



LIFE SCIENCES

Name & Signature of the Invigilator

PAPER – II

OMR Answer Sheet No. :

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DEC-21/04

Roll No. :

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(in figures as in Hall Ticket)

Roll Number in words :

041715

Question Booklet Sl. No.

Time : 2 Hours]

No. of Printed Pages : 20

[Maximum Marks : 200

Instructions for the Candidates

- Write your Roll Number in the space provided on the top of this page.
- This paper consists of **one hundred (100)** multiple choice type of questions. **All** questions are compulsory.
- At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
 - To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker seal and do not accept an open booklet.
 - Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
 - After this verification is over, the Test Booklet Number should be entered on the OMR Answer Sheet and the OMR Answer Sheet Number should be entered on this Test Booklet.
- Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the oval as indicated below on the correct response against each item.
Example : (A) (B) (C) (D) where (B) is the correct response.
- Your responses to the items are to be indicated on the OMR Answer Sheet under Paper – II only. If you mark your response at any place other than in the oval in the OMR Answer Sheet, it will not be evaluated.
- Rough Work is to be done in the end of this booklet.
- If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
- You have to return the original OMR Answer Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet and duplicate copy of OMR Answer Sheet on conclusion of examination.
- Use only Blue/Black Ball point pen.
- Use of any calculator or any electronic devices or log table etc., are prohibited.
- There shall be no negative marking.

પરીક્ષાર્થીઓ માટે સૂચનાઓ

- આ પાનાની ટોચ પર દર્શાવેલી જગ્યામાં તમારો રોલ નંબર લખો.
- આ પ્રશ્નપત્રમાં બહુવૈકલ્પિક ઉત્તરો ધરાવતા સો (100) પ્રશ્નો આપેલા છે. બધા જ પ્રશ્નો ફરજિયાત છે.
- પરીક્ષાની શરૂઆતમાં આપને પ્રશ્નપુસ્તિકા આપવામાં આવશે. પ્રથમ પાંચ (૫) મિનિટ દરમિયાન તમારે પ્રશ્નપુસ્તિકા ખોલી અને ફરજિયાતપણે નીચે મુજબ પરીક્ષણ કરવું :
 - પ્રશ્નપુસ્તિકાનો વપરાશ કરવા માટે આ કવર પૃષ્ઠની ધાર પર આપેલ સીલ સ્ટીકર ફાડી નાખો. કોઈપણ સંજોગોમાં સીલ સ્ટીકર વગરની કે ખુલ્લી પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં.
 - કવર પૃષ્ઠ પર છપાયેલ નિર્દેશાનુસાર પ્રશ્નપુસ્તિકાના પ્રશ્નો, પૃષ્ઠો અને સંખ્યાને બરાબર ચકાસી લો. પ્રામીયુક્ત પ્રશ્નપુસ્તિકા કે જેમાં પ્રશ્નો/ પૃષ્ઠો ઓછાં હોય, બે વાર છપાયા હોય, અનુક્રમમાં અથવા અન્ય કોઈ ફરક હોય અર્થાત કોઈપણ સંજોગોમાં પ્રામીયુક્ત પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં. અને જો પ્રામીયુક્ત પ્રશ્નપુસ્તિકા મળી હોય તો નિરીક્ષક પાસેથી તુરંત જ બીજી સારી પ્રશ્નપુસ્તિકા મેળવી લેવી. આ માટે ઉમેદવારને પાંચ (૫) મિનિટનો સમયગાળો આપવામાં આવશે. પછીથી, પ્રશ્નપુસ્તિકા બદલવામાં આવશે નહીં કે કોઈ વધારાનો સમયગાળો આપવામાં આવશે નહીં.
 - આ ચકાસણી સમાપ્ત થાય પછી, પ્રશ્નપુસ્તિકાનો નંબર OMR જવાબ પત્રક પર લખવો અને OMR જવાબ પત્રકનો નંબર પ્રશ્નપુસ્તિકા પર લખવો.
- પ્રત્યેક પ્રશ્ન માટે ચાર જવાબ વિકલ્પ (A), (B), (C) અને (D) આપવામાં આવેલ છે. તમારે સાચા જવાબના ઓવલ (oval) ને નીચે આપેલ ઉદાહરણ મુજબ પેનથી ભરીને સંપૂર્ણ કાળું કરવાનું રહેશે.
ઉદાહરણ : (A) (B) (C) (D) કે જ્યાં (B) સાચો જવાબ છે.
- આ પ્રશ્નપુસ્તિકાના પ્રશ્નોના જવાબ અલગથી આપવામાં આવેલ OMR જવાબ પત્રકમાં પેપર-II લખેલ વિભાગમાં જ અંકિત કરવા. જો આપ OMR જવાબ પત્રકમાં આપેલ ઓવલ (oval) સિવાય અન્ય સ્થાને જવાબ અંકિત કરશો તો તે જવાબનું મૂલ્યાંકન કરવામાં આવશે નહીં.
- કાચું કામ (Rough Work) પ્રશ્નપુસ્તિકાના અંતિમ પૃષ્ઠ પર કરવું.
- જો આપ OMR જવાબ પત્રક નિયત જગ્યા સિવાય અન્ય કોઈપણ સ્થાને, આપનું નામ, રોલ નંબર, ફોન નંબર અથવા એવું કોઈ ચિહ્નકે જેનાથી તમારી ઓળખ થઈ શકે, અંકિત કરશો અથવા અલ્પ ભાષાનો પ્રયોગ કરો, અથવા અન્ય કોઈ અનુચિત સાધનોનો ઉપયોગ કરો, જેમકે અંકિત કરી દીધેલ જવાબ ભૂંસી નાખવો કે સફેદ શાહીનો ઉપયોગ કરી બદલશો તો આપને પરીક્ષા માટે અયોગ્ય જાહેર થઈ શકો છો.
- પરીક્ષા સમય પૂરો થઈ ગયા બાદ ઓરીજીનલ OMR જવાબ પત્રક જે તે નિરીક્ષકને ફરજિયાત સોપી દેવું અને કોઈ પણ સંજોગોમાં તે પરીક્ષા ખંડની બહાર લઈ જવું નહીં. પરીક્ષા પૂર્ણ થયા બાદ ઉમેદવાર ઓરીજીનલ પ્રશ્નપુસ્તિકા અને OMR જવાબ પત્રકની ડુપ્લિકેટ કોપી પોતાની સાથે લઈ જઈ શકે છે.
- માત્ર કાળી / ભૂરી બોલ પોઈન્ટ પેન વાપરવી.
- કેલ્ક્યુલેટર, લોગ ટેબલ અને અન્ય ઈલેક્ટ્રોનિક યંત્રોનો ઉપયોગ કરવાની મનાઈ છે.
- ખોટા જવાબ માટે નકારાત્મક ગુણાંકન પ્રથા નથી.



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DO NOT WRITE HERE



LIFE SCIENCES
Paper – II

1. Identify the incorrect statement with respect to the red muscle.
(A) Red muscle is rich in myoglobin.
(B) Red muscle is rich in enzymes of Kreb's cycle.
(C) Red muscle makes lot of lactic acid.
(D) Red muscle undergoes slow rate of contraction.

2. A plant biologist interested in developing seed sterility in Arabidopsis, induces random mutations in a number of specific genes and then determines which of the resulting gene mutant plants have impaired seed development. This approach is an example of
(A) Forward genetics
(B) Reverse genetics
(C) Both forward and reverse genetics
(D) Neither forward nor reverse genetics

3. An amino acid residue was substituted in a protein using mutagenesis. Change in secondary structure of the protein can be studied using which technique ?
(A) UV-Visible absorption spectroscopy (B) Fluorescence spectroscopy
(C) ESR spectroscopy (D) Circular dichroism spectroscopy

4. Which radiation does not change its direction while passing through a magnetic field ?
(A) α radiation (B) β^+ radiation
(C) β^- radiation (D) X-rays

5. Po (atomic mass 216 and atomic number 84) undergoes decay to form Po (atomic mass 212 and atomic number 84).
$${}_{84}^{216}\text{Po} \rightarrow \rightarrow \rightarrow {}_{84}^{212}\text{Po}$$

What radioactive particles are emitted in this decay ?

(A) $2\alpha + 2\beta^-$	(B) $\alpha + \beta^-$
(C) $2\alpha + 2\beta^+$	(D) $\alpha + 2\beta^-$

6. Removal of anthers from the bisexual flower before the anther is mature is known as
(A) Fertilization (B) Emasculation
(C) Hybridization (D) Sterilization



7. The amino acids present in a peptide, which cannot be distinguished in a MALDI-TOF experiment are
- (A) Lysine and Glutamic acid (B) Leucine and Isoleucine
(C) Isoleucine and Glutamic acid (D) Lysine and Leucine
8. Which of the following techniques can be used to find free radical content in a sample ?
- (A) Atomic absorption spectroscopy (B) ESR spectroscopy
(C) NMR spectroscopy (D) Raman spectroscopy
9. COVID-19 does not possess reverse transcriptase. Why ?
- (A) Its genetic material is not RNA
(B) Its genetic material is double stranded RNA
(C) Its genetic material is positive sense single stranded RNA
(D) Its genetic material is negative sense single stranded RNA
10. What is the function of DNA Polymerase- α in eukaryotic replication ?
- (A) Replication of leading strand (B) Replication of lagging strand
(C) Priming DNA synthesis (D) Replication repair
11. AGAMOUS gene is involved in the development of
- (A) Leaf development (B) Shoot development
(C) Carpel development (D) Root development
12. Ribosomes were isolated from bacteria grown in heavy medium (^{13}C and ^{15}N) and from bacteria grown in a light medium (^{12}C and ^{14}N). These ribosomes were added to an *in vitro* system actively engaged in protein synthesis. An aliquot removed several hours later and was analysed by density gradient centrifugation. How many bands of 70S ribosomes would you expect to see in the density gradient ?
- (A) 2 (B) 4 (C) 6 (D) 8
13. How does Diphtheria toxin inhibit translation in humans ?
- (A) Inhibits peptidyl transferase in the large ribosomal subunit
(B) Inhibits aminoacyl tRNA binding to small subunit
(C) Being aminoacyl-tRNA analog causes premature chain termination
(D) ADP ribosylates eEF2 to cause its catalytic inactivation



14. Which heat shock protein works both as chaperone and protease ?
(A) Hsp60 (B) Hsp70
(C) Hsp100 (D) Hsp40
15. In a centrifugation experiment, if the rotor diameter is twice that of the original one. What is the kind of change expected in the RCF value ?
(A) Increases by two fold (B) Decreases by two fold
(C) Increases by four fold (D) Decreases by four fold
16. Following are the various events that occur during the development of embryo sac in plants. Identify the correct order.
1. PCD of haploid megaspores
2. MMC formation
3. Movement of the polar nuclei towards the centre
4. Cellularization of the embryo sac
5. Functional Megaspore (FM) formation
6. Egg cell formation
(A) 2, 1, 5, 3, 4, 6 (B) 2, 1, 3, 6, 4, 5
(C) 1, 3, 5, 4, 6, 2 (D) 5, 4, 3, 6, 2, 1
17. During pregnancy which of the following hormones maintains integrity of the uterine wall ?
(A) Estrogen (B) Progesterone
(C) Oxytocin (D) Prolactin
18. While separation of a protein mixture, a protein (Mw 65 kD, pI 6.7) is contaminated with two other proteins, one with a similar molecular mass and pI of 7.0 whereas the other has a molecular mass of 120 kD and pI of 6.5. Suggest a procedure to purify the protein.
(A) By size exclusion chromatography only
(B) By size exclusion chromatography followed by ion exchange chromatography
(C) By ion exchange chromatography
(D) By affinity chromatography only
19. Plasma membrane bound aquaporins function can be inhibited by
(A) Mercury (B) Sodium Chloride
(C) Ammonium Sulphate (D) Calcium Carbonate



20. Which method was used to sequence the human genome ?
- (A) Cytogenetic mapping
 - (B) Shotgun sequencing
 - (C) Chromosome walking
 - (D) Radiation hybrid mapping
21. Which one of the following macromolecule is often used to establish family trees for organisms because it is present in all organisms and does not accumulate mutations quickly ?
- (A) rRNA
 - (B) Fibrino peptides
 - (C) Chloroplast DNA
 - (D) Mitochondrial DNA
22. Action of topoisomerase leads to changes in
- (A) Linking number of ss linear DNA
 - (B) Linking number of ds linear DNA
 - (C) Linking number of closed circular ss DNA
 - (D) Linking number of closed circular ds DNA
23. What is the melting temperature of the following PCR primer ?
5'-ATCGATCCTTAGGATAGCG-3'
- (A) 52°C
 - (B) 56°C
 - (C) 60°C
 - (D) 65°C
24. Formation of seed without fertilization is called
- (A) Apomixis
 - (B) Parthenocarpy
 - (C) Vegetative reproduction
 - (D) Sexual reproduction
25. Wobble pairing occurs between
- (A) 1st nucleotide of codon and 3rd nucleotide of anticodon
 - (B) 3rd nucleotide of codon and 3rd nucleotide of anticodon
 - (C) 3rd nucleotide of codon and 1st nucleotide of anticodon
 - (D) 1st nucleotide of codon and 1st nucleotide of anticodon
26. Testosterone is synthesized by which of the following ?
- (A) Seminiferous tubules
 - (B) Interstitial cells
 - (C) Vas deferens
 - (D) Prostate gland



27. Which of the following prokaryotic organism has largest genome known till date ?
- (A) *Bradyrhizobium japonicum* (B) *Myxococcus xanthus*
(C) *Saccharomyces cerevisiae* (D) *Sorangium cellulosum*
28. If the pathogens have spread on the large area then which principle you need to apply to stop them from entering the newer area.
- (A) Exclusion (B) Eradication
(C) Avoidance (D) Protection
29. Oxidation of 6 molecules of glucose by pentose phosphate pathway produces the
- (A) 6 molecules of pentose, 6 molecules of NADPH and 6 molecules of CO₂
(B) 6 molecules of pentose, 12 molecules of NADPH and 6 molecules of CO₂
(C) 12 molecules of pentose, 12 molecules of NADPH and 6 molecules of CO₂
(D) 8 molecules of pentose, 6 molecules of NADPH and 6 molecules of CO₂
30. According to the Histogen theory of apical meristem development, plerome is responsible for the formation of
- (A) Epidermis (B) Cortex
(C) Vascular structures (D) Hypodermis
31. Who rejected the concept of abiogenesis very first time ?
- (A) Louis Pasteur (B) Francesco Redi
(C) John Needham (D) John Tyndall
32. Agropine is formed by the
- (A) Condensation of alpha ketoglutarate with arginine
(B) Phosphodiester of sucrose and L-arabinose
(C) Condensation of glutamate with mannose
(D) Condensation of pyruvate with arginine
33. Which of the following quantitative proteomics method utilises light and heavy versions of biotinylated iodoacetamide reagent to label the proteome sample ?
- (A) Protein microarrays
(B) Isotope coded affinity tag
(C) Metabolic stable isotope coding
(D) Enzymatic stable isotope coding



34. During the isoelectric focusing (IEF), a protein in a pH region above its isoelectric point (pI) will migrate towards the _____ on an immobilized pH gradient (IPG) strip.
- (A) Center of the gel (B) Anode
(C) Cathode (D) Stop migrating
35. In yeast-two hybrid system, the prey library is constructed by cloning cDNA sequences into the vector adjacent to the DNA sequence for the _____ domain of the transcription factor Gal4 and then introduced into yeast cells.
- (A) Transcription activation
(B) DNA binding
(C) Ribosome-binding
(D) Calmodulin-binding
36. Which one out of the following is not a connecting link ?
- (A) Peripatus (B) Archeapterix
(C) Trypanosoma (D) Balanoglossus
37. Which one of the following is converted into a variety of sulphur compounds that serve as nuclei for water droplet formation, contributing to the formation of clouds when it enters the atmosphere ?
- (A) Dimethyl sulphonioacetate
(B) Dimethyl sulphide
(C) Dimethyl sulphate
(D) Dimethyl sulphoxide
38. What is the major difference between phase contrast and differential interference contrast microscopy ?
- (A) Light source (B) Path of light
(C) Lamda of light (D) Sample preparation
39. Select the wrong statement about MHC molecules.
- (A) MHC molecules are recognised by T-cells
(B) MHC molecules are known as HLA in humans
(C) MHC molecules are highly polymorphic
(D) MHC molecules are secreted by T-cells



40. A thymocyte is a
- (A) Hematopoietic progenitor cell
 - (B) Lymphocyte within the thymus
 - (C) Thymic epithelial cell
 - (D) Cortical epithelial cell of the thymus
41. According to ABC mode of flower development, what will be the flower organization if A class of gene is mutated
- (A) sepal-sepal-carpel-carpel
 - (B) sepal-petal-carpel-carpel
 - (C) sepal-petal-stamen-carpel
 - (D) carpel-stamen-stamen-carpel
42. Which one of the following is correct statement about Nitric oxide (NO) ?
- (A) Nitric oxide (NO) is a secondary messenger and able to diffuse across cell membrane. It acts as vasodilator and increases blood flow to lower the blood pressure.
 - (B) Nitric oxide (NO) is a primary messenger and unable to diffuse across cell membrane. It acts as vasodilator and increase blood flow to lower the blood pressure.
 - (C) Nitric oxide (NO) is a tertiary messenger and able to diffuse across cell membrane. It acts as vasoconstrictor compound and increases the blood pressure.
 - (D) Nitric oxide (NO) is a neurohormone and unable to diffuse across cell membrane. It acts as vasoconstrictor compound and increases blood flow to increase blood pressure.
43. During the embryonic development, at morula stage embryo contains inner cell mass and outer cell mass. What is the future of inner and outer cell mass ?
- (A) Embryo and fetus from inner cell mass, whereas placenta from outer cell mass
 - (B) Chorionic membrane from inner cell mass, whereas amniotic membrane from outer cell mass
 - (C) Amniotic membrane from inner cell mass, whereas yolk-sac and fetus from outer cell mass
 - (D) Chorionic membrane from inner cell mass, whereas placenta and yolk-sac from outer cell mass
44. In children, when hypothyroidism is associated with physical and mental retardation, collectively known as
- (A) Goiter
 - (B) Gigantism
 - (C) Cretinism
 - (D) Myxedema



45. What happens to the root, if the QC cells of the apical meristem are damaged ?
- (A) New QC is formed by the stele cells
 - (B) New QC is formed by the procambium cells
 - (C) The root continues growing without any new QC
 - (D) New QC is formed by the root cap cells
46. After the treatment of drug in cell culture, which one of the following technique is preferable to study the phosphorylation status of specific protein ?
- (A) Western blot analysis
 - (B) Colony hybridization
 - (C) Array CGH technique
 - (D) DNA fingerprinting
47. The wavelength of fluorescent light is always greater than that of the exciting radiation - is stated by
- (A) Lamberts law
 - (B) Mikhael Tsvet
 - (C) Stokes law
 - (D) Mullis law
48. What is the mechanism of anticoagulant action of sodium oxalate ?
- (A) Inhibits thrombin from acting on fibrinogen
 - (B) Inhibits platelets
 - (C) Inhibits fibrin
 - (D) Chelates calcium ions
49. Which one of the following is the function of the Golgi apparatus ?
- (A) Processing and glycosylation of proteins
 - (B) Amino acid metabolism
 - (C) Nucleic acid metabolism
 - (D) Lipid metabolism
50. Viviparous nature of seed germination occurs in
- (A) Mango
 - (B) *Rhizophora*
 - (C) Banana
 - (D) *Rhizoctonia*



51. A transcription unit is 8000 nucleotides long. If only 15% of this unit is exon, calculate the approximate molecular weight of the protein encoded.
- (A) 40 kDa
 - (B) 44 kDa
 - (C) 1200 kDa
 - (D) 100 kDa
52. Colocalization of two fluorescently labelled proteins in an organelle in the cell is usually visualised by
- (A) Phase contrast microscopy
 - (B) Scanning electron microscopy
 - (C) Atomic force microscopy
 - (D) Confocal microscopy
53. A linear DNA is 100% labelled at one end and has three restriction sites for EcoRI. If it is partially digested by EcoRI so that all possible fragments are produced, how many of these fragments will be labelled and how many non-labelled ?
- (A) 4 labelled; 6 unlabelled
 - (B) 4 labelled; 4 unlabelled
 - (C) 3 labelled; 5 unlabelled
 - (D) 3 labelled; 3 unlabelled
54. A cell, cytoplasm having a water potential (ψ_w) of -0.732 MPa was kept in 0.1 M ($\psi_w = 0.244$ MPa) sucrose solution for attaining equilibrium. The movement of water molecules is
- (A) The movement of water molecules from the cell to sucrose solution
 - (B) The movement of water molecules from sucrose solution to the cell
 - (C) No movement of water molecules
 - (D) Sucrose moves into the cell
55. The frequency of crossing over between any two linked genes is
- (A) Higher if they are recessive
 - (B) Proportional to the distance between them
 - (C) Determined by their relative dominance
 - (D) The same as if they were not linked