A

22103 **120 MINUTES**

1. Which among the following statements about prions is WRONG?
   A) They cause CJD, FFI and GSS in humans
   B) Prion disease is a type of proteopathy
   C) CD230 is the major prion protein in humans
   D) Frozen conditions for extended periods of time will inactivate prions.

2. Which among the following is known as Manna Lichen?
   A) Lecanora esculenta B) Peltigera canina
   C) Cetraria islandica D) Cladonia sylvatica

3. Which among the following traits does not suit Cycadales?
   A) The stomata are Syndetocheilic
   B) Stem apex does not possess tunica layer
   C) Plants are dioecious
   D) Microsporangia are eusporangiate in development

4. Select the suitable pairs from the following

a.	Copal	1.	Callitris
b.	Sandarc	2.	Agathis
c.	Rosin	3.	Pinus
d.	Oil of Hemlock	4.	Tsuga
		5.	Abies

   A) a-2, b-1, c-3, d-4 B) a-3, b-4, c-2, d-5.
   C) a-1, b-2, c-3, d-4 D) a-5, b-4, c-1, d-3

5. Eccentric secondary wood was characteristic of
   A) Bennettitales B) Pentoxylales
   C) Pteridospermales D) Cordaitaceae

6. Which among the following is **not** a character of Gnetum?
   A) The female gametophyte becomes completely cellular after fertilization
   B) Occurrence of a distinct tent pole
   C) The male gametophyte has a single male prothallus cell
   D) Prothallial tubes are formed during fertilization

7. Given below are enzymes involved in the C4 photosynthetic pathway. Select the correct sequential order of enzymes in the pathway:
   1. Malic enzyme 2. PEP Carboxylase
   3. Pyruvate phosphate dikinase 4. Malate dehydrogenase

   A) 2, 4, 1, 3 B) 2, 1, 3, 4 C) 1, 3, 2, 4 D) 1, 2, 3, 4

8. Analyze the following data
1. Any specimen cited in the protologue other than the holotype
2. Any specimen cited by the author when there is no holotype
3. A specimen or illustration designated from the original material as the nomenclatural type when no holotype was indicated at the time of publication
4. A specimen or illustration selected to serve as an interpretative type when all original material associated with a validly published name is demonstrably ambiguous or cannot be critically identified for purposes of the precise application of the name to a taxon

Considering the above statements a lectotype refers to:

A) 1 only B) 3 & 4 only C) 1 & 2 only D) 3 only

9. DELTA system is an integrated set of programmes which is a flexible and powerful method for recording taxonomic descriptions for computer processing was developed in:

A) Australia B) Japan C) USA D) Mexico

10. The oldest botanical garden in the world:

A) Palermo Botanic Garden of Italy
B) Leiden Botanic Garden of Netherlands
C) Padua Botanic Garden of Italy
D) Royal Botanic Garden of Scotland

11. The term ecotype was first proposed by:

A) Turesson B) Odum C) Wagner D) Clement

12. Select the correct match from the following (Common name – binomial- family)

A) Jute- Corchorus capsularis- Malvaceae
B) Opium- Papaver somniferum- Piperaceae
C) Green gram- Vigna unguiculata- Fabaceae
D) Annatto- Bixa Orellana- Bixaceae

13. In eusporangiate ferns, the sporangial initials are superficial in position and periclinal divisions of these cells result in outer wall cells and inner primary sporogenous cells. Select the fern from the following which is not eusporangiate

A) Psilotum B) Selaginella C) Isoetes D) Salvinia

14. An ovular structure that directs the growth of the pollen tube towards the micropyle is termed as:

A) Endostome B) Exostome C) Endothelium D) Obturator

15. An example for a tetra sporic embryosac :

A) Allium Type B) Drusa Type
C) Polygonum Type D) Oenothera Type

16. The diploid chromosome number of a plant species is 28. The chromosome numbers in various cells of that species is given below. Select the **wrong** one:
A) Nucellus = 28, Integument = 28, Funicle = 28, Micropyle = 28
B) Antipodals =14, Synergids = 14, inetguments = 28, Nucellus = 28
C) Endosperm = 84, Egg = 14, Synergid = 14, Nucellus = 14
D) Egg =14, Nucellus = 28, Antipodals = 14, Synergid = 14

17. Which among the following statement/s represent/s Diplospory?
1. A nucellar cell becomes activated and develops into an embryosac
2. Embryosac is formed from a megaspore mother cell without meiosis
3. Embryo developing from an unfertilized egg

A) 1 &2 only B) 2 & 3 only C) 2 only D) 1 only

18. The phytohormone that induces stomatal closure in plants is
A) IAA B) ABA C) GA D) IBA

19. Electron Transport System in mitochondrion consists of four multiprotein complexes localized in the inner mitochondrial membrane. Consider the reaction mentioned below and mention to which complex it belongs to
Succinate + UQ ⟶ Fumarate + UQH2

A) Complex I B) Complex II C) Complex III D) Complex IV

20. A plant response which is **not** influenced by blue light:
A) Inhibition of stem elongation
B) Stimulating stomatal opening
C) Stimulating asymmetric growth and bending
D) Inhibits proton pump at the guard cell plasma membrane

21. Cadastral genes are a class of genes involved in
A) Fruit maturation B) Floral development
C) Root initiation D) Pollen-Pistil interaction

22. Bowen ratio is related to:
A) Solute translocation in sieve elements
B) Growth of stem apex
C) Regulation of leaf temperature
D) Movement of phytohormones

23. Select the correct statemen/st connected with the features for Lamiaceae
1. Plants aromatic, Leaves exstipulate, Flowers zygomorphic, Fruits carcerulus
2. Plants aromatic, Leaves stipulate, Stamens didynamous, Fruits utricle
3. Stem angled, leaves stipulate, flowers actinomorphic, Flowers epigynous
4. Stem not angled, Leaves exstipulate, Flowers perigynous, Style gynobasic
A) 1 only B) 2 only C) 3 only D) 4 only

24. Select the correct pair from the following:
1. Abzymes…….. Monoclonal antibody with catalytic activity
2. Ribozymes……Catalytic RNA
3. Allosteric enzymes…..Biocatalysts do not exhibiting typical Michaelis-Menten Kinetic behaviour
4. Isoenzymes…….Enzymes differing in amino acid sequence yet catalyzing the same reaction

A) 1,2,3 & 4 B) 1,2 & 3 only
C) 1,2 & 4 only D) 1 & 4 only

25. Which among the following statements is not true regarding Cherenkov radiation?
1. Cherenkov radiation is faster than light
2. Cherenkov radiation is mostly in the UV spectrum
3. Cherenkov radiation can be dangerous
4. Cherenkov radiation is always red

A) 4 only B) 1 only C) 1 &4 only D) 1 &3 only

26. Which among the following is a derived amino acid?
A) Alanine B) Valine C) Glycine D) Cystine

27. RNAs capable of silencing the expression from their own genes are called
A) HnRNAs B) si RNAs C) guide RNA D) sn RNA

28. The number of structural genes in Tryptophan Operon is
A) 5 B) 4 C) 3 D) 6

29. PRPP is the key molecule in the de novo synthesis of purine and pyrimidine nucleotides and its synthesis is catalyzed by PRPP synthetase. Which among the following functions as a competitive inhibitor of PRPP synthetase?
A) ADP B) AMP C) NAD D) FAD

30. In eukaryotes, synthesis of mRNA in the nucleus is carried out by:
A) RNA Polymerase I B) RNA Polymerase II
C) RNA Polymerase III D) RNA Polymerase II and III

31. Considering chromosome duplications, when the duplicated region is immediately adjacent to the original segment, it is termed as
A) Reverse duplication B) Tandem duplication
C) Displaced duplication D) Simple duplication

32. Consider a chromosome originally having the segments ABC.DEFGH
Which among the following represents pericentric inversion in this segment?
A) AGD.BCFEH B) ABC.DGFEH
C) ABC.HGFED D) ABC. HGFED

33. The term Lamp Brush Chromosomes (LBC) was introduced in biological nomenclature by:
A) Ruckert B) Flemming C) Balbiani D) Walker

34. Phagocyte mediated defense against infections, especially with intracellular microbes is stimulated by:
A) T_H1 cells B) T_H2 cells C) TILs D) TSTA

35. Polycistronic RNA is common in:
A) Fungi B) Plant cells C) Bacteria D) Green Algae

36. Energy for tRNA charging is provided by:
A) ATP B) GTP C) GDP D) ADP

37. Select the **wrong** match from the following
A) Gene desert------ Devoid of protein coding genes
B) Multigene Family----repeated evolution of an ancestral gene
C) Protein Domains- ------Self-stabilizing showing independent folding
D) Haplotype-----Haploid set of chromosome

38. A disease which is **not** caused by a fungus:
A) Leaf spot of mango B) Powdery mildew of rubber
C) Coffee rust D) Red rust of tea

39. Quick wilt of pepper is caused by species of:
A) Oidium B) Pestalotiopsis
C) Phytophthora D) Ustilago

40. Biosurfactants have advantages over chemical surfactants. Given below are few properties. Choose those which are applicable to biosurfactants
1. Lower toxicity 2. Effectice at extreme temperature and pH
3. Biocompatibility 4. Biodegradability

A) 1 ,2 & 4 only B) 1,2,3 & 4 C) 1 & 3 only D) 2 &4 only

41. Kieselghur of commerce is obtained from:
A) Sargassum B) Laminaria C) Diatoms D) Fucus

42. Syngenecious androecium is the characteristic feature of:
A) Polygalaceae B) Malvaceae C) Asteraceae D) Rubiaceae

43. Pycnoxylic wood is seen in:
A) Pinus B) Cycas C) Zamia D) Macrozamia

44. PAS staining method is used to detect:
A) Lipids B) Proteins
C) Carbohydrates D) Amino acids

45. Warburg effect is defined as:
A) The greater absorption in the blue spectrum
B) Lesser absorption in the green spectrum
C) Inhibitory effect of O_2 in Photosynthesis
D) Masking of chlorophylls by Carotenoids

46. Richmond- Lang effect is related to:
A) CK B) GA C) IAA D) ABA

47. Select the Elton pyramid which can never be in the pattern in any ecosystem inverted:
A) Pyramid of energy
B) Pyramid of number in a pond ecosystem
C) Pyramid of biomass in sea
D) Pyramid of number in grass land

48. Tyloses are associated with:
A) Vessels of secondary xylem B) Cork cells
C) Sieve tubes D) Parenchyma of Secondary phloem

49. Amphivasal secondary vascular bundles are found in:
A) Bignonia B) Draceana C) Boerhavia D) Centella

50. A cell organelle common to both eukaryotes and prokaryotes is
A) Ribosome B) Golgi apparatus
C) Smooth ER D) Centriole

51. Which among the following does not find use as a chemical mutagen?
A) Dichloroacetone B) Ethylene Oxide
C) Ethylcarbamate D) Isopentenyl Pyro phosphate

52. The term heterosis was coined by:
A) Gregor Johann Mendel B) George H Shull
C) Kolreuter D) Camerarius

53. Which of the following is associated with nutrition of the poor in developing countries?
A) Biomagnification B) Bioremediation
C) Biofortification D) Biotransformation

54. The distribution patterns around the high latitudes of the southern hemisphere is termed as:
A) Circumaustral B) Circumpolar
C) Pantropic D) Cosmopolitan

55. Select the primary pollutant from the following
A) PAN B) Acid rain
C) Ground level Ozone D) Carbon monoxide

56. Kelps belong to:
A) Phaeophyceae B) Rhodophyceae
C) Chlorophyceae D) Bacillariophyceae

57. The inflorescence in Caesalpinia is:
A) Umbel B) Corymb C) Verticillaster D) Thyrsus

58. Ovary is inferior in:
A) Solanum B) Pisum C) Helianthus D) Mangifera

59. The range of variable such as weight in first quartile Q1 and third quartile Q3 is assumed as 215.65 and 226.31 gm respectively for an ungrouped data. What will be the Quartile deviation?
A) 4.65 B) 5.33 C) 8.44 D) 2.66

60. A cross is made between White Leghorns (IICC) and White Wyandottes (iicc). When the F1 Whites (IiCc) were bred together, white and colored chicks appeared. The F2ratio will be:
A) 3:1 B) 4:1 C) 13:3 D) 9:7

61. When more than one gene can have multiple effects on the phenotype, the phenomenon is called:
A) Multiple allelism B) Epistasis
C) Codominance D) Pleiotropism

62. Colchicine specifically blocks:
A) DNA synthesis B) Anaphasic movement
C) Chromosome condensation D) Formation of cell plate

63. The endosperm in Gymnosperms is:
A) Haploid B) Diploid C) Triploid D) Hexaploid

64. The GS-GOGAT pathway is energetically more costly than GDH pathway. The number of ATPs consumed in GS-GOGAT pathway:
A) 2 B) 3 C) 1 D) 6

65. A technique used to detect and measure the physical and chemical characteristics of a population of cells:
A) Flow cytometry B) HPLC
C) HPTLC D) FPLC

66. A, B and Z forms are three forms of DNA. Analyze the following statements and find which are correct regarding Z DNA:
1. Z DNA is left handed
2. Z DNA can be seen in Humans
3. Z DNA has 10 base pairs per turn

A) 1, 2, & 3 B) 1 & 2 only C) 1 & 4 only D) 1 only

67. Assertion (A) : Sympatric speciation is the process of evolution of new species from a surviving ancestral species while both continue to inhabit the same geographical region
Reason (R) : They evolve in such a way that they could interbreed freely

A) Both A and R are correct B) A is correct and R is wrong
C) Only R is correct D) Both A and R are wrong

68. DMSO is commonly used as a:
A) dehydrating agent B) vital stain
C) cryoprotectant D) pesticide

69. Following are few statements for FASTA. Select the correct response
1. It is used for searching similarities between sequences of DNA and Protein
2. Nucleotides or amino acids re represented as single letter codes
3. It is better for similarity searching in less similar sequences
4. The program follows a heuristic method

A) 1, 2 & 3 only B) 1 & 2 only C) 1, 2, 3 & 4 D) 2, 3 & 4 only

70. The functional elements along the sequence of a genome is identified by
A) Genome annotation B) Chromosome mapping
C) Sequence alignment D) DNA Proof reading

71. Chlorophyll a is absent in:
A) Volvox B) Fucus
C) Gelidium D) Photosynthetic bacteria

72. Select from the following – a reaction that requires two different enzymes like ligase and a thermostable Polymerase:
A) PCR B) LCR C) RAPD D) SSR

73. In Kerala, ICAR-NBPGR Regional Station is situated at:
A) Thiruvananthapuram B) Kasaragod
C) Thrissur D) Kozhikode

74. Given below are few statements related to phloem translocation in plants. Select the **wrong** statement:
A) Apoplastic loading of sucrose into the sieve tubes is an active transport process
B) Short distance pathway is always symplastic
C) SUT1 and SUT2 are the major sucrose transporters in phloem loading
D) Species exhibiting symplastic loading exclusively translocates sucrose

75. A mixture of Chromium trioxide, Osmium tetroxide and Glacial Ascetic Acid in distilled water form the ingredients of the fixative
A) FAA B) Carnoy's Fluid
C) Flemming's Fluid D) PAS

76. Choose the correct characteristic feature/s of the Severe Acute Respiratory Syndrome Coronavirus - 2 (SARS-CoV-2) from those given below

1. The COVID-19 belongs to genera Betacoronavirus, order Nidovirales
2. Single-stranded RNA associated with a nucleoprotein within a capsid comprised of matrix protein
3. The virus uses ACE2 as the entry receptor-like SARS-CoV
4. The envelope bears club-shaped glycoprotein projections

A) 1 only B) 1 & 3 only C) 1,2 & 3 only D) 1, 2, 3 & 4

77. Select the mismatch pair from the following

A) *Oedogonium aquaticum* - haplontic life cycle
B) *Cladophora glomerata* - diplontic life cycle
C) *Ulva lactuca*-heteromorphic diplohaplontic life cycle
D) *Polysiphonia fucoides*- Diplobiontic life cycle

78. Select the statement/s which is/are incorrect

1. Three distinct phases i. e. haplophase, dikaryophase and diplophase occur in the life cycle of *Puccinia*
2. In *Ustilago*, first of all smut spores are produced which germinate to produce basidia and basidiospores
3. Deuteromycetes reproduce by producing a variety of asexual spores such as conidia, chlamydospores, arthrospores, oidia etc.
4. A saucer shaped asexual body composed of a group of small conidiophores bearing conidia arising from a stromatic mass of hyphae is termed pycnidium

A) 1 only B) 2 only C) 2 & 3 only D) 4 only

79. Select the correctly matched pair/s of fungal disease/s and the causative organism/s

1. Loose smut of wheat – *Ustilago maydis*
2. Panama disease of banana – *Fusarium oxysporum*
3. Downy mildew of grapevine – *Uncinula nector*
4. Late blight of potato – *Alternaria solani*

A) 1 &2 only B) 1 only C) 2 & 3 only D) 1, 2, 3, & 4

80. Many enzymes are produced by fungi, which find their application in many industries. Match the enzymes and fungi producing them

a. Cellulase	1. *Aspergillus oryzae*
b. α -Amylase	2. *Trichoderma reesi*
c. Invertase	3. *Aspergillus niger*
d. Lactase	4. *Saccharomyces cerevisiae*

A) a-3, b-1, c-4, d-2 B) a-2, b-1, c-4, d-3
C) a-2, b-1, c-3, d-4 D) a-3, b-2, c-4, d-1

81. Identify the Bryophyte which has elaters in the capsule
A) *Riccia* B) *Marchantia* C) *Funaria* D) *Polytrichum*

82. Which of the following are heterosporous pteridophytes?
A) *Dryopteris* and *Pteridium* B) *Selaginella* and *Salvinia*
C) *Equisetum* and *Lycopodium* D) *Lycopodium* and *Salvinia*

83. Choose the correct statements:
1. Lepidodendron is an extinct Lycopod tree
2. Their bark was covered with diamond-shaped leaf scars
3. They reproduced with a cone like structure
4. Lepidodendron existed during the Permian period

A) 1 & 2 only B) 1 & 3 only C) 1, 2 & 3 only D) 1, 2 & 4 only

84. Identify the DNA phylogeny-based angiosperm classification system at the order and familial levels in which groups are always monophyletic
A) Henning system
B) Hutchinson system
C) Bessey's Phylogenetic system
D) APG system

85. Select the incorrectly matched pair with respect to arrangement of stamens
A) Brassicaceae - tetradynamous B) Rubiaceae - epipetalous
C) Asteraceae – polyandrous D) Lamiaceae – didynamous

86. Match the morphology of the useful part with the plant

a.	*Myristica fragrans*	1.	Cotyledons
b.	*Vigna unguiculata*	2.	Fleshy aril
c.	*Corchorus capsularis*	3.	Oleo-gum-resin
d.	*Ferula asafoetida*	4.	Phloem fibres

A) a-3, b-1, c-4, d-2 B) a-2, b-3, c-1, d-4
C) a-2, b-1, c-4, d-3 D) a-4, b-2, c-1, d-3

87. The most commonly used staining procedure in the histology laboratory for localization of carbohydrates
A) Sudan black B) The periodic acid-Schiff (PAS)
C) Coomassie brilliant blue D) Aniline blue black

88. According to transpiration pull theory the ascent of water through xylem is due to
1. a negative pressure (tension) that develops in mesophyll cells in the leaf
2. The cohesive property of water required for sustaining water column in the xylem
3. water remains as a continuous column due to the adhesive property of xylem vessels

A) 1 only B) 1 & 2 only
C) 2 & 3 only D) 1,2 & 3

89. Which of the following is an example for an electrogenic pump?
A) H^+K^+ ATPase in animal cells
B) H^+ and $Ca2^+$ pumps in plant plasma membrane
C) $Na^+ K^+$ ATPase
D) None of the above

90. An electron transport chain consisting of one FAD molecule, one heme of cyt b type (cyt b557) and one cofactor containing Mo called molybdenum cofactor (MoCo) is a characteristic feature of the enzyme
A) Nitrogenase B) Nitrate reductase
C) Nitrite reductase D) Glutamate dehydrogenase

91. Which of the following statement regarding cyanide insensitive respiration is **not** correct?
A) It is an alternative pathway that transfers electrons directly from the ubiquinone pool to oxygen, bypassing complex III and cytochrome c oxidase
B) The cyanide-resistant respiration is conferred by a protein, the alternative oxidase (AOX), sensitive to salicylhydroxamic acid (SHAM)
C) The pathway occurs only when the mitochondrial UQ pool is highly reduced
D) AOX is inactivated by a high concentration of pyruvate

92. Match the class of floral organ identity genes in *Arabidopsis* in with the corresponding genes

a. Class A genes that control whorls 1 and 2	1. Apetala 3 and Pistillata
b. Class B genes that control whorls 2 and 3	2. Seedstick and Shatterproof
c. Class C genes that control whorls 3 and 4.	3. Apetala 1 and Apetala 2
d. Class D genes that specify identity of ovule	4. Agamous

A) a-3, b-1, c-4, d-2 B) a-2, b-1, c-4, d-3
C) a-2, b-1, c-3, d-4 D) a-3, b-2, c-1, d-4

93. Select the correct statements with respect to circadian rhythms :
1. The rhythm has an endogenous free running period that lasts~ 24h
2. The rhythms are entrainable ie the rhythm can be reset by exposure to external stimuli such as light and heat a process called entrainment.
3. The external stimulus used to entrain the rhythm is called zeitgeber or time giver
4. The rhythm exhibits temperature compensation

A) 1 only B) 1 & 3 only C) 1, 2 & 3 only D) 1, 2, 3 & 4

94. The seed stock handled to maintain specific identity and genetic purity, which may be designated or distributed and produced under careful supervision of an agricultural experiment station is known as
A) Breeder seed B) Foundation seed
C) Registered seed D) Certified seed

95. Choose the correct statements regarding Pentose phosphate pathway (PPP)

1. The respiratory substrate is glucose 6-phosphate
2. The pathway consists of 2 phases: a preparative phase and a payoff phase
3. The two most important products from this process are the ribose-5-phosphate sugar used to make DNA and RNA, and the NADPH molecules which help with building other molecules
4. No energy in the form of ATPis produced or used up in this pathway

A) 1 only B) 1 & 3 only C) 1, 2 & 3 only D) 1, 3 & 4 only

96. According to the principle underlying the formation of Ramachandran plot which are the more likely conformation/s for a polypeptide chain to adopt?

A) Alpha helices B) Beta strands
C) Turns D) All of these

97. Cell cycle checkpoints ensure that each of the various events that make up the cell cycle occurs accurately and in the proper order. Checkpoints are surveillance mechanisms that halt the progress of the cell cycle if

A) chromosomal DNA is damaged
B) DNA replication during S phase has not been properly completed.
C) chromosome alignment during M phase is not complete
D) All the above

98. Philadelphia chromosome detected in the malignant cells of chronic myelogenous leukemia (CML) patients is the result of translocation between chromosome numbers

A) 22 and 9 B) 22 and 5 C) 9 and 5 D) 12 and 18

99. Which of the following is an error prone repair system?

A) Base excision repair (BER)
B) Nucleotide excision repair (NER)
C) SOS repair
D) Mismatch repair (MMR)

100. Match the following:

a. Negative regulation	1. a repressor protein binds to an operator to prevent a gene from being expressed.
b. Positive regulation	2. a transcription factor is required to bind at the promoter to enable RNA polymerase to initiate transcription.
c. Inducible regulation	3. the gene is regulated by the presence of its substrate.
d. Repressible regulation	4. the gene is regulated by the product of its enzyme pathway.

A) a- 2, b- 1, c- 3, d- 4 B) a- 1, b- 2, c- 4, d- 3
C) a- 4, b- 3, c- 2, d- 1 D) a- 1, b- 2, c- 3, d- 4

101. *CpG* sites, that is *5′—C—phosphate—G—3′* sites and CpG islands are considered very important in epigenetics because they are important in controlling gene expression through

A) Methylation of cytosine
B) Acetylation of cytosine
C) Acetylation of guanine
D) Methylation of guanine

102. Match the following epistatic reactions with their ratios

a.	Dominant epistasis	1.	9 : 7
b.	Recessive epistasis	2.	9: 3: 4
c.	Duplicate dominant genes	3.	15: 1
d.	Duplicate recessive genes	4.	12: 3: 1

A) a- 4, b- 3, c- 2, d- 1
B) a- 2, b- 4, c- 3, d- 1
C) a- 4, b- 2, c- 3, d- 1
D) a- 3, b- 2, c- 4, d- 1

103. Match the following classical examples of maternal effects and cytoplasmic inheritance with their corresponding organisms

a.	Dextral and sinistral shell coiling	1.	*Neurospora*
b.	Killer Trait	2.	*Paramecium aurelia*
c.	Poky trait	3.	*Limnaea peregra*
d.	Iojap trait	4.	*Zea mays*

A) a- 3, b- 2, c- 1, d- 4
B) a- 3, b- 1, c- 2, d- 4
C) a- 2, b-3, c-1, d-4
D) a- 4, b- 2, c- 1, d- 3

104. In a linkage mapping study it was found that genes a and b are 18 map units apart, genes b and c are 6 map units apart and a and c 12 map units apart . The total length of the map is 18 map units. Determine the gene sequence in the map.

A) a- b- c
B) b- a- c
C) a-c-b
D) the data is insufficient

105. Which of the following is **not** a factor affecting and changing Hardy-Weinberg Equilibrium?

A) Mutation
B) Migration
C) Random mating
D) Selection against a recessive lethal

106. Which of the following describes the immunity obtained from vaccinations?

A) Innate immunity
B) Adaptive, natural and active immunity
C) Adaptive, artificial and active immunity
D) Adaptive natural and passive immunity

107. Which of the following statements about monoclonal and polyclonal antibodies is **incorrect** ?

A) Monoclonal antibodies are produced by a single clone of plasma B cells against a single antigen.
B) Polyclonal antibodies are produced by different clones of plasma B cells against different antigens.
C) Polyclonal antibodies are produced by different clones of plasma B cells against a particular antigen.
D) Monoclonal antibody production requires hybridoma cell lines while Polyclonal antibody production does not require it.

108. Which of the following statements about ecosystem productivity is **incorrect**?

A) Gross primary production (GPP) refers to the total rate of organic carbon production by autotrophs
B) Net primary production (NPP) is GPP minus the autotrophs' own rate of respiration.
C) Secondary production (SP) typically refers to the growth rate of heterotrophic biomass.
D) Net ecosystem production (NEP) is GPP minus the respiration by all organisms in the ecosystem except decomposers.

109. There is an overall tendency for the density of a population under the influence of intraspecific competition to settle at *K* (carrying capacity). In this context find the correct statement/statements from the following.

A) over a sufficiently large density range, as density increases, competition between individuals generally reduces the per capita birth rate and increases the death rate.
B) At densities below *K*, births exceed deaths and the population increases.
C) At densities above *K*, deaths exceed births and the population decreases.
D) All the above.

110. How ships pollute oceans and waterways?

A) Through oil spills
B) Discharge of cargo residues from bulk carriers
C) Transport of invasive species through ballast water
D) All the above

111. Match the international treaties with their targeted environmental threat

a. Montreal protocol- 1987	1. Against Persistent organic pollutants
b. Paris agreement- 2015	2. To set emission targets for developed countries
c. Kyoto Protocol	3. To protect Ozone layer
d. Stockholm Convention	4). For action against climate change

A) a- 3, b- 4, c- 2, d- 1
B) a- 1, b- 4, c- 2, d- 3
C) a- 4, b- 3, c- 2, d- 1
D) a- 2, b- 4, c- 3, d- 1

112. The international organization involved as the single agency or as a major partner in all of the following initiatives:
1. Convention on International Trade in Endangered Species of Wild Fauna and Flora
2. The Convention on Wetlands
3. Publication of 'Caring for the Earth'
4. Business and Biodiversity Programme
5. Publication of the list of world's most threatened species

A) IUCN B) UNEP
C) UNESCO D) World Wide Fund for Nature

113. According to present astrophysical, geological, archaeological and biological notions which one of the following is grossly **wrong**?
A) Present Universe started with a Big-bang some 13.5 billion years before present
B) Earth formed about 4.5 billion years before present
C) Life on earth originated about 3.5 billion years before present
D) Blue-green algae originated about 1 billion years before present

114. Select the correct statements about Molecular evolution and molecular clock
1. The rate of molecular evolution is usually defined as the number of nucleotide (or amino acid) substitution per site per year.
2. There is a Universal molecular clock ticking at the same rate in all organisms.
3. The rates of morphological and molecular evolution are perfectly matching.
4. Molecular clock in a group of closely related organisms (e.g. mice, rats and hamsters) is called a local clock.

A) 1 and 2 only B) 2 and 3 only
C) 3 and 4 only D) 1 and 4 only

115. Select the forms of tissue cultures best suited for secondary metabolite production in bioreactors?
A) Callus cultures and cell suspension cultures
B) Cell suspension cultures and hairy root cultures
C) Callus cultures multiple shoot cultures
D) All the above

116. Allopheny is:
A) The phenomenon of concurrent display of two or more allelic cellular phenotypes in a single organism.
B) Display of different phenotypes by a single allele in different organisms
C) Display of same allelic cellular phenotype by different alleles.
D) All the above

117. Which of the following is a secondary database?
A) GenBank B) DDBJ C) Ensembl D) PDB

118. The technique for visualizing biochemical processes by allowing an investigator to determine the location of radioactively labelled materials within a cell

A) Phase-contrast microscopy B) Autoradiography
C) Fluorescent microscopy D) Magnetic resonance Imaging

119. The type of distribution which deals with multiple levels of events having different degrees of freedom

A) Chi-squared distribution B) Normal distribution
C) F distribution D) t distribution

120. Match the vegetative propagation methods with the plants to which they are most suited.

a.	Cutting	1.	Rose
b.	Air-layering	2.	Mango
c.	Grafting	3.	Tapioca
d.	Budding	4.	Guava

A) a- 2, b- 1, c-3, d- 4 B) a- 1, b- 2, c-3, d- 4
C) a- 3, b- 4, c-2, d- 1 D) a- 4, b- 2, c-3, d- 1