Roll No. | | | | | | | |

(Write Roll Number from left side exactly as in the Admit Card)

Signature of Invigilators

1. _____

2. _____

1415

Question Booklet Series **A**

PAPER–III

Question Booklet No.

Subject Code : 14

OMR Sheet No. .....

(To be filled by the candidate)

LIFE SCIENCES

Time : 2 Hours 30 Minutes *Maximum Marks: 150*

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
2. At the commencement of the examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and verify it:
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
   (ii) Faulty booklet, if detected, 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.
   (iii) After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet and the OMR Sheet Number should be entered on this Question Booklet.
3. This paper consists of seventy-five (75) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
4. Each Question has four alternative responses marked: (A) (B) (C) (D). You have to darken the circle as indicated below on the correct response against each question.

   Example: (A) (B) ● (D), where (C) is the correct response.
5. Your responses to the questions are to be indicated correctly in the OMR Sheet. If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Rough work is to be done at the end of this booklet.
7. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR 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.
8. Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
9. You have to return the Original OMR 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 question booklet and duplicate copy of OMR Sheet after completion of examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table or mobile phone etc. is strictly prohibited.**
12. **There are no negative marks for incorrect answers.**

[Please Turn Over]

LIFE SCIENCES

PAPER III

1. The species replacement that occurs over very large geographical region is described as:

(A) Alpha diversity
(B) Beta diversity
(C) Gamma diversity
(D) Point diversity

2. The type specimen used by the author in the original publications is known as:

(A) Lectotype
(B) Isotype
(C) Holotype
(D) Syntype

3. Which of the following performs its function with some cytoplasm but no nucleus?

(A) Sieve tube element
(B) Tracheid
(C) Guard cell
(D) Companion cell

4. A heterokaryon is usually derived as a result of:

(A) Mutation
(B) Regeneration of a gametic cell in culture
(C) Enucleation of a cell
(D) Cell fusion

5. Which of the following has both aerial insect pollinated and underground cleistogamous flowers?

(A) *Oxalis corniculata*
(B) *Commelina benghalensis*
(C) *Primula vulgaris*
(D) *Gloriosa superba*

6. Caruncle is formed by proliferation of the cells of:

(A) Tip of the outer integument
(B) Tip of the nucellus
(C) Funiculus or testa, or both
(D) Placenta

7. Experiment in *Torenia fournieri* provide strong evidence that pollen tube is attracted by a chemo-attractant secreted by:

(A) Micropyle
(B) Synergid
(C) Egg
(D) Central cell

8. Who among the following gave the theory that crop origins have been diffused in both time and space?

(A) Vavilov
(B) Zhukovsky
(C) Harlan
(D) Hawkes

9. Wheat, barley and coffee have their maximum diversity in

(A) Ethiopia
(B) Mediterranean region
(C) South America
(D) China

10. Which one of the following animals is an amphibian?

(A) Duck-billed platypus
(B) Protopterus
(C) Tylototriton
(D) Chameleon

11. Which of the following growth regulators plays an important role in initiation of seed germination?

(A) Auxins
(B) Gibberellins
(C) Cytokinins
(D) Ethylene

12. Ammonia is incorporated in biomolecules through which of the following amino acids?

(A) Lysine and glutamate
(B) Histidine and arginine
(C) Glutamate and glutamine
(D) Glutamate and histidine

13. In C_4 plants, what happens to the CO_2 formed when malate is decarboxylated in bundle sheath cells?

(A) It enters the calvin cycle
(B) It enters the vacuoles
(C) It reacts with serine to form phosphoglycolate
(D) It is released in the process of photorespiration

14. Root hairs absorb water when the external water is:

(A) Hypotonic
(B) Hypertonic
(C) Isotonic
(D) Acidic solution

15. Bengal famine which destroyed rice crop during 1942-43 was due to

(A) *Alternaria*
(B) *Helminthosporium*
(C) *Puccinia*
(D) *Cercospora*

16. Which light is most effective in inducing apogamous development of sporophyte?

(A) Far red
(B) Green
(C) Red
(D) White

17. Select the larval sequences based on evolutionary/ phylogenetic hierarchy from lower to higher organisms.

(A) Miracidium—Trochophore—Auricularia—Tornaria
(B) Miracidium—Tornaria—Bipinnaria—Auricularia
(C) Miracidium—Trochophore—Bipinnaria—Redia
(D) Miracidium—Redia—Brachiolaria—Trochophore

18. Phenetic classification involves the use of:

(A) Character state comparison
(B) Branching and phylogeny
(C) Parsimony principle
(D) Ancestral character

19. In molluscs, the general body cavity is

(A) Blatocoel
(B) Hydrocoel
(C) Haemocoel
(D) Pseudocoel

20. Which geographical region of the Earth has the distribution of the flightless bird—*Rheas*?

(A) Ethiopian
(B) Palearctic
(C) Neotropical
(D) Australian

21. Retrogressive metamorphosis is shown in:

(A) Vertebrates
(B) Cephalochordates
(C) Urochordates
(D) Hemichordates

22. In which of the following groups notochrord is only present during embryonic development?

(A) Cephalochordata
(B) Hemichordata
(C) Agnatha
(D) Gnathostomata

23. In mammals, the corpus callosum connects

(A) the two optic lobes
(B) the two cerebral hemispheres
(C) the cerebrum of the cerebellum
(D) the pons of the medulla oblongata

24. Which chromosomes serve as MALE sex switch in Birds?

(A) XY
(B) ZZ
(C) ZW
(D) XO

25. Mark the fish which lacks an accessory respiratory organ but can still breath air from atmosphere.

(A) Climbing perch *(Anabas)*
(B) Indian catfish *(Saccobranchus)*
(C) Eel *(Anguilla)*
(D) African catfish *(Clarias)*

26. What is incorrect about the circulatory system of aves?

(A) Heart is four chambered
(B) Well-developed renal portal system
(C) Sinus venosus and trancus arteriosus are lacking
(D) RBC are nucleated

27. What is the role of Ca^{++} in muscle contraction?

(A) It binds to tropomyosin, enabling troponin to move and reveal binding sites for cross bridges.
(B) It binds to troponin, enabling tropomyosin to move and reveal binding sites for cross-bridges.
(C) It binds to tropomyosin, enabling troponin to release ATP.
(D) It binds to troponin, enabling tropomyosin to release ATP.

28. Sarcolemma of caveoli contains

(A) Voltage-gated Ca^{2+} channels
(B) Voltage-gated Na^{+} channels
(C) IP_3-gated Ca^{2+} channels
(D) Ryanodine receptor

29. Which of the three amino acids are present in Tc AChE catalytic triad?

(A) Serine 200, histidine 440, glutamate 327
(B) Threonine 200, histidine 440, glutamate 327
(C) Tyrosine 440, lysine 200, phenylalanine 327
(D) Serine 300, histidine 540, glutamate 627

30. The function of tango and calo receptor is respectively

(A) sensitive to temperature and cold
(B) sensitive to taste and pain
(C) sensitive to temperature and humidity
(D) sensitive to touch and heat

31. Which is the correct sequence of the events leading to the formation of mature sperm?

(A) Primary spermatocytes–secondary spermatocytes–spermatids–spermatogonia–sperms.
(B) Spermatogonia–spermatids–primary spermatocytes–secondary spermatocytes–sperms.
(C) Spermatogonia–primary spermatocytes–secondary spermatocytes–spermatids–sperms.
(D) Spermtogonia–spermatids–secondary spermatocytes–sperm.

32. All animals have endogenous clock which is set and reset by external environmental stimuli called

(A) Conditioner
(B) Entrainer
(C) Azimuth
(D) Trial and error

33. Which among the following adaptations is *not* connected with bird migration?

(A) Hyperphagia
(B) Body weight increase
(C) Restlessness and tethering
(D) Preening of feathers

34. Organisms living at nearly constant temperature and unable to tolerate variations are said to be

(A) Stenotherms
(B) Mesotherms
(C) Poikilotherms
(D) Eurytherms

35. Mark the vector transmitting *Trypanosoma cruzi* that causes Chagas's disease

(A) Tsetse fly
(B) Assassin bug
(C) Tiger mosquito
(D) Sand fly

36. The correct sequence of developmental stages of *Ascaris* in human is

(A) Outside—stomach—liver—spleen—lung—intestine—outside.

(B) Outside—trachea—lung—liver—intestine—outside.

(C) Outside—trachea—lung—heart—liver—intestine—outside.

(D) Outside—intestine—liver—heart—lung—intestine—outside.

37. In mosquitos, the sex distinction can be done on the basis of

(A) Size of wings

(B) Antennae

(C) Legs

(D) Ocelli

38. Which one among the following is a National Pest?

(A) Tea aphid

(B) Gram aphid

(C) Mustard aphid

(D) Rose aphid

39. Bubonic plague is transmitted by

(A) Flea

(B) Lice

(C) Tick

(D) Bug

40. Population with low reproductive rate and higher competetive ability is said to be

(A) r–selection

(B) k–selection

(C) Equilibrium level

(D) Threshold level

41. Which of the following element comes from sedimentary source to the maximum in bio-geochemical cycle?

(A) Carbon

(B) Nitrogen

(C) Sulphur

(D) Phosphorous

42. In which state of India the dancing deer is found?

(A) Mizoram

(B) Maharashtra

(C) Madhya Pradesh

(D) Manipur

43. Select the odd pair in having the dissimilar type of nucleic acid.

(A) Retro and Reovirus

(B) Papilloma and Pox virus

(C) Adeno and Herpes virus

(D) Baculo and Retro vrius

44. Stability of an ecosystem having attained climax largely depends on:

(A) high diversity of its flora and fauna

(B) dominance of one plant/animal species

(C) more productivity and less diversity

(D) increased dominance and low productivity

45. Of the five mass extinctions, the most serious one resulting in removal of 60% of life forms occurred during:

(A) Cretaceous

(B) Devonian

(C) Ordovician

(D) Permian

46. Acid-fastness of some bacteria is believed to be due to the presence of:

(A) Crotonic acid

(B) Mycolic acid

(C) Acetic acid

(D) Hydroxybutyric acid

47. High concentration of dipicolinic acid is unique to which bacterial structure?

(A) Nucleoid

(B) Ribosomes

(C) Endospore

(D) Magnetosome

48. Which one is an aminoglycosidic antibiotic?
(A) Chloramphenicol
(B) Erythromycin
(C) Streptomycin
(D) Tetracycline

49. Which of the following compound is a reversible inhibitor of HIV reverse transcriptase?
(A) Azathioprine (Retrovir)
(B) Indinavir
(C) d-tubocuratine
(D) Botulinum toxin

50. Which one of the following hormone induces spermatogenesis and sperm differentiation?
(A) FSH
(B) LH
(C) Oxytocin
(D) Parathyroid hormone

51. Riboswitches are:
(A) RNA sequence that regulate gene expression by directly binding small molecules to control their primary structure.
(B) RNA sequences that regulate gene expression by directly binding small molecules to control their secondary structure.
(C) RNA sequence that regulate translation.
(D) RNA sequence that regulate transciption.

52. The energy is most favourable at the van der Waals contact distance. Owing to electron-electron repulsion, the energy rises rapidly as the distance between the atoms becomes shorter than the
(A) Contact distance
(B) Polar distance
(C) Bond length
(D) Electric dipole

53. A Ramachandran plot provides a convenient graphical depiction of the allowable combinations of angles. Which one of the following combinations is correct?
(A) phi (ϕ) and alpha (α)
(B) phi (ϕ) and psi (ψ)
(C) psi (ψ) and gamma(γ)
(D) alpha (α) and beta (β)

54. During De-novo biosynthesis, the C-2 and N-3 atoms in the pyrimidine ring come from
(A) Aspartate
(B) Carbamoyl phosphate
(C) PRPP
(D) Ribose 5-phosphate

55. Lactate is formed by active skeletal muscle when the rate of glycolysis exceeds the rate of
(A) Oxidative metabolism
(B) Gluconeogenesis
(C) Glycogenolysis
(D) Beta-oxidation of fatty acids

56. Which of the following receptors is correctly paired with the type of stimulus to which it is most apt to respond?
(A) Pacinian corpuscle and motion
(B) Meissner's corpuscle and deep pressure
(C) Merkel cells and warmth
(D) Ruffini corpuscle and sustained pressure

57. Components of the mammalian poly adenylation machinery are:
(A) CPSF, CstF, CF I, CF II, PAP, PABII, CTD, Ssu72 and PC4, and symplekin.
(B) CPSF, CF I and symplekin.
(C) CSPF, CstF, CF I, CTD and symplekin.
(D) CPSF, CStF, CF I, PABII, Ssu72 and Pc4.

58. Integration of linear form of λ phage into bacterial chromosome requires the product of
(A) CII gene
(B) aH sites
(C) λ int gene
(D) CIII gene

59. Which would result in haemolysis in foetus?
(A) AO incompatibility
(B) AB incompatibility
(C) Rh incompatibility
(D) All of the above

60. The two enzymes commonly used for isolation of protoplasts from plants are

(A) Cellulase and lipase
(B) Cellulase and amylase
(C) Pectinase and cellulase
(D) Pectinase and lipase

61. Which of the following hormone induces shoot formation in callus in plant tissue culture?

(A) Zeatin
(B) IAA
(C) NAA
(D) IBA

62. The highest resolution of fluorescence microscopy is about

(A) 0·2 μm
(B) 1·0 μm
(C) 2·0 μm
(D) 1·5 μm

63. A signal peptide contains

(A) A kozak sequence (PuNNAUGG)
(B) A positively charged amino acid near the N-terminal end followed by approximately 10-15 hydrophobic amino acid
(C) 5′ AAU AAA 3′ polyadenylated sequence
(D) A pribnow box (5′ TATAAT 3′)

64. The connecting link between Echinoderms and Chordates is:

(A) Oikopleura
(B) Archaeopteryx
(C) Balanoglossus
(D) Antedon

65. Which metal is mostly used for coating samples in Scanning Electron Microscopy?

(A) Nickel
(B) Chromium
(C) Gold
(D) Platinum

66. Which one of the biologically important nucleus gives NMR signals?

(A) ^{13}C
(B) ^{55}Fe
(C) ^{83}Kr
(D) ^{63}Cu

67. The three components in an X-ray crystallographic analysis are a protein crystal, a source of X-rays, and a

(A) MALDI-TOF
(B) Biologically active nucleus
(C) Polyampholytes mixture
(D) Detector

68. In a mark-release-recapture experiment, 30/473 = 0·063 carbonaria, and 62/496 = 0·125 normal moths were recaptured. The relative fitness of carbonaria over normal moths in those conditions would be

(A) 0·304
(B) 0·504
(C) 0·804
(D) 0·704

69. The regression coefficient b = 0·2 suggests

(A) 1 unit increase in x is associated with a 0·8 unit increase in y axis.
(B) 1 unit increase of x is associated with a 0·2 unit increase of y axis.
(C) 1 unit increase of x is associated with a 1·2 unit increase of y axis.
(D) 1 unit increase of x is associated with a 1·0 unit increase of y axis.

70. The χ^2 distribution is useful in all the following *except*:

(A) testing the homogenity of binomial proportion.

(B) testing the independence of two characters.

(C) testing the goodness-of-fit of a probability model.

(D) testing the equality of two variances.

71. Blood serum cholesterol level of 10 subjects are as under:

240, 260, 290, 245, 255, 288, 272, 263, 277, 250

The value of SD calculated with the help of assumed mean will be

(A) 15·372

(B) 17·372

(C) 7·4

(D) 19·272

72. The isomerization of 11-cis-retinal group of rhodopsin to its all-trans form causes the Schiff-base nitrogen atom to move approximately

(A) 5 nm

(B) 5 Å

(C) 10 nm

(D) 5 μm

73. Infectious stage of *Plasmodium* is

(A) Trophozoite

(B) Sporozoite

(C) Cryptozoite

(D) Meta Cryptozoite

74. Myosin light chain kinase (MLCK) of smooth muscle is activated by

(A) Ca^{2+}- calmodulin complex

(B) Myosin phosphatase

(C) ATPase

(D) Phospholipase C

75. Where is the headquarter of the National Biodiversity Authority located?

(A) Kolkata

(B) Mumbai

(C) Chennai

(D) Delhi

ROUGH WORK

ROUGH WORK

ROUGH WORK