

Ph. D. Entrance Test – 2015**Subject: Bio-Physics****Paper – I**

Important: Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No.

*In Figure**In Words*

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O.M.R. Answer Sheet Serial No.

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Signature of Candidate: _____

Signature of Invigilator: _____

Time: 60 Minutes Number of Questions: 50 Maximum Marks: 50**DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.****INSTRUCTIONS:**

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains **50** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen**. **There shall be no negative marking for wrong answers.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
8. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
9. For rough work only the blank sheet at the end of the Question Booklet be used.
10. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
11. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
12. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
13. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistance or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
14. **Communication equipment such as mobile phones, pager, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
15. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

- The area of allowed regions in the Ramachandran plot will be least for -
 - Gly
 - L-Ala
 - L-Pro
 - α -methyl L-Valine
- Small RNAs with internally complimentary sequences that form hair-pin like structure, synthesized as precursor RNAs and cleared by endonuclease to form short duplexes are called-
 - Sn RNA
 - mRNA
 - tRNA
 - miRNA
- Transport of water across aquaporins is regulated by the presence of which of the following sequence of three highly conserved amino acids-
 - Ala- Asn-Pro
 - Pro-Asn-Ala
 - Asn-Pro-Ala
 - Pro-Ala-Asn
- Which of the cyclins have essential functions in S-phase of cell cycle-
 - A-type
 - B-type
 - D-type
 - Both B-type and D-type
- During generation of an action potential, depolarization is due to-
 - K^+ - efflux
 - Na^+ - efflux
 - Na^+ - influx
 - K^+ - influx
- G-protein linked receptors are transmembrane proteins of-
 - Single pass
 - Three pass
 - Five pass
 - Seven pass
- The cell signaling response is generated and maintained mainly by which of the following pair of cytokins-
 - IL-4 and IL-10
 - IL-12 and IFN- γ
 - IFN- γ and TNF- α
 - IL-2 and IL-12
- Elisa assay uses-
 - An enzyme which can react with secondary antibody
 - An enzyme which can react with the antigen
 - A substrate which gets converted into a colored product
 - A radiolabelled secondary antibody
- Which of the following molecules is involved in Ca^{2+} -dependent cell-cell adhesion-
 - Calmodulin
 - Cadherin
 - N-CAM
 - Calpain
- Routinely used glucose biosensor estimates blood glucose level by sensing the concentration of-
 - Glucose
 - Oxygen
 - δ -gluconolactone
 - H_2O_2

20. In gene regulation, the Open Reading Frame (ORF) implies-
- A) Intervening nucleotide sequence in between two genes
 - B) A series of triplet codons not interrupted by a stop codon
 - C) A series of triplet codons that begins with a start codon and ends with a stop codon
 - D) The exonic sequence of a gene that corresponds to the 5' UTR of the mRNA and thus does not code for the protein
21. In host-graft interaction, the rejection of the graft does not involve-
- A) Erythrocytes
 - B) T-Cells
 - C) Macrophages
 - D) Polymorpho-nuclear leucocytes
22. Which of the following waves is likely to be absent in a normal ECG-
- A) P
 - B) T
 - C) Q
 - D) R
23. In a normal human eye, for sharp image formation on the retina, maximum dioptric power is provided by the -
- A) Retina
 - B) Cornea
 - C) Anterior surface of the lens
 - D) Posterior surface of the lens
24. The base analog 2-aminopurine pairs with thymine, and can occasionally pair with cytosine. The type of mutation induced by 2-aminopurine is-
- A) Transversion
 - B) Transition
 - C) Deletion
 - D) Non sense
25. A single strand nick in the parental DNA helix just ahead of a replication fork causes the replication fork to break. Recovery from this calamity requires-
- A) DNA ligase
 - B) DNA primase
 - C) Site specific recombination
 - D) Homologous recombination
26. Which of the following processes interferes in sequence based phylogeny-
- A) Horizontal gene transfer
 - B) Adaptive mutations
 - C) DNA repair
 - D) Reverse transcription
27. Indirect immunofluorescence involves fluorescently labeled-
- A) Immunoglobulin-Specific antibodies
 - B) Antigen-Specific antibodies
 - C) Hapten-Specific antibodies
 - D) Carrier-Specific antibodies
28. Measurement and mapping with spatial resolution, the membrane potential of a cell, which is too small for microelectrode impalement, is done using-
- A) Radioisotope
 - B) Voltage-sensitive dye
 - C) pH-sensitive dye
 - D) Vital dyes

29. Which nitrogen of adenosine gets protonated if the pH of the nucleoside is lowered from 7 to 3-
 A) N 1 B) N 3 C) N 7 D) N 9
30. The oligopeptide, F-A-R-P-M-T-S-T-P-G-F, is treated with trypsin, chymotrypsin and carboxypeptidase B, then apart from the original peptide, the number of fragments obtained will be-
 A) 4 B) 3 C) 2 D) 0
31. Which one of the following interactia plays a major role in stabilizing B-DNA-
 A) Hydrogen bond B) Hydrophobic interaction
 C) Van dar Waal's interaction D) Ionic interaction
32. Phosphatidyl serine, an important component of biological membrane is located in-
 A) The outer leaflet but flip-flops to inner leaflet under specific conditions
 B) Both the leaflets
 C) The middle of the bilayer
 D) The minor leaflet but flip-flops to outer leaflet under specific conditions
33. The major disadvantage of using liposome as a targeted drug delivery vehicle is that-
 A) It gets internalized by phagocytes inside the lysomes
 B) It is very unstable and has low shelf-life
 C) It gets intscalated in cell membranes
 D) It's drug intrapinent efficiency is very low.
34. ATP- binding casette (ABC) transporters-
 A) are all P-glycoproteins
 B) are found only in eukaryotes
 C) are both a membrane-spanning domain that recognizes the substrate and an ATP- binding domain
 D) affect translocation by forming channels
35. Site-specific recombination results in precise DNA rearrangements, which is limited to specific sequences. The enzymes that are important to carry out the process are
 A) Restriction endonuclease and DNA polymerase
 B) Nuclease and ligase
 C) DNA polymerase and ligase
 D) DNA polymerase and DNA gyrase
36. Which of the following statement is not true about the small interfering RNA (si RNA)-
 A) si RNA has a 21-25 nucleotide sequence with 2-nucleotide overhanging at the 3' end
 B) si RNA is processed by the RNA-protein complex RISC
 C) si RNA is often induced by viruses
 D) si RNA does not generally act at the level of transcription

37. Which of the following statement is incorrect in relation to the treatment of pre-B cells with phorbol esters-
- Phorbol esters activate NF κ B for translocation into the nucleus
 - Phorbol esters activate protein Kinase C
 - Phorbol esters lead to phosphorylation of NF κ B
 - Phorbol esters remove the inhibitor from inactive NF κ B complex in the cytoplasm
38. Mycobacterium tuberculosis is an intra-cellular bacterium. It prefers to infect-
- Macrophages
 - B-Cells
 - T-Cells
 - Neutrophils
39. Integrin molecules link extracellular matrix (ECM) to the actin cytoskeleton of the cell. Integrin binds to which of the following ECM macromolecules-
- Laminin
 - Collagen
 - Fibronectin
 - Vitronectin
40. eD19 is a marker for-
- B-cells
 - T-cells
 - Macrophages
 - NK- cells
41. Which one of the following oncogene-protein product is not correct-
- erb A- thyroid hormone receptor
 - erb B – epidermal growth factor receptor
 - ras – guanine nucleotide binding protein with GTP-ase activity
 - fos- platelet derived growth factor receptor
42. The *ced-9* gene appears to be a binary switch that regulates cellular survival and apoptosis in nematodes considering that *Ced-9* proteins can bind to and inactivate *Ced-4*, which of the following would lead to apoptosis-
- activation of *Ced-9* gene
 - Loss of function of *Ced-9* gene
 - Loss of function of *Ced-3* gene
 - Loss of function of *Ced-4* gene
43. Photosystem-II functions as a light-dependent water-plastoquinone oxidoreductase. What are the names of two reaction centre proteins that bind the electron, transfer, prosthetic groups, such as P 680, phrophytin and plastoquinone-
- C P 43 and C P 47
 - D1 and D 2
 - 33 KDa and 23 KDa
 - F_A and F_B
44. If r denotes the correlation coefficient and m denotes the slope of regression line, interchanging X and Y axis would-
- Change m but not r
 - Change r but not m
 - Change both m and r
 - Not change r nor m

45. Phosphorylation of ADP to ATP occurs through energy metabolism comprising oxidative phosphorylation or substrate-level phosphorylation or photo phosphorylation (in plants). ATP can also be formed from ADP through the action of adenylase Kinase. The crystal structure determination of adenylase Kinase shows that the C-terminal region has the sequence,

Val-Asp-Asp-Val-Phe-Ser-Gln-Val- Cys-Thr-HIS-Leu-Asp-thr-Leu-Lys

What can be a possible conformation of this sequence-

- A) A helix that is not amphipaltic B) Amphipaltic helix
 C) Lencine zipper helix D) Beta hairpin
46. Consider a 51-residuc long protein containing only 100 bonds about which rotation can occur. Assume that 3 orientations per bond are possible, based on these assumptions how many conformations will be possible for this protein-
- A) 3^{100} B) 100^3 C) 3^{51} D) $51 \times 100 \times 3$
47. A plot of $V/[S]$ versus V is generated for an enzyme catalyzed reaction and a straight line is obtained. Indicate the information that can be obtained from the plot-
- A) V_{max} and turnover number K_m can be obtained only from a plot of $1/V$ versus $1/[S]$
 B) K_m/V_{max} from the slope
 C) V_{max} , K_m and turnover number
 D) Only K_m and turnover number
48. Differential Scanning Calorimetry (DSC) study of calf thymus DNA was carried out measure the midpoint of thermal denaturation (T_m), ΔH_m (enthalpy change at T_m) and ΔC_p (constant - pressure heat capacity change). It has been observed that $\Delta C_p = 0$, $T_m = 755^\circ\text{C}$ and $\Delta H_m = 50.4 \text{ K cal/mole}$. The Gibbs free energy change at 37°C is then-
- A) 25.5 K cal/mole B) 2.6 K cal/mole
 C) 0.6 K cal/mole D) 5.6 K cal/mole
49. The use of biotinylated secondary antibody in ELISA-
- A) Increases the sensitivity of the assay but compromises the specificity
 B) Increases the sensitivity of the assay without compromising the specificity
 C) Does not alter either sensitivity or specificity
 D) Decreases both sensitivity and specificity
50. The intestinal absorption of glucose is impaired by Ourbain, an inhibitor of Na^+/K^+ -ATPase. Indicate the correct explanation-
- A) The inhibitor has blocked the transport of Na^+ from intestinal lumen to the epithelial cells.
 B) The inhibitor has blocked Na^+ transport from the epithelial cells to the interstitial spaces.
 C) The inhibitor has blocked the transport of Na^+ from epithelial cells to the intestinal lumen.
 D) The inhibitor has blocked Na^+ transport from the interstitial space to the epithelial cells.