



বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

M.Sc. Examinations 2020

Semester IV

Subject: HUMAN PHYSIOLOGY

Paper: PHY – 403 (Special Paper)

(Theory)

Full Marks: 40

Time: 2hrs.

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

Unit: PHY 403.1A

(Special Paper A: Microbiology and Immunology)

*Answer any **One** of the following questions*

1. What is meant by genetic material? What was meant as “transforming principle” in Griffith’s interpretation? Write down the experiment that could establish DNA as genetic material. What is the significance of anti-sense RNA?
2. What is genetic recombination? How does transduction participate in recombination process? How do Generalized and Specialized transduction differ from each other? Give example of each type of bacteriophage. How does lysogeny gets established in bacteriophage lambda?
3. Write down the key features of eukaryotic chromosome. Write down the levels of chromatin packaging to give rise to metaphase chromosome. Mention the major characteristics of mammalian centromeres. What is the importance of telomere?
4. Describe the major steps in prokaryotic transcription. Write down the important features of Promoter in transcription. Write down the principles of action of inducer and corepressor with specific examples. Why operator is called a cis-acting site?
5. What is attenuation? Discuss attenuation as gene regulation with reference to tryptophan operon. Describe the structural features of IS elements. Differentiate conservative transposons and replicative transposons.
6. Write notes on:
 - A. Repetitive DNA.
 - B. Positive and negative regulation.
 - C. siRNA in gene silencing.

D. TATA Box and enhancer of eukaryotic chromosome.

Unit: PHY 403.2A

(Special Paper A: Microbiology and Immunology)

*Answer any **One** of the following questions*

1. Write down the mechanisms of cytotoxic T cell-mediated immune response against viral infection. What are granzymes? How NK cells are significant against virus-infected cells? What are PRR?
2. What is meant by engraftment? Describe the underlying processes for transplant rejection mentioning the details of different types of Grafts. What is Graft versus Host disease? Describe the HIV mechanism to cause acquired immunodeficiency in human.
3. Differentiate primary and secondary immune-deficiencies including description of a specific disorder of each type. Write down the features of SCID.
4. Give an overview of tumor antigen and immune response generated to that. Write down the major factors associated with tumor evasion to immune response. What are the major breakthroughs of cancer immunotherapy? Name two cytokines licensed for cancer immunotherapy in human.
5. Discuss the mechanism of inflammation including specific features and markers. Differentiate type I and type II hypersensitivity.
6. Write notes on:
 - A. CAMs.
 - B. Working principle of mRNA vaccine.
 - C. Mechanism of transformation of proto-oncogenes.
 - D. Allorecognition.

Unit: PHY 403.1C

(Special Paper C: Biochemistry, Molecular Endocrinology and Reproductive Physiology)

*Answer any **One** of the following questions*

1. a) Define karyotyping. Differentiate between asymmetric and symmetric karyotype. b) Mention different types of banding of chromosome in karyotyping. c) Describe the process of Q-banding and C-banding mentioning their advantages and disadvantages.
2. a) What is Blood- brain barrier? Write down the name of major small nitrogen containing neurotransmitters. b) Describe the metabolism of glutamate and GABA in our body. c) What is the relation of glutamate synthesis to citric acid cycle? d) Mention the role of glutamate as a transmitter in CNS. e) What do you know about glutamate excito-toxicity?
3. a) State the difference between cytokines and growth factors. b) Describe the cytokines of adaptive immunity mentioning their principal cell sources and biologic effects. c) What are



different types of interferons and their biologic function? Write notes on Type I and Type II cytokine receptors.

4. a) What are nanomaterials? b) Define nanocrystallite. Write a note on Quantum Confinement. c) Elaborate Physical, Chemical, Electrical and Magnetic properties of nanomaterials.
5. a) What is enzyme immobilization? Mention its advantages and disadvantages. b) Discuss the different carrier binding methods of enzyme immobilization. c) Write a note on cross-linking and entrapment of enzyme immobilization.
 - a) State the source and medical importance of non-functional plasma enzymes. b) Mention the name of some diagnostically important enzymes. c) Give examples of some important phase I and Phase II detoxification enzymes. d) Describe the catalytic cycle of cytochrome P450. d) Discuss the phase II reactions. What are non-microsomal enzymes?

Unit: PHY 403.2C

(Special Paper C: Biochemistry, Molecular Endocrinology and Reproductive Physiology)

*Answer any **One** of the following questions*

1. a) What is essential hypertension? How salt and water homeostasis is maintained in our body? b) Write down the components of renin-angiotensin system. c) What do you know about angiotensin-converting enzyme and angiotensin receptors? d) State the functions of angiotensin II.
2. a) How intramuscular triglycerides and mTOR are associated with insulin resistance? b) Discuss the pathophysiologic features of microvascular complications seen in diabetes mellitus. c) State the antiatherogenic and proatherogenic effects of insulin.
3. a) What are Sertoli and Leydig cell aging? b) How does aging influence on testosterone production and male fertility? c) Write down briefly on genetic risks of aging.
4. a) Discuss the effect of alcohol on different liver parameters. b) Discuss critically the growth and endocrine effects of alcohol in our body. c) Elaborate the effects of adolescent alcohol drinking on bone development?
5. a) What are Stimulant drugs? Give examples. b) Describe the pharmacological effect of cocaine. c) What are Sedatives? Discuss the effects of Barbiturates after acute and chronic administration in our body.
6. Write notes on:
 - E. Action of insulin on carbohydrate and protein metabolism,

- F. Obesity and type 2 diabetes mellitus,
- G. Pheochromocytoma,
- H. Drug abuse.

Unit: PHY 403.1E

(Special Paper E: Biophysics and Electrophysiology with Structural Biology)

*Answer any **One** of the following questions*

1. a) What is biomechanics? Explain with examples. b) Write the features of active and passive motions of kinematics. c) What is meant by kinesiology? d) "Our fundamental motion depends on osteokinematics"-Explain it. e) Voluntary motor balance is controlled by Limits of Stability (LOS)-Why? f) Discuss the advantages of first class lever system in our body with examples.
2. a) Write the principle of Fluorescence resonance energy transfer (FRET). b) What do you understand by photobleaching? c) What are the advantages of confocal microscopy? d) What is deconvolution? e) What are the AFM imaging artifacts? f) Discuss the merits and demerits of contact and non-contact mode of atomic force microscopy.
3. a) How photoreceptor cell are responsible for the development of photoreceptor potential? b) With a suitable diagram describe the membrane bound structure of rhodopsin protein. c) Describe the role of fovea centralis in the context of potential development. d) Write the process of phototransduction mechanism with a suitable schematical presentation. e) Discuss in brief the relation between dark current and receptor potential.
4. a) Derive the Nernst equation for membrane potential. b) Describe the molecular mechanism of olfactory transduction. c) What do you understand by labeled line coding of taste sensation. d) Discuss the application of laser in biomedical field.
5. a) What is electroretinogram (ERG)? b) "The Eye generates a lot of electrical signal, some fast and some slow"- Why? c) Describe in detail the wave pattern of electroretinogram with a suitable graph. d) What is a dark adapted and light adapted feature of photoreceptor cells? e) Write a short note on Granit's Landmark Study of ERG. f) What are oscillatory potentials of ERG?
6. a) What is a transducer? b) Discuss briefly about gating kinetics and physio-pharmacology of ion channels. c) Mention the physiological significance of Hodgkin-Huxley model. d) Write briefly about the source and mechanism of formation of rhythmic EEG. e) Discuss the EEG changes during sleep.

Unit: PHY 403.2E

(Special Paper E: Biophysics and Electrophysiology with Structural Biology)

*Answer any **One** of the following questions*

1. What is partition coefficient? Write the principle of ion exchange chromatography. What is the difference between ion exchange chromatography and affinity chromatography? Discuss briefly about the detection systems of thin layer chromatography(TLC).What is the difference between absorption and adsorption? What is induction effect in chromatography?
2. Define the terms crystallographic axes, axes of symmetry, planes of symmetry, centre of symmetry of a crystal. Write about the application of crystallography in biological sciences. What



are monoclinic and triclinic crystals? Mention the basic characteristics of crystals. Discuss briefly about the curve of cooling of crystalline and amorphous substances. Define lattice energy.

3. Write the principle of circular dichroism. What is the difference circular dichroism and optical rotatory dispersion(ORD)? Define the term molar ellipticity. Write the applications of circular dichroism in biology.

4 a) What is nuclear medicine? b) Why is Nuclear Medicine so important? c) Write the importance of HIDA (hepatobiliaryiminodiacetic acid) scan. d) Write the principle of PET scanning. e) What is non-ionizing radiation (NIR)? Give examples. f) Describe the basic control methods of NIR.

5. a) What is meant by bioelectromagnetism (BEM)? b) Explain the nature of current dipole (Q) in the light of BEM. c) How can magnetic or electromagnetic fields do that relate to biology? d) What is magnetite? e) Explain the importance of magnetite in biological system. e) What could you expect during a Bio-Magnetic therapy session?

6. a) Describe in details the types of photochemical reactions in terms of Gibbs energy. b) State the differences in between the first and second law of photochemistry. c) Explain the justification of Beer-Lambert law in the field of absorption of light. d) What is Stark-Einstein's photo-equivalence law? e) Explain the Jablonski Diagram in term of luminescence of light.

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