1½+1½)+2

4. (a) What are the unique properties of all stem cells?

(b) How are embryonic stem cells stimulated to differentiate?

(c) What is adult stem cells? 2+2+1

Or

(a) State briefly the basic characteristics of cancer cells.

(b) What is c-ras gene? How mutant Ras Protein is unregulated in cancer? 2+(1+2)

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(Unit—28)

Answer all questions from the following :

1. (a) State the principle and the procedure for array of hormones using RID.

(b) Mention the merits and demerits of RIA.

(1+2)+(1+1)

Or

(a) What are the active principles of thymus gland ?

(b) State the important biological activities of thymosin β4. 1+4

2. Disuss how increased thyroid hormone secretion during cold stress exerts immunoenhancing effects. 5

Or

Describe the apoptosis via the extrinsic pathway during male germ cell development. 5

3. (a) What is bipotential gonad ?

(b) Discuss on the genetical control of testis determination. 1+4

4. (a) "Oxidative stress affects ovulation and age-related fertility"—Discuss. 3+2

Or

(a) Describe the steps of IVF.

(b) Mention the role of gonadotropin releasing hormone in IVF. 3+2

[Biophysics (SPL)]

(Unit—27)

Answer all questions from the following :

1. (a) What do you understand by a molecular orbital ?

(b) Define the quantum numbers for defining an atomic orbital.

(c) Draw the Lewis dot structure of Nace and NH_3.

(d) Why is the value of second ionization potential higher than the first ionization potential ? 1+1+2+1

Or

(a) Derive Pouseilli's equation for a fluid flowing through a rigid tuse.

(b) What are the limitations of Pouseilli's equation for biological systems ?

(c) What is Pauli's exclusion principle ? 2+2+1

2. (a) Define efficiency and free energy of a biological system.

(b) Why is entropy of system considered as a state function ?

(c) The living system functions in a steady state under non-equilibrium—Explain the statement in light of thermodynamics. 2+1+2

Or

(a) What do you mean by order of reaction ? Classify it.

(b) What is Fick's first law of diffussion ? How can you calculate diffusion flux (J) from this law.

(c) Explain the molecular theory of surface tension. (1+1)+1+2

3. (a) Explain the general Jablonski diagram of absorption and flourescence emission spectra.

(b) Write the Frank Condon principle of flourescence enission spectrum.

(c) "Resolution (R) of a compound microscope depends on numerical aperture"—Why ? 2+2+1

Or

(a) Discuss the factors that affect electrophonetic mobility.

(b) Discuss the principle of ISO-electric focussing and mention the properties of carrier ampholytes.

(c) What is chemical shift ? Why is tetramethyl silane (TMS) used as an internal standard in NMR spectroscopy. 1+2+2

4. (a) Classify and explain the nature of protein folding.

(b) Write the principle of protein structure on the basis of Ramachandran Plot.

(c) Describe the protein stability with relation to post-translational modification. 2+1+2

Or

(a) What is contact potential ?

(b) Briefly discuss the different types of ion-selective electoodes and their applications.

(c) Discuss the design and application of oxygen electrodes. 1+2+2

Spl. Paper :
[*Biophysics and Electrophysiology with Structural Biology*]

(Unit—28)

Answer all questions from the following :

1. (a) Draw the molecular structure of water and specify the bonds lengths and angle.

(b) What do you understand by latent heat of fusion ?

(c) "The latent heat of vapourization of water at 100°C is 539.5 calories"—Explain the statement. 5

Or

(a) Define redox reactions ?

(b) Briefly state the role of ATP synthase complex in electron transport chain.

(c) How cells convert the stored metabolic energy of NADH and [$FADH_2$] into ATP ? 1+2+2

2. (a) With a suitable diagram, briefly describe the singer and Nicolson's fluid mosaic model of cell membrane.

(b) What types of intrinsic proteins are found in the cell membrane ?

(c) How does the dynamic movement of the cell membrane going on during cellular transport ? 2+1+2

Or

(a) What do you mean by Zeta and stern potential ?

(b) Derive the Nernst equation for membrane potential. 2+3

3. (a) Describe briefly the molecular events occuring at defined stages of the cell cycle.

(b) "Cell cycle studies are greatly simplified by using synchronized cells"—Justify the statement. 3+2

Or

(a) What do you understand by premature chromosome condensation ?

(b) Discuss the role of lecting as cell recognition molecules. 2+3

4. (a) Describe briefly the structural organisation of active site of the enzyme.

(b) "According to IUB (International Union of Biochemistry); hexokinase is recommended as EC 2.7.1.1"—Explain it.

(c) Co-relate the relationship between enzymes rate of reaction and Gibbs free energy (4G°). 2+1+2

Or

(a) What is activation energy ?

(b) State Arrhenious equation and discuss its application. 2+3

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