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

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Signature of Invigilator

Question Booklet Series

X

PAPER-II

Question Booklet No.

Subject Code : 14

LIFE SCIENCES

Time : 2 Hours

Maximum Marks: 200

Instructions for the Candidates

- Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
- 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:
 - To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
 - Faulty booklet, if detected, should be got replaced immediately by a correct booklet from the invigilator within the period of 5 (five) minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
 - Verify whether the Question Booklet Number is identical with OMR Sheet Number; if not, the full set is to be replaced.
 - After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet.
- This paper consists of One Hundred (100) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
- 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) (C) (D) , where (C) is the correct response.
- 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.
- Rough work is to be done at the end of this booklet.
- If you write your Name, Phone Number or put any mark on any part of the OMR Sheet, except in 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.
- Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
- 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.
- Use only Black Ball point pen.
- Use of any calculator, mobile phone, electronic devices/gadgets etc. is strictly prohibited.
- There is no negative marks for incorrect answer.

**The Question Booklet
is encrypted with
QR code for
security purpose.**

LIFE SCIENCES

1. In *Arabidopsis*, apico-basal polarity during embryogenesis is established by which of the following genes?
 - (A) FACKEL
 - (B) SHORT ROOT
 - (C) GNOM
 - (D) GURKE
2. Colchicine is a chemical which
 - (A) prevents microtabular polymerization
 - (B) prevents microtubular depolymerization
 - (C) activates attachment of spindle fibres with kinetochore plates
 - (D) prevents polyploidization of cells
3. Identify the event which is *not* associated with Na^+ current impairment
 - (A) Exposure to red tide caused by dinoflagellates
 - (B) Consumption of shellfish fed on dinoflagellates
 - (C) Consumption of cadmium contaminated water
 - (D) Consumption of ovaries of blowfish
4. Cortisol released from adrenal cortex in response to stress leads to
 - (A) mobilization of free fatty acids
 - (B) enhancement of K^+ elimination
 - (C) lowering of blood glucose level
 - (D) stimulation of immune system
5. How many neurons are likely to be there in your brain?
 - (A) 15,000
 - (B) 15,000,000
 - (C) 15,000,000,000
 - (D) 50,000,000,000
6. A single nucleotide polymorphism (SNP) is an example of
 - (A) transpositional control
 - (B) a genetic marker
 - (C) genetic regulation
 - (D) a frame shift mutation
7. Which of the following assumptions does *not* belong to the Hardy Weinberg principle?
 - (A) Gene pool remains a constant
 - (B) Used algebraic equations
 - (C) Allele frequency varies in species
 - (D) Frequency remained fixed through generations
8. The type of male sterility where pollen development is normal but pollen function is impaired, is termed as
 - (A) sporogenous male sterility
 - (B) functional male sterility
 - (C) structural male sterility
 - (D) transgenic male sterility
9. In which minor phyla of invertebrates the anus is located inside the lophophore?
 - (A) Brachiopoda
 - (B) Kamptozoa
 - (C) Tardigrada
 - (D) Phoronida
10. Under stressful condition, the administration of nonsteroidal anti-inflammatory agent, such as aspirin may cause significant reductions in
 - (A) GFR
 - (B) clearance of kidneys
 - (C) osmolarity of plasma
 - (D) free water clearance of kidneys

[Please Turn Over]

11. Which of the following is *not* a G-protein coupled receptor?

- (A) Glycine receptor
- (B) Adrenergic receptor
- (C) Glutamate receptor
- (D) Muscarinic receptor

12. The basic factors that stimulate gastric secretion are

- (A) gastrin, acetylcholine and histamine
- (B) gastrin, secretin and cholecystokinin
- (C) gastrin, secretin and somatostatin
- (D) gastrin and vasoactive intestinal peptide

13. Which of the following cellular enzymes is related to relaxation of vascular smooth muscle?

- (A) eNOS
- (B) Hexokinase
- (C) Catalase
- (D) Phosphofructokinase

14. Which one of the following physiological functions is most likely to be impaired due to presence of mutated occludin and claudin proteins?

- (A) Conduction of electrical impulse through intercalated discs of cardiac tissue
- (B) Proper functioning of blood-brain barrier
- (C) Generation of coordinated peristaltic waves in smooth muscle cells of gastrointestinal tract
- (D) Proper assembly of gap junctions

15. The 'mid-blastula transition' is the point in development when

- (A) translation of maternal mRNA is initiated
- (B) cell division in the embryo ends
- (C) transcription of zygotic genes begins
- (D) blastocoel formation occurs

16. In *Drosophila*, *bicoid* (*bcd*) gene controls embryonic gene expression by transcriptional activation and translational repression. If *bcd* mRNA is injected at the middle of a *bicoid* mutant (*bcd⁻*) *Drosophila* embryo, what would be the expected phenotype?

- (A) Normal body segmentation will occur
- (B) Formation of acron at both the termini
- (C) Formation of telson at both the termini and head at the middle
- (D) Absence of telson and abdomen

17. Which one of the following redox centers within the respiratory chain does *not* possess a prosthetic group?

- (A) Flavoproteins
- (B) Iron-sulphur proteins
- (C) Ubiquinone
- (D) Cytochromes

18. Why do Burchell's Zebras migrate 150 miles every year away from Botswana's water filled Okavango Delta to the Makgadikgadi Salt Pan?

- (A) To escape from the predators
- (B) To lick the salt there and absorb the minerals it provides
- (C) For food and reproduction
- (D) To avoid adverse climate conditions

19. *Plasmodium* spp. overcome the hosts' physical and physiological barriers by synthesizing the protein named as

- (A) Urocanic acid
- (B) Thrombospondin-related anonymous protein (TRAP)
- (C) Serum resistance associated protein (SRA)
- (D) Arginine deiminase

20. A 24 years old foreign male Ph.D. student of your university was detected with blood in his urine after 4 weeks of his arrival from Africa. Microscopic examination of his urine revealed the presence of eggs with terminal spines. In course of investigation, he admitted that he had been working in the rice field of his family occasionally since his teenage. The most likely etiologic agent of his complaint was

- (A) *Ascaris lumbricoides*
- (B) *Schistosoma haematobium*
- (C) *Schistosoma mansoni*
- (D) *Trypanosoma brucei*

21. Rocky mountain spotted fever is transmitted by the

- (A) American dog tick
- (B) Gulf Coast tick
- (C) Black legged tick
- (D) Rocky mountain wood tick

22. The ABO blood types of 1000 people from an isolated city were determined and the following data are obtained:

Blood Type	Number of people
A	42
B	672
AB	36
O	250

What would be the frequency of i-allele of ABO blood group gene of these data?

- (A) 0.50
- (B) 0.40
- (C) 0.46
- (D) 0.292

23. The inheritance of a trait due to difference in DNA methylation pattern may be referred to as

- (A) epiallelic inheritance
- (B) genomic inheritance
- (C) mitochondrial inheritance
- (D) pseudo inheritance

24. Oligoglycosylceramides present ubiquitously in plasma membrane that play a very important role in signal transduction, cell-cell interaction and modulation of cell proliferation, is a class of

- (A) Glycoglycerolipids
- (B) Glycosphingolipids
- (C) Glycoprotein
- (D) Phosphoglycerides

25. In a food web consisting of 10 species, the observed number of links is 20. The connectance value for this food web is

- (A) 0.2
- (B) 2.0
- (C) 0.5
- (D) 5.0

26. A keystone species is

- (A) a large animal or other organism on which many species depend
- (B) any plant or animal species that plays a unique and crucial role in the way an ecosystem functions
- (C) any species that creates and maintains an ecosystem
- (D) a plant or animal species that is very sensitive to environmental changes in its ecosystem

27. Which one of the following is *not* the characteristic of Mangrove vegetation?

- (A) Viviparous germination
- (B) Pneumatophores
- (C) Buttresses
- (D) Prop root

28. 'Race ways' are typically used for the culture of

- (A) Catfishes
- (B) Carps
- (C) Ornamental fishes
- (D) Trouts

29. Several techniques are employed for aquaculture of the Indian Major Carps. Which one of the following techniques is *not* recommended for this purpose?

- (A) Inbreeding
- (B) Induced breeding
- (C) Selective breeding
- (D) Polyculture

30. Which one of the following statements is *not* true?

- (A) Viruses contain either DNA or RNA as genetic material
- (B) The nucleic acid of viruses is surrounded by a protein coat
- (C) Viruses multiply within the living cells using the viral mRNA, tRNA and ribosomes
- (D) Viruses multiply inside the living cells

31. Anaerobic ammonium oxidation (Anammox) is an important microbial process involved in the nitrogen cycle. Select the *correct* option from among the following combinations.

- (P) The Anammox bacteria oxidize ammonium with nitrite under anaerobic condition
- (Q) The Anammox process is currently used for the removal of ammonium in waste water system
- (R) The Anammox bacteria belong to genera *Brocadia*, *Kuenenia*, *Scalindua*, *Anammoxoglobus* and *Jettenia*
- (S) The Anammox bacteria are characterized by the possession of extracellular anammoxosome in which the anammox process takes place

- (A) (P), (Q) and (S)
- (B) (P), (Q) and (R)
- (C) (R) and (S)
- (D) (Q), (R) and (S)

32. In some organisms, the potent allosteric activator of phosphofructokinase-1, one of the key regulatory enzymes of glycolytic pathway is

- (A) ATP
- (B) Lactic acid
- (C) Phosphoenolpyruvate
- (D) Fructose 2, 6-bisphosphate

33. An increase in entropy occurs in which one of the following situations?

- (A) Capturing of energy from sunlight during photosynthesis
- (B) Consolidation of memory in dendritic spines
- (C) Active transport of Ca^{2+} from cytosol to endoplasmic reticulum
- (D) Release of inorganic phosphate during ATP hydrolysis

34. Which of the following groups of microorganisms produce the neurotoxin β -N-methylamino-L-alanine (BMAA), a natural non-proteinogenic diamino acid that is produced in marine, freshwater and terrestrial environment?

- (A) Archaeobacteria
- (B) Cyanobacteria
- (C) Deuteromycetes
- (D) Actinomycetes

35. Biosynthesis of which of the following pairs of antibiotics is achieved through the use of nonribosomal protein synthases (NRPSs)?

- (A) Tyrocidine and Gramicidins
- (B) Bacitracin and Gentamycin
- (C) Polymyxin and Cephalosporin
- (D) Nystatin and Ristocitin

36. The leader peptide of *trp* operon contains two contiguous tryptophan residues. In absence of tryptophan ribosome, stalling occurs allowing the leader regions 2 and 3 to pair. At what position of a 14 amino acids leader peptide two contiguous tryptophan codons are located?

- (A) 5 and 6
- (B) 7 and 8
- (C) 8 and 9
- (D) 10 and 11

37. Si RNA

- (A) forms a complex in spliceosome
- (B) recruits histone acetyl transferase to the nucleus
- (C) forms a complex with RISC-protein to inhibit translation or cause degradation of complementary mRNA
- (D) is not transmitted to daughter cells after cell division

38. A phenomenon where a single gene has more than one phenotypic effect is known as

- (A) pleiotropy
- (B) phenocopy
- (C) phenology
- (D) phenotype

39. A decrease in Bcl-2 / Bax ratio will impact a cell by

- (A) preventing apoptosis
- (B) inducing apoptosis
- (C) inducing metastasis
- (D) inducing growth

40. One of the underlying reasons for development of the tertiary lymphoid organs (TLOs) as lymphoid neoorganogenesis in case of cancer is

- (A) suppression of TNF- α
- (B) chronic inflammatory microenvironment
- (C) inactivated 1L-17 mediated immune response
- (D) blockade of 1L-22

41. When a lambda DNA enters a new host, how is lysogeny established in absence of CI repressor?

- (A) With the help of products C II and C III, necessary for RNA polymerase to initiate transcription at the promoter P_R
- (B) With the help of products C II and C III, necessary for RNA polymerase to initiate transcription at the promoter P_L
- (C) With the help of products C II and C III, necessary for RNA polymerase to initiate transcription at the promoter P_{RM}
- (D) With the help of products C II and C III, necessary for RNA polymerase to initiate transcription at the promoter P_{RE}

42. λ ZAP vector is an example of

- (A) Phage
- (B) Phagemid
- (C) Cosmid
- (D) Plasmid

[Please Turn Over]

43. Viral-based transfection involves using a viral vector to carry a specific nucleic acid sequence into a host cell. Which of the following viruses are often used for stable transfection of cells?

- (A) Lentivirus
- (B) Adenovirus
- (C) Adeno-associated virus
- (D) Herpes virus

44. Three restriction endonucleases, P, Q and R, are capable of recognising 4bp, 6bp and 8bp sequences, respectively. What would be the relative frequency of occurrence of these sequences on a bacterial genome?

- (A) $P > Q > R$
- (B) $P > R > Q$
- (C) $R > Q > P$
- (D) $Q > R > P$

45. Minisatellites or Variable Number Tandem Repeats (VNTRs) are used in

- (A) gene therapy
- (B) gene mapping
- (C) DNA fingerprinting
- (D) polymerase chain reaction

46. Choose the right combination of components required to set up a PCR from the following

- (A) Template DNA, two primers, dNTPs and DNA ligase
- (B) Template DNA, two primers, NTPs and DNA ligase
- (C) Template RNA, two primers, NTPs and DNA polymerase
- (D) Template DNA, two primers, dNTPs and DNA polymerase

47. In protoplast culture experiment, the early detection of primary cell wall formation can be achieved by using

- (A) Fluorescein isothiocyanate
- (B) TTC
- (C) Acridine orange
- (D) Calcafluor white

48. Which of the following embryo sacs comprises of an egg apparatus of three haploid cells, three diploid antipodal cells and a central cell with two polar nuclei of which one is haploid and the other is triploid?

- (A) Adoxa type
- (B) Allium type
- (C) Polygonum type
- (D) Fritillaria type

49. In cryopreservation experiment, cryoprotectant chemicals act by

- (A) increasing the size of the ice crystals
- (B) lowering the freezing temperature of the cytoplasmic fluid
- (C) reducing the viscosity of the cytoplasmic fluid
- (D) inactivating the gene expression

50. Image formation in a Scanning Electron Microscope (SEM) requires signal of

- (A) elastically scattered electrons
- (B) inelastically scattered electrons
- (C) unscattered electrons
- (D) secondary electrons

51. Light inducible seed germination, termed photoblastism, occurs in some higher plants. Which one of the following is the example of positive photoblastic seed that does not germinate in darkness but requires exposure to sunlight?

- (A) Letuce
- (B) Onion
- (C) Lily
- (D) Nigella

52. Density gradient centrifugation of genomic DNA of a specific organism revealed a lower density peak in addition to the main peak. This is due to

- (A) AT rich satellite DNA
- (B) GC rich satellite DNA
- (C) equal proportion of AT and GC rich satellite DNA
- (D) pyrimidine rich satellite DNA

53. Median of first '100' natural number is

- (A) 50.5
- (B) 50
- (C) 51
- (D) 51.5

54. If the slope of the regression line is 1.75 and the intercept is 12, then the value of Y, when X is 3, would be

- (A) 1.75
- (B) 12
- (C) 17.25
- (D) 37.75

55. In C_4 plants, refixation of CO_2 occurs in chloroplasts of

- (A) spongy mesophyll
- (B) palisade tissue
- (C) bundle sheath cells
- (D) guard cells

56. Quiescent centres of root apices serve as

- (A) site for storage of nutrients to be utilized for growth and development of roots
- (B) reservoir of growth regulators
- (C) reserve block of diploid cells, when the root tip is damaged while pushing through the soil
- (D) region of absorption of water

57. Which of the following statements is *incorrect*?

- (A) Root apical meristem is the major site of synthesis of free cytokinin
- (B) Amino acid methionine is the precursor of ethylene
- (C) Benzyl adenine is the most abundant naturally occurring cytokinin in higher plants
- (D) Tryptophan is the precursor of IAA

58. During secondary wood formation in plants, balloon-like protrusions called 'Tyloses' are generated from

- (A) axial and ray parenchyma cells of xylem
- (B) phloem parenchyma cells
- (C) companion cells of phloem
- (D) vascular cambial cells

59. In which of the following chromosomes lateral loops of DNA are present?

- (A) B-chromosomes
- (B) Lamp-brush chromosome
- (C) Sex chromosome
- (D) Lagging chromosome

60. 'Incertae sedis' is the term used for a taxonomic group where

- (A) its phylogeography is not known
- (B) its characters match with a particular endemic species
- (C) its broader relationships are unknown or undefined
- (D) its distribution is confined to Galapagos islands only

61. Identify the *wrong* statement about the Bulliform cells or motor cells

- (A) They are minute specialized sub-epidermal cells that occur on the abaxial side of leaves in dicotyledonous plant
- (B) They are especially found on the upper surface of the leaves of species belonging to Poaceae and Cyperaceae families
- (C) They are believed to be involved in rolling and unrolling of leaves under severe drought and salinity conditions
- (D) They are generally present near the mid-vein portion of the leaf and are large, empty and colour less

62. Which of the following statements is *incorrect*?

- (A) In meiosis, one cycle of DNA replication is followed by two rounds of chromosome segregation
- (B) Astral type of mitosis is present in majority of the animal cells
- (C) Two homologous chromosomes in meiotic prophase I are held together by synaptonemal complex
- (D) Pluripotent cells have the ability to regenerate an entire organism *in vitro*

63. Which one of the following compounds specifically cleaves peptide bonds after methionine residue?

- (A) 1-fluoro-2, 4-dinitrobenzene
- (B) Trypsin
- (C) Cyanogen bromide
- (D) Pepsin

64. Which of the following statements is *not* correct for chrysolaminarin?

- (A) Chrysolaminarin is the reserve carbohydrate for Xanthophycophyta
- (B) It is a neutral lipid triglycerol, an important precursor for the production of biodiesel
- (C) It is a soluble polymer consisting of glucose monomers linked by β (1-3) bond with limited β (1-6) branching
- (D) It is stored inside the cells being encapsulated in vacuoles

65. The chemical nature of 'reserpine', obtained from the plant *Rauwolfia serpentina*, is

- (A) Tropane alkaloid
- (B) Indole alkaloid
- (C) Tropolene alkaloid
- (D) Pyrrolidine alkaloid

66. A molecular probe used in nucleic acid hybridization process is generally

- (A) an oligonucleotide double stranded DNA segment with random sequence of nitrogen bases
- (B) a large single stranded polynucleotide fragment having random sequence of nitrogen bases
- (C) a large ds DNA fragment with random sequences of nitrogen bases having unlabelled atoms
- (D) an oligonucleotide, complimentary single strand DNA having labelled atoms

67. Which of the following statements is *not* correct for heterocysts?

- (A) Heterocysts are specialized nitrogen-fixing cells, produced by some filamentous cyanobacteria
- (B) The presence of photosystem I ensures that sufficient ATP can be generated in heterocysts
- (C) The presence of photosystem II activity also ensures that sufficient oxygen is liberated in the heterocyst
- (D) Heterocysts fix nitrogen from dinitrogen (N_2) in the air using the enzyme nitrogenase

68. Gel-filtration chromatography is a versatile method for efficient separation of biological molecules. Which of the following statements is *not* true for this chromatographic method?

- (A) It is a form of partition chromatography used to separate molecules of different molecular size
- (B) This technique has also been referred to as gel-permeation chromatography or molecular sieve chromatography
- (C) In this method molecules are separated based on their affinity to the ion exchanger
- (D) The gel-filtration matrices may be made from dextrans or agarose

69. Waste water treatment is a multistep operation employing a number of independent processes. Which of the following stages of waste water treatment is carried out by aerobic microorganisms?

- (A) Primary treatment
- (B) Secondary anaerobic waste water treatment
- (C) Activated sludge system
- (D) Tertiary treatment

70. Which of the following methods is used for protein detection using antibody based probes to obtain specific information about target proteins from complex samples?

- (A) Northern blotting
- (B) Southern blotting
- (C) Western blotting
- (D) Eastern blotting

71. Which one of the following neurons in CNS has a GABA_A receptor containing the alpha 6 subunits?

- (A) Purkinje cell
- (B) Granule cell
- (C) Mossy fiber afferent
- (D) Red nuclear efferent

72. In signal transduction, the *Rhizobium* establishes its contact with leguminous plant through

- (A) surface polysaccharides of bacterial cell wall
- (B) the receptor proteins of bacterial cell membrane
- (C) proteins secreted by bacterial cell wall
- (D) metallic ions present in the soil

73. The first transgenic cow developed in 1997 was Rosie. Which of the following genes was introduced in Rosie?

- (A) Human- α -lactalbumin
- (B) Sheep β -lactoglobulin
- (C) Human factor IX
- (D) tPA

74. Histone acetylation increases the transcription of gene because

- (A) it increases the DNA histone interaction
- (B) the acetyl groups of histones are recognized by RNA polymerase
- (C) histone acetylation loosens the DNA-histone complex making it more accessible to RNA polymerase
- (D) histone acetylation increases the DNA bending which is recognized by RNA polymerase

75. The *Mycoplasma* spp. are characterized by all of the following general features except

- (A) they form 'fried-egg' colonies on solid media
- (B) they are wall-less microorganisms and are pleomorphic in shape
- (C) penicillin is the drug of choice for the control of *Mycoplasma* infections
- (D) they are osmotically fragile and are related to bacterial L-forms

76. Which of the following enzymes is *not* found in lysosomes?

- (A) Phosphatase
- (B) Lipase
- (C) Protease
- (D) Resolvase

77. The synthesis of monounsaturated fatty acid palmitoleate, 16 : 1 (Δ^9) from palmitic acid is catalysed by fatty acyl-CoA desaturase in an oxidative reaction, the enzyme is a

- (A) Mixed function oxidase
- (B) Dioxygenase
- (C) Fatty acid synthase
- (D) Dehydrogenase

78. The two extracellular domains, present in each chain of T-cell receptor (TCR) heterodimer belonging to immunoglobulin superfamily (IgSF) domain, are constituted of

- (A) Alpha-helix
- (B) Helix-turn-helix
- (C) Parallel beta-sheet
- (D) Antiparallel beta-sheet

79. Which one of the following organic groups has least probability of hydrogen bond formation with water?

- (A) Amine
- (B) Methyl
- (C) Hydroxyl
- (D) Carbonyl

80. In symbiotic relationship with plants, which of the following is formed by Ectomycorrhizal fungi?

- (A) Nodules
- (B) Arbuscules
- (C) Haustoria
- (D) Hartig net

81. In a stirred tank bioreactor, the primary function of the impeller is to

- (A) continuously mixing the microbial cells in the liquid culture medium
- (B) measure the dissolved oxygen in the fermentation medium
- (C) prevent the formation of foam in the vessel
- (D) supply adequate oxygen to the growing culture

82. In April 2016, the National Green Tribunal suspended the environmental clearance given to the proposed hydropower project in Arunachal Pradesh to save which of the following animal species?

- (A) Great Hornbills
- (B) Gayals
- (C) Snowy Owls
- (D) Black-necked Cranes

83. Bacterial ribosomes are composed of two asymmetric subunits, the large 50S subunit of *Escherichia coli* ribosome consists of

- (A) 16S rRNA, 5S rRNA and 21 proteins
- (B) 23S rRNA and 21 proteins
- (C) 16S rRNA and 34 proteins
- (D) 23S rRNA, 5S rRNA and 34 proteins

84. Loktak is one of the 37 Ramsar sites in India. It is the home for

- (A) Barking deer
- (B) Brow Antlered deer
- (C) Sambar
- (D) Spotted deer

85. Which of the following statements is most appropriate about 'Y' chromosome in mammals?

- (A) Essential for the development of embryo
- (B) Non-essential for the development of embryo but important for male sex determination
- (C) Non-essential for sex determination but important for male fertility
- (D) Essential for male sex determination and male fertility

86. Which one of the following incidents is *not* associated with Lyon hypothesis?

- (A) Consanguinity
- (B) Dosage compensation
- (C) Formation of tortoise-shell pattern in fur coat of female cats
- (D) Presence of Barr Body in female cats

87. What would be the average packing ratio of DNA in the solenoid structure of chromatin?

- (A) 146
- (B) 6
- (C) 200
- (D) 40

88. The interaction in which an individual gives up or sacrifice some of its own reproductive potential to benefit another individual is called

- (A) Agnostic
- (B) Territory
- (C) Hierarchy
- (D) Altruism

89. The Hilsa Shad, *Tenualosa ilisha*, is a migratory fish. It comes under the category of

- (A) Oceanodromous fish
- (B) Potamodromous fish
- (C) Amphihaline potamotocous fish
- (D) Amphihaline thalassotocous fish

90. The excretory products of earthworm are

- (A) ammonia and uric acid
- (B) urea and amino acid
- (C) amino acid
- (D) ammonia, urea and creatinine

91. A researcher was observing tail regeneration of *Planeria* injecting with RNAi for β -catenin mRNA into the blastema. What would be the expected result of his experiment?

- (A) *Planeria* with an extended tail
- (B) *Planeria* with two tails
- (C) *Planeria* with heads at both ends
- (D) *Planeria* with regeneration of a normal tail

92. During development in placental mammal, the fertilized egg undergoes division to form a blastocyst. The outermost cells of the blastocyst differentiate to form 'a thin layer of cells', which then invades the uterus and begins to form the placenta. This 'thin layer of cells' is known as

- (A) Allantois
- (B) Endometrium
- (C) Myometrium
- (D) Trophoblast

93. Excretory organ of *Herdmania* is

- (A) Protonephridia
- (B) Supra neural gland
- (C) Solenocytes
- (D) Metanephridia

94. Which of the following environmental pollutants causes methemoglobinemia in humans?

- (A) Arsenic
- (B) Fluoride
- (C) Nitrate
- (D) Triphosphate

95. According to Pressure Flow Model, mass flow of solute from source to sink occurs due to

- (A) concentration gradient
- (B) turgor pressure gradient
- (C) osmosis
- (D) osmosis and diffusion

96. 'Congo jute' an important superior jute substitute, is produced from

- (A) *Hibiscus sabdariffa*
- (B) *Unena lobata*
- (C) *Agave sisalang*
- (D) *Boehmeria nivea*

97. The chromosome number of antipodal cells of a cereal plant is 10. What would be the chromosome number in the cells of aleurone layer of the grain of this plant?

- (A) 10
- (B) 15
- (C) 30
- (D) 20

98. Which of the following pumps triggers pollen tube growth and discharge in the event of double fertilization?

- (A) Sodium-potassium pump
- (B) Proton pump
- (C) Calcium pump
- (D) Chloride pump

99. The spirochetes form one of the major phyla of the Eubacteria and are characterized by the following features except

- (A) morphologically most spirochetes have long helically coiled or corkscrew-shaped cells
- (B) like Gram-negative bacteria, spirochetes are 'diderms' or double membrane bacteria
- (C) spirochete flagella are referred to as 'endoflagella' or 'axial filaments'
- (D) all the spirochetes are free-living and can be cultivated from virtually any moist, nutrient rich environment

100. Primary production in an aquatic ecosystem is usually measured using Light-and-Dark-bottle technique. In this method, the dissolved oxygen concentration of the pond water enclosed in a BOD bottle before incubation (I) and after a fixed duration of incubation in a dark bottle (D) and light bottle (L) were measured. Then, the gross and net primary productivity of this system may be estimated as

- (A) (L-D) and (L-I), respectively
 - (B) (L-D) and (I-D), respectively
 - (C) (L-I) and (L-D), respectively
 - (D) (L-I) and (I-D), respectively
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Space for Rough Work

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