LIFE SCIENCES

Name & Signature of the Invigilator

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PAPER-III
SEPT/13/04

ICR Answer Sheet No. : | | | | | |

Roll No. : | | | | | |

Roll Number in words : .....

.....

Time : 2.30 Minutes] **No. of Printed Pages : 20** **[Maximum Marks : 150**

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of Seventy five (75) multiple choice type questions. All questions are compulsory.
3. At the commencement of examination, the question booklet will be given to candidate. In the first 5 minutes, candidate is requested to open the booklet and compulsorily examine it as below
   (i) 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.
   (ii) 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 five minutes. Afterwards, neither the question booklet will be replaced nor any extra time will be given.
   (iii) After this verification is over, the test booklet number should be entered in the ICR answer sheet and the ICR Answer Sheet number should be entered on this test booklet.
4. Each item has upto four alternative responses marked (A), (B), (C) and (D). The answer should be a capital letter for the selected option. The answer letter should entirely be contained within the corresponding square.

   Correct method [A] Wrong method [A] OR [A]

5. Your responses to the items for this paper are to be indicated on the ICR Answer Sheet under Paper III only.
6. Read instructions given inside carefully.
7. Rough work is to be done in the end of the booklet only.
8. You have to return the original ICR Answer Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the examination hall. You are, however, allowed to carry duplicate copy of ICR sheet and test booklet on conclusion of the examination.
9. Use black ball point pen.
10. Use of any Calculators or log tables or any other electronic devices is prohibited.
11. There shall be no negative marking.
12. In case of any discrepancy in Gujarati and English version of questions the English version should be taken as final.

SEAL

પરીક્ષાર્થીઓ માટે સૂચનાઓ :

1. આ પાનાની ટોચમાં દર્શાવેલી જગ્યામાં તમારો રોલનંબર લખો.
2. આ પ્રશ્નપત્રમાં બહુવૈકલ્પિક ઉત્તરો ધરાવતા કુલ પંચોતેર (૭૫) પ્રશ્નો આપેલા છે. બધા જ પ્રશ્નો ફરજિયાત છે.
3. પરીક્ષાની શરૂઆતમાં ઉમેદવારને પ્રશ્નપુસ્તિકા આપવામાં આવશે. પ્રથમ ૫ મિનિટ દરમ્યાન, ઉમેદવારે પ્રશ્નપુસ્તિકા ખોલી અને ફરજિયાતપણે નીચે મુજબ પરીક્ષણ કરવું.
   (i) પ્રશ્નપુસ્તિકાનો વપરાશ કરવા માટે આ કવર પેજની ધાર પર આપેલ સીલ ફાડી નાખો. કોઈપણ સંજોગોમાં સીલ સ્ટીકર વગરની કે ખુલ્લી પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં.
   (ii) કવર પૃષ્ઠ પર છાપેલ નિર્દેશાનુસાર પ્રશ્નપુસ્તિકાના પ્રશ્નો પૃષ્ઠો અને ક્રમ્બરને બરાબર ચકાસી લો. ખામીયુક્ત પ્રશ્નપુસ્તિકા કે જેમાં પૃષ્ઠો/પ્રશ્નો ઓછા હોય, બે વાર છાપ્યા હોય, અનુક્રમમાં અથવા કોઈ અન્ય કારણ અર્થાત કોઈપણ પ્રકારની ખામીયુક્ત પ્રશ્નપુસ્તિકા સ્વીકારવી નહીં. એને જે ખામીયુક્ત પ્રશ્નપુસ્તિકા મળી હોય તો નિરીક્ષક પાસેથી તુરંત જ બીજી સારી પ્રશ્નપુસ્તિકા મેળવી લેવી. આ માટે ઉમેદવારને પાંચ મિનિટનો સમયગાળો આપવામાં આવશે. ત્યારબાદ, પ્રશ્નપુસ્તિકા બદલવામાં આવશે નહીં કે કોઈ વધારાનો સમય પણ આપવામાં આવશે નહીં.
   (iii) આ ચકાસણી સમાપ્ત થયા પછી, ટેસ્ટ પુસ્તિકા નંબર ICR જવાબ પત્રકમાં લખવો અને ICR જવાબ પત્રક નંબર પ્રશ્નપુસ્તિકા પર લખવો.
4. પ્રત્યેક પ્રશ્ન માટે ચાર ઉત્તર વિકલ્પ (A), (B), (C) અને (D) આપવામાં આવેલ છે. પસંદગીનો જવાબ માત્ર અંગ્રેજી કેપીટલ મૂળાક્ષર દ્વારા જ આપવો. પસંદ કરેલ અંગ્રેજી કેપીટલ અક્ષર આપેલ ખાનામાં સંપૂર્ણ રીતે સમાઈ જાય તે રીતે લખવો.

   સાચી રીત : [A] ખોટી રીત : [A] અથવા [A]

5. આ પ્રશ્નપુસ્તિકાના પ્રશ્નોના જવાબ આકારણી માટેના ICR જવાબ પત્રકમાં પેપર–૩ લખેલ વિભાગમાં જ લખવા.
6. અંદર આપેલ સૂચનાઓ ધ્યાનપૂર્વક વાંચો.
7. આ પ્રશ્નપુસ્તિકાની અંતે આપેલ કાચું કામ માટે છે.
8. પરીક્ષા સમય પૂરો થઈ ગયા પછી ઓરીજીનલ ICR જવાબ પત્રક જે તે નિરીક્ષકને ફરજિયાત સોંપી દેવું અને કોઈપણ સંજોગોમાં પરીક્ષાખંડની બહાર જઈ શકશો નહીં. પરીક્ષા પૂર્ણ થયા બાદ ઉમેદવાર પ્રશ્નપુસ્તિકા તથા ICR જવાબપત્રકની ડુપ્લિકેટ કોપી પોતાની સાથે લઈ જઈ શકે છે.
9. માત્ર કાળી પેન/કાળી બોલ પેન વાપરવી.
10. કેલકયુલેટર અને અન્ય ઈલેકટ્રોનિક યંત્રોના ઉપયોગ કરવાની મનાઈ છે.
11. ખોટા જવાબ માટે નેગેટિવ ગુણાંકન પ્રથા નથી.
12. પ્રશ્નપુસ્તિકાના કોઈ પ્રશ્નમાં અનુવાદ અંગે કોઈ વિવાદ/મતભેદ જણાય તો અંગ્રેજી વર્ઝન યોગ્ય ગણાશે.

LIFE SCIENCES

PAPER - III

Note : This paper contains **SEVENTY FIVE (75)** Multiple-choice questions, each question carrying **TWO (2)** marks. Attempt **All** questions.

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1. Which of the following modifications is found in the glutamate residue in protein ?

   (A) Acetylation

   (B) Methylation

   (C) Carboxylation

   (D) Phosphorylation

   C

2. Which of the following statements is *correct* ?

   (A) Solubility of proteins at isoelectric point is maximum

   (B) Solubility of proteins at isoelectric point is minimum

   (C) Solubility of proteins is independent of isoelectric point

   (D) Solubility of proteins is dependent on their size

   B

3. Which of the following statements is *false* ?

   (A) All biological processes have negative ΔG°

   (B) Biological processes with positive ΔG° can only occur upon coupling with another process with higher negative ΔG°

   (C) ΔG° varies with the concentrations of biological constituents of the process

   (D) ΔG° does not describe the energetics of biological process

   D

4. Which of the following statements is *correct* ?

(A) Cellulose is glucose polymer of α 1 – 4 linkage

(B) Starch is glucose polymer of β 1 – 4 linkage

(C) Amylopectin has large number of β 1 – 6 linkage

(D) Cellulose is glucose polymer of β 1 – 4 linkage

D

5. Which of the following enzymes have common proteins ?

(A) Pyruvate carboxylase and PEP carboxylase

(B) Pyruvate carboxylase and acetyl CoA carboxylase

(C) Pyruvate dehydrogenase and 2-ketoglutarate dehydrogenase

C

(D) Phosphofructokinase and pyruvate kinase

6. Which of the following is *correct* for the B-DNA structure ?

(A) Sugar pucker is 2' endo and glycoside bond is syn

(B) Sugar pucker is 3' endo and glycoside bond is syn

(C) Sugar pucker is 2' endo and glycoside bond is anti

C

(D) Sugar pucker is 3' endo and glycoside bond is anti

7. Which of the following molecules is least likely to cross a cellular membrane by simple diffusion ?

(A) Carbon dioxide

(B) Nitrogen

(C) Oxygen

(D) Water

A

8. The number of nuclear pores on nuclear membrane depends on :

(A) Size of a cell
(B) Transcriptional activity of a cell
(C) DNA content of a cell
(D) Size of a nucleus

B

9. The lowest level of chromosome organization is :

(A) 30 nm fiber
(B) Nucleosome
(C) Solenoid
(D) Chromosomal loops

B

10. What effect would you expect if gene expression of lac operon is completely repressed ?

(A) Cell will become more efficient in energy production
(B) Lactose will accumulate and become toxic
(C) Lactose will not be converted into inducer
(D) Lactose will be converted into glucose

C

11. Which specific protein is formed in G2 phase ?

(A) Histone
(B) Polymerase
(C) Scaffold protein
(D) Condensin

D

12. Golgi apparatus is *not* found in :

(A) Nerve cell
(B) RBC.
(C) Germ cell
(D) Gland cell

B

13. Which of the following is *true* for the separation of proteins by gel filtration chromatography ?

(A) Proteins with low molecular weight comes out first

(B) Proteins with high molecular weight comes out first

(C) Proteins entrapped into the pores of the gel matrix comes out in the increasing order of size

(D) Proteins entrapped into the pores of the gel matrix comes out in the decreasing order of size

D

14. Which of the following bond(s) does *not* play a role in the folding of common polypeptides ?

(A) Hydrogen bonds between side chains

(B) Hydrogen bonds between backbone

(C) Salt bridges

(D) Disulfide bonds

D

15. Which of the ϕ and ψ values of amino acid residues are sterically allowed according to Ramachandran plot ?

(A) Both ϕ and ψ values are negative

(B) Both ϕ and ψ values are positive

(C) The value of ϕ is negative and ψ is positive

(D) The value of ϕ is positive and ψ is negative

C

16. Which of the following sequence of proteins is involved in the initiation of bacterial DNA replication ?

(A) Dna A, Dam A, Gyrase, Primase

(B) Dam A, Dna A, Gyrase, Primase

(C) Gyrase, Dna A, Dam A, Primase

(D) Dna A, Gyrase, Dam A, Primase

D

17. Which of the following bacterial genes has a unique promotor region ?

(A) Citrate synthase

(B) *t*RNA

(C) *r*RNA

(D) Flagellin

D

18. During the initiation of bacterial transcription the σ factor does *not* bind to :

(A) –10 consenses sequence

(B) –35 consenses sequence

(C) The region between –35 and –10 consenses sequence

(D) UP element

D

19. Which of the following statements about a protective immune response to intracellular bacterial pathogens is *not true* ?

(A) It involves an antibody response

(B) It involves a cell mediated immune response

(C) It may involve CTLS

(D) It may involve Th_1 type of cells

A

20. Cytokines that are the soluble mediators of immune response are :

(A) produced by only T helper cells

(B) produced by only B cells

(C) produced by only macrophages

(D) produced by macrophages, B and T cells

D

21. The cell junction that is responsible for maintaining the polarity of epithelial cells is :

(A) gap junctions

(B) desmosomes

(C) tight junctions

(D) hemi desmosomes

C

22. In G-protein coupled receptors, the subunit of G-protein that has GTPase function is the following :

(A) Gα

(B) Gβ

(C) Gαβ

(D) Gγ

A

23. Conversion of a proto-oncogene to an oncogene that results in cancer may be considered as :

(A) loss of function mutation

(B) gain of function mutation

(C) activation of gene

(D) inactivation of gene

B

24. Bacteria may use the following for entry into host cells, *except* :

(A) TLR

(B) EGF-R

(C) Mannose receptor

(D) Scavenger receptor

B

25. Fate mapping with vital dye for amphibian eggs was done by :

(A) Vogt, 1929 (B) Mangold, 1931

(C) Spemann, 1930 (D) Von Boer, 1927

A

26. Haploid nuclei are found in :

(A) Microspores and microspore mother cell

(B) Microspore mother cell and megaspore mother cell

(C) Microspore mother cell and megaspore

(D) Megaspore and microspore

D

27. The complete meiotic division occurs exactly during somatogenesis between the stages of :

(A) Resting and dividing spermatogonia

(B) Primary and secondary spermatocytes

(C) Primary spermatocyte to spermatic level

C

(D) Spermatid to sperm

28. Apical initials are present in :

(A) Root and shoot apex (B) Shoot and leaf apex

(C) Bud apex (D) Leaf apex

A

29. Differentiation process in life cycle of animals is a/an :

(A) Specialised state (B) Unspecialised state

(C) Common state (D) Uncommon state

A

30. The main difference between necrosis and apoptosis is *not* :

(A) Vesicular traffic (B) DNA fragmentation

(C) No change in cellular organelle (D) Apoptotic bodies

A

31. In senescent leaves, the first in the breakdown pathway of chlorophyll is :

(A) Removal of magnesium (B) Opening of porphyrin structure

(C) Removal of phytol chain (D) Modification of tetrapyrrole

C

32. The reaction centre chlorophyll of photosystem I absorbs maximally at ..... in its reduced state.

(A) 680 nm (B) 870 nm

(C) 620 nm (D) 700 nm

D

33. The regulation of the distribution of fixed carbon into various metabolic pathways is known as :

(A) Distribution (B) Allocation

(C) Division (D) Gradation

B

34. A high Respiratory Quotient (RQ) value is indicative of :

(A) Absence of respiration (B) Aerobic respiration

(C) Anaerobic respiration (D) Inhibition of respiration

C

35. Phototropins, the photoreceptors for phototrophic bending in seedlings are :

(A) Terpenes (B) Flavoproteins

(C) Lipids (D) Alkaloids

B

36. The only plant growth hormone that has been transported partly is :

(A) Auxin
(B) Abscisic acid
(C) Gibberellic acid
(D) Ethylene

A

37. The process of differentiation of spermatozoa from a spermatid is known as :

(A) Spermeiogenesis
(B) Spermatogenesis
(C) Spermiation
(D) Spermatolysis

A

38. Classic haemophilia is due to deficit of :

(A) Factor IV
(B) Factor VIII
(C) Factor IX
(D) Factor XI

B

39. Inhibitory neurotransmitter is :

(A) Ach
(B) Dopamine
(C) Serotonin
(D) GABA

D

40. Function of portal veins is to deliver :

(A) Releasing hormones
(B) insulin
(C) Octapeptides
(D) Neurotransmitters

A

41. The type of placenta in human is :

(A) Chorial
(B) Desmochorial
(C) Haemochorial
(D) Syndesmochorial

C

42. Example for ureotelic animals are :

(A) Protozoan, Echinoderm, Fish

(B) Amphibian, Arthropod, Fish

(C) Amphibian, Fish, Protozoan

(D) Fish, Amphibian, Mammal

D

43. In a test-cross of a pea plant heterozygous for the recessive allele, wrinkled, what fraction of the progeny would be wrinkled ?

(A) one third

(B) one half

(C) one fourth

(D) three fourth

B

44. Two genes A and B are 10 cm apart. What percentage of the progeny will be *aabb* when a cross is made between two individuals both with the genotype $\frac{AB}{a\ b}$?

(A) ~10%

(B) ~20%

(C) ~40%

(D) ~80%

B

45. The process by which a bacterial cell picks up exogenous pieces of DNA directly from the media and incorporates it into its genome is called :

(A) conjugation

(B) transduction

(C) transformation

(D) translocation

C

46. A lod score is :

(A) measure of genetic diversity in a population

(B) measure of interference of one crossover with another

(C) measure of the number of human chromosomes in a hybrid cell

(D) measure of the probability of linkage between two loci D

47. Which of the following diseases can be described as a genetic disease where the mutation originates in somatic cells ?

(A) Huntington's disease (B) Cystic fibrosis

(C) Cancer (D) Sickle-cell anemia C

48. Classification of which animals depends on the characteristics of the cytoskeleton present :

(A) Porifera (B) Platyhelminths

(C) Urochordata (D) Fishes A

49. The disease 'Elephantasis' is caused by :

(A) Wuchereria (B) Ascaris

(C) Fasciola (D) Schystosoma A

50. APG classification is essentially :

(1) Cladistics (2) Molecular taxonomy

(3) Numerical taxonomy (4) Phylogenic in nature

(A) (1) (B) (1) + (2)

(C) (1) + (2) + (3) (D) (1) + (2) + (4) D

51. Symbiosis type of association between animals can be seen in :

(A) Hermit crab and Sea anemone

(B) Hermit crab and Sycon

(C) Sea anemone and Unio

(D) Unio and Sycon

A

52. Polymorphism is seen mainly in the phylum of :

(A) Coelenterata (B) Annelida

(C) Arthropoda (D) Porifera

A

53. According to nomenclatural type method Angiosperms should be correctly named as :

(A) Embryophyta (B) Maganoliophyta

(C) Spermatophyta (D) Magnoliopsida

B

54. A food chain always starts with :

(A) Nitrogen fixation (B) Respiration

(C) Photosynthesis (D) Decay

C

55. Which one of the following is the *correct* food chain ?

(A) Algae — Daphnia — Dragonfly nymph — Newt — Grass snake

(B) Daphnia — Dragonfly nymph — Newt— Algae — Grass snake

(C) Grass snake — Newt — Dragonfly nymph — Daphnia — Algae

(D) Newt — Grass snake — Dragonfly nymph — Algae — Daphnia

A

56. In an aquatic ecosystem, the depth to which light penetrates is called :

(A) Aphotic (B) Photic

(C) Euphotic (D) Non-photic

B

57. Biomass produced by plants in oceans accounts for :

(A) 85% (B) 75%

(C) 65% (D) 58%

A

58. Species diversity is higher in ecosystem experiencing :

(A) No disturbance (B) Moderate disturbance

(C) High disturbance (D) Drastic disturbance

D

59. Who is the author of the book 'Origin of Species' ?

(A) Mendel (B) Lamarck

(C) Darwin (D) Weisman

C

60. The organ which was once functional and well developed in an organism's evolutionary past but has become reduced or non-functional now is called :

(A) Homdogous organ (B) Analogous organ

(C) Primordial organ (D) Vestigial organ

D

61. Cenozoic era refers to the age of :

(A) Invertebrates (B) Fishes

(C) Birds (D) Mammals

D

62. The oldest microfossil found so far of age 3.5 billion years ago is :

(A) Cyanobacteria (B) Coacervates

(C) Eobionts (D) Microspheres A

63. Which of the following times was marked by the largest mass extinction of life in the history of earth ?

(A) The end of Devonian

(B) The end of Cretaceous

(C) The end of Permian C

(D) The end of Triassic

64. A clinical isolate of *Pseudomonas* is resistant to penicillins. Which of the following can be used to overcome the resistance ?

(A) β-glucanase inhibitor

(B) β-glucosidase inhibitor

(C) β-lactamase inhibitor

(D) β-galactosidase inhibitor C

65. B-lymphocytes that are responsible for producing antibodies do so :

(A) Only after exposure to the corresponding antigen

(B) Even before exposure to the corresponding antigen

(C) Only after it interacts with an antigen presenting cell

(D) When (A) and (C) take place B

66. Microorganisms are diverse as regards to their ability to produce metabolites. Which of the following is a source of microbial cellulose ?

(A) *Acetobacter xylanicum*

(B) *Acetobacter diazotropicus*

(C) *Azotobacter chroococcum*

(D) *Aeromonas maltophila*

A

67. Rhizoremediation of pollutants is based on microorganisms associated with :

(A) Bulk soil

(B) Root soil

(C) Spermosphere

(D) Phyllosphere

B

68. The first attempt at gene therapy in humans was using the following gene to overcome SCID :

(A) gene for adenosine deaminase

(B) gene for tyrosinase

(C) gene for recombinase

(D) recombination activating gene

A

69. Which of the following may by used as a component of biosensor based on O_2 consumption ?

(A) glucose oxidase

(B) superoxide dismutase

(C) catalase

(D) (A) and (C)

A

70. The molecular mass of a protein determined by gel filtration is 120 kDa. When its mass is determined by SDS-PAGE with and without β-mercaptoethanol, it is only 60 kDa. What is the most probable explanation for these observations ?

(A) Protein is a dimer in which two identical chains are cross-linked by disulfide bond(s)

(B) Protein is a monomer of molecular mass 60 kDa but it is excluded from the gel matrix due to strong repulsion between the gel matrix and the protein

(C) Protein is a monomer but it is nicked into half its size by SDS

(D) Protein is most likely to be composed of two subunits having identical molecular mass

D

71. The following statement about radio immuno assay technique is *not true* :

(A) It is based on antigen-antibody interaction

(B) The enzyme is radio labelled

(C) The antigen is radio labelled

(D) It is a competitive assay

B

72. Which of the following pictorial representations enable us to study relationship between variables ?

(A) Histogram (B) Pie-chart

(C) Bar diagram (D) Linear diagram

D

73. In the experiments conducted by Meselson and Stahl for demonstrating semi-conservative nature of DNA replication, the following isotope was used :

(A) ^{15}N (B) ^{14}C

(C) ^{3}H (D) ^{32}P

A

74. Mechanical fixation in microscopy involves the use of :

(A) coagulant fixative

(B) non-coagulant fixative

(C) both (A) and (B)

C

(D) liquid nitrogen

75. Which of these techniques can be used for single cell recording ?

(A) CAT

(B) Patch clamp technique

(C) fMRI technique

B

(D) ECG