MSBE

Roll No..…….. **Test Booklet No. …….**

Name of Candidate …… ***Signature of Candidate …….***

Date of Examination: 15th June 2015 ***Signature of Invigilator …….***

……

INSTRUCTIONS TO CANDIDATES

Time: 3 hours **FIC No.** ……

Max. Marks: 200

1. This Test Booklet consists of **two** sections (**Section A and Section B**).

2. For answering **Section A (Multiple Choice Type Questions 1-150):**
   (a) Each question is followed by four alternative answers. Candidates are required to select the most appropriate answer (A or B or C or D) for the question and write the option only in capital letters in the BOX provided.
   (b) Candidates are required to make all entries in the BOX in **ink/ball point pen only**. There should be no overwriting. **Any entry made in pencil or showing overwriting will be ignored. Each Multiple Choice Question carries one mark**.

3. For answering **Section B (Short Answer Type Question 1-10):**
   Each short answer type question is provided with appropriate blank space. The candidate is required to write the answer in the **blank space only**. **Each short answer type question (a + b parts) carries five marks (a = 3 marks and b = 2 marks)**.

4. Within 10 minutes of the start of the examination, the candidates will check the Test Booklet and ensure that it contains all the pages and no question is missing.

5. The candidates will write their **Roll Number** on top of the cover page of the Test Booklet. If any candidate writes his/her identity at any place beyond the prescribed space, he/she will be deemed to have used unfair means and will be liable to punishment for the same.

6. No candidate will be permitted to leave the examination hall until the expiry of one hour from the commencement of the examination.

7. No candidate is allowed to note down the questions or the answers thereto. Doing so will amount to use of unfair means and the candidate shall be dealt with accordingly.

8. There shall be **no negative marking**.

9. No candidate will be permitted to take away the booklet after completion of the examination.

10. Use only English language to answer the questions in Section B.

P.T.O.

Evaluation Scores of Section A

1	2	3	4	5	6	7	8	9

10	11	12	13	14	15	Total

Evaluation scores of Section B

1	2	3	4	5	6	7	8	9	10	Total

Signature of the Examiners: 1. 2.

3. 4. 5.

6. 7. 8.

9. 10. 11.

12. 13. 14.

15.

Section A

1. *Escherichia coli* is grown in a culture medium containing radioactive phosphorous for 48 hours. Which of the following would have radioactive label?

   A. Proteins, RNA and phospholipids

   B. RNA and phospholipids only

   C. Phospholipids only

   D. Proteins and phospholipids only

2. The cocci bacteria that mostly occur in single or pairs are:

   A. Streptococci

   B. Tetracocci

   C. Diplococci

   D. None of the above

3. The two modified sugars, N- acetylglucosamine (NAG) and N- acetylmuramic acid (NAM), present in the cell walls of Gram positive bacteria are covalently linked by:

   A. α-1,4-glycosidic bond

   B. α-1,6-glycosidic bond

   C. β-1,4-glycosidic bond

   D. β-1,6-glycosidic bond

4. When a virus enters a cell but does not replicate immediately, the phenomenon is called as :

   A. Heliotism

   B. Symbiosis

   C. Lysogeny

   D. Synergism

5. For a virus to replicate in host cell:

A. The host cell must be undergoing mitosis.

B. Its genome must be released in the host cytoplasm.

C. The host cell must lack a cell membrane.

D. The capsid subunits should enter the host cell cytoplasm.

☐

6. Astaxanthin is obtained from:

A. *Haematococcus*

B. *Ectocarpus*

C. *Dunaliella*

D. *Scenedesmus*

☐

7. Which of the following algae is responsible for red colour of red sea?

A. *Chlamydomonas braunii*

B. *Trichodesmium erythraeum*

C. *Ulothrix zonata*

D. *Dunaliella salina*

☐

8. Iota Carrageenan is produced by:

A. *Eucheuma cottonii*

B. *Eucheuma spinosum*

C. *Gigartina acicularis*

D. All of the above

☐

9. *Cephaleuros* is:

A. An endophytic alga

B. A parasitic alga

C. A freshwater alga

D. A lithophytic alga

10. Sargasso sea is named after a:

A. Green alga

B. Brown alga

C. Red alga

D. Cyanobacterium

11. What ensures the distribution of two genetically distinct nuclei in the daughter cells after division in a dikaryotic mycelium in the members of Basidiomycota?

A. Woronin bodies

B. Septal plugs

C. Clamp connection

D. Crozier

12. In fungi, a globose fruiting body with no opening is known as:

A. Perithecium

B. Apothecium

C. Cleistothecium

D. Ascostroma

13. Which of the following is not a fungus?

A. *Claviceps*

B. *Phytophthora*

C. *Cladosporium*

D. *Penicillium*

14. Members of which one of the following phyla form zoospores in their life cycle?

A. Chytridiomycota

B. Ascomycota

C. Basidiomycota

D. Zygomycota

15. The peltate disc formed on sporangial dehiscence in *Rhizopus* is:

A. an inverted columella

B. a remnant of sporangial wall

C. an inverted sporangial wall

D. a part of sporangiophore

16. Common scab in potato is caused by which of the following:

A. *Xanthomonas*

B. *Streptomyces*

C. *Cercospora*

D. *Pyricularia*

17. The causal organism of the disease responsible for Irish famine is:

A. *Phytophthora infestans*

B. *Alternaria solani*

C. *Ralstonia solanacearum*

D. *Rhizoctonia solani*

18. Which of the following pathogens transfers its DNA into the host genome to parasitize?

A. *Agrobacterium tumefaciens*

B. *Aspergillus ridulans*

C. *Meloidogyne incognita*

D. *Myzus persicae*

19. *Anthoceros* shows a close ancestry with green algae due to the presence of :

A. An active intercalary meristem in the foot of sporophyte

B. Long filamentous protonema

C. Single large chloroplast with a pyrenoids in each cell

D. Multi layered jacket of gametangia

20. In bryophytes, meiosis occurs in the:

A. Sporogenous tissue of the sporangium to produce spores

B. Gametangia to produce sperms and egg

C. Spores to produce protonema

D. Gametophyte to produce gametangia

21. The primitive type of sporophyte, that lacks foot, seta and elaters and is completely embedded in the gametophytic tissue, is found in:

A. *Riccia*

B. *Porella*

C. *Pellia*

D. *Marchantia*

22. Retort cells of shoot and hyaline cells of leaf lamina facilitate high water holding capacity in the gametophores of:

A. *Funaria*

B. *Porella*

C. *Pellia*

D. *Sphagnum*

23. Siphonostele is characterized by the presence of:

A. Central pith surrounded by vascular tissue with or without leaf gap

B. Central cylinder of xylem in which phloem is interspersed

C. Central solid core of xylem surrounded by phloem

D. Central solid core of phloem surrounded by xylem

24. Which one of the following is **not** correct?

A. In the stem of *Selaginella*, stele is suspended in the centre by means of endodermal trabeculae.

B. In *Equisetum,* the spores are spirally wrapped with elaters.

C. In *Pteris,* the sporangia occur in bean-shaped reproductive bodies, called sporocarp.

D. Stem of *Rhynia* is protostelic.

25. Spores of heterosporous pteridophytes germinate to produce:

A. Monoecious prothallus

B. Dioecious prothallus

C. Sterile prothallus

D. Sporophytic prothallus

26. Which one of the following is the source of highly priced dry fruit 'Chilgoza' (Pine nut)?

A. *Pinus gerardiana*

B. *Pinus wallichiana*

C. *Pinus roxburghii*

D. *Pinus khasiana*

27. A unique feature of *Gnetum* is:

A. Nuclei of some nucellar cells function as eggs

B. Archegonia remain in a group surrounded by a common jacket

C. Two distinct archegonia are present at the micropylar end of the female gametophyte

D. No distinct archegonia are present and some free nuclei of the female gametophyte function as eggs

28. The cortex of corolloid roots in *Cycas* consists of:

A. Algal zone inhabited by *Nostoc* and *Anabaena*

B. Fungal zone inhabited by mycorrhizae

C. Distinct sclereid zone having cells filled with calcium oxalate crystals

D. Bacterial zone inhabited by *Rhizobium*

29. Which of the following has endoplasmic reticulum, plastids and mitochondria but no nucleus at maturity?

A. Sclereid
B. Tracheid
C. Sieve element
D. Companion cell

30. In which of the following types of stomata, the guard cells are not surrounded by distinct subsidiary cells?

A. Anisocytic
B. Cyclocytic
C. Paracytic
D. Anomocytic

31. Programmed cell death is **not** involved in:

A. Differentiation of vessels
B. Degeneration of non-functional megaspores
C. Differentiation of sieve elements
D. Heartwood formation

32. Latex of *Carica papaya* contains:

A. Liquid wax
B. Rubber
C. Alkaloids
D. A proteolytic enzyme

33. Glandular trichomes of *Cicer arietinum* secrete:

A. Organic acids

B. Nectar

C. Mucilage

D. Terpenes

34. Leaf surface closer to the central axis of the plant is termed as:

A. Abaxial

B. Proximal

C. Adaxial

D. Distal

35. Paedomorphosis refers to the phenomenon of:

A. Sudden increase in length of tracheary elements

B. Differential length of tracheary and ray elements

C. Gradual increase in length of tracheary elements

D. Haphazard arrangement of primary xylem

36. The height and width of a ray element can be examined by cutting:

A. Transverse section

B. Longitudinal section

C. Tangential section

D. Both transverse and longitudinal section

37. Amphicribal bundles are characterized by:

A. Intraxylary phloem in close contact with xylem

B. Phloem that is external to xylem

C. Xylem surrounding phloem

D. Phloem surrounding xylem

38. Which of the following is responsible for the economic importance of Cinnamon bark?

A. Secretory oil cells

B. Laticiferous tubes

C. Colleters

D. Secretory ducts

39. Plumose condition of stigma with receptive surface dispersed on multiseriate branches is a characteristic feature of:

A. Mangrove plants

B. Entomophilous plants

C. Cereals

D. Species with wet-type of stigma

40. During pseudogamous type of apomixis:

A. Polar nuclei fuse with one of the sperm cells to form endosperm

B. Polar nuclei fuse and initiate autonomous endosperm formation

C. Polar nuclei fail to fuse and endosperm is not formed

D. Polar nuclei never participate in the process

41. Callose deposition in meiocytes during microsporogenesis mainly ensures:

A. prevention of water loss from the meiocytes.

B. gametophytic control of development.

C. firmness to the microspores.

D. sporophytic control of development.

42. In an embryo sac:

A. nucleus of the egg cell is usually located towards the micropylar end and those of the synergids towards the chalazal end.

B. cell wall of the egg cell is not attenuated towards the chalazal end.

C. of plant species where the egg apparatus is without the synergids, the egg cell possesses the filiform apparatus.

D. central cell invariably harbours two nuclei.

43. The type of cytoplasmic streaming at the tip region of growing pollen tubes is:

A. Circular

B. Spiral

C. Pulsating

D. Reverse fountain

44. Übisch bodies are the:

A. membrane bound lipoidal bodies that contribute to exine formation.

B. polysachharidic granules that give species specific exine pattern.

C. membrane bound proteinaceous bodies that confer recognition reaction.

D. callose rich vesicles which get impregnated in the cavities of exine.

45. One of the essential prerequisites for normal microgametogenesis to proceed is:

A. formation of two sperm cells before the release of pollen grains.

B. vacuole formation and asymmetric division in the microspores.

C. physical association of sperm cells with the vegetative nucleus.

D. the attainment of stigma receptivity before anther dehiscence.

46. Female gametophyte in *Peperomia* is:

A. Bisporic, 16-nucleate and bipolar

B. Tetrasporic, 4-nucleate and bipolar

C. Tetrasporic, 16-nucleate and polypolar

D. Monosporic, 8-nucleate and bipolar

47. Elaiosome arises as an outgrowth of:

A. Inner integument

B. Raphe or hilum

C. Funiculus

D. Nucellus

48. X-bodies formed during fertilization in flowering plants represent the:

A. degenerated unfertilized male and female gametes

B. degenerated nuclei of the synergid and the vegetative nucleus

C. laggard chromosomes that do not participate in syngamy

D. laggard chromosomes that do not participate in triple fusion

49. A specimen or any other element selected from the original material cited by the author when no holotype was designated at the time of publication is called:

A. Holotype
B. Isotypes
C. Lectotype
D. Topotype

50. A group that includes a common ancestor and some but not all of its descendants is called:

A. Monophyletic
B. Polyphyletic
C. Paraphyletic
D. Plesiomorphic

51. The floral formula showing bisexual, zygomorphic, $K_{(5)}$, C_5, A_{9+1}, G_1 arrangement represents which of the following?

A. Brinjal
B. Pea
C. Sunflower
D. Mustard

52. Which statement is not true about taxonomic keys?

A. A key consists of a number of couplets
B. Each couplet has a pair of leads
C. The two leads of a couplet are arranged in yokes
D. Polyclave keys are single-access keys

53. Lloyd Botanic Garden is located at:

A. Kew

B. Dehra Dun

C. Darjeeling

D. Moscow

54. Allopatric speciation is due to:

A. Mutation

B. Reproductive isolation only

C. Geographical isolation only

D. Interplay of geographical isolation and reproductive isolation

55. Most primitive angiosperm is:

A. *Magnolia*

B. *Nymphaea*

C. *Amborella*

D. *Ranunculus*

56. A classification based on overall similarities is called:

A. Artificial classification

B. Phylogenetic classification

C. Phenetic classification

D. Phyletic classification

57. Which statement is **not** correct?

A. Primitive or ancestral condition is called plesiomorphy

B. Similarity due to common ancestry is called homology

C. The evolutionary history or pattern of descent of a group of organisms is called phylogeny

D. Phylograms do not show evolutionary relationships and phylogenetic distances

58. ICN stands for:

A. International Code of nomenclature of Algae, Fungi and Plants

B. International Code of Botanical Nomenclature

C. International Code of Nomenclature of Cultivated Plants

D. International Code of Nomenclature

59. Km value of an enzyme is the substrate concentration at:

A. ½ V max

B. 2 V max

C. ¼ V max

D. V max

60. Which of these enzymes is not a part of the Calvin cycle?

A. Aldolase

B. Glyceraldehyde 3- phosphate dehydrogenase

C. Phosphofructokinase 1

D. Transketolase

61. Link between glycolysis, Krebs cycle and β-oxidation of fatty acids is:

A. Citric acid

B. Oxalo-acetic acid

C. Succinic acid

D. Acetyl Co- A

62. Sucrose is synthesized in:

A. Cytosol

B. Chloroplast

C. Mitochondria

D. Peroxysomes

63. How many ATP molecules are produced per molecule of sucrose during aerobic respiration?

A. 20

B. 25

C. 60

D. 50

64. The major class of pharmacologically active secondary metabolites exemplified by morphine and cocaine, are:

A. Terpenoids

B. Alkaloids

C. Phenolics

D. Biogenic amines

65. How many $FADH_2$ and NADH molecules are produced, respectively, after 6 cycles of β-oxidation pathway?

A. 6, 6

B. 6, 12

C. 12, 6

D. 6, 18

66. Sulphur containing amino acids are:

A. cysteine and methionine

B. methionine and threonine

C. cysteine and threonine

D. cysteine and serine

67. Which of the following statements about the control of enzyme activity by phosphorylation is correct?

A. Phosphorylation of an enzyme is not a reversible process since it is a covalent modification.

B. Phosphorylation of an enzyme occurs by protein phosphatases.

C. Phosphorylation of an enzyme is an intracellular process and cannot occur in response to external signals.

D. Phosphorylation of an enzyme results in a conformational change.

68. Choose the correct statement about a transamination reaction:

A. It involves ATP hydrolysis.

B. It requires keto reductase.

C. It requires NAD^+ or $NADP^+$.

D. It requires pyridoxal phophate.

69. Soil hydraulic conductivity is the highest for:

A. Sand

B. Clay

C. Mixture of sand and clay

D. Silt

70. Embolism in xylem happens due to:

A. low transpiration

B. high transpiration

C. high photosynthesis

D. low photosynthesis

71. Fruits and vegetables loose sweetness at temperature above the temperature compensation point due to decline in:

A. lipid reserve

B. carbohydrate reserve

C. protein reserve

D. water content

72. Which is not an essential mineral nutrient for plants?

A. Aluminium

B. Sulpur

C. Calcium

D. Chlorine

73. Most prevalent natural cytokinin in higher plants is:

A. Kinetin

B. Zeatin

C. BAP

D. Thidiazuron

74. Which is **not** correct for very low fluence responses (VLFR)?

A. VLFR action spectrum matches the absorption spectrum of Pr.

B. Pfr is the active form for these responses.

C. *Arabidopsis* seed germination is a VLFR.

D. Requires fluence of $1\mu\ M^{-2}$.

75. Transport of ABA takes place through:

A. xylem

B. phloem

C. endodermis

D. both A and B

76. Which of the following is true for the flowering process?

A. Phototropic

B. Gravitropic

C. Photoperiodic

D. Thigmotropic

77. Select the correct botanical name of popcorn from among the following:

A. *Zea mays* var. *indentata*

B. *Zea mays* var. *saccharata*

C. *Zea mays* var. *everta*

D. *Zea mays* var. *indurata*

78. Which of the following compounds causes bitterness in almond?

A. Benzoic acid

B. Cyanogenic diglucoside amygdalin

C. Salicylic acid

D. Cinnamic acid

79. Which species of the *Bacillus* is used for curing off bitterness of tea leaves?

A. *Bacillus subtilis*

B. *Bacillus megatherium*

C. *Bacillus lactis*

D. *Bacillus mycococcus*

80. Which of the following are not new World crops?

A. Maize, peanut

B. Sunflower, cotton

C. Potato, tomato

D. Mustard, olive

81. Which of the following is the source of 'Lagos silk rubber'?

A. *Hancornia speciosa*

B. *Parthenium argentium*

C. *Funtumia elastica*

D. *Ficus carica*

82. Select the correct group of plant genera that produce fibres of economic importance:

A. *Gossypium, Cassia, Hibiscus*

B. *Cocos, Crotalaria, Corchorus*

C. *Gossypium, Helianthus, Cocos*

D. *Corchorus, Brassica, Cocos*

83. International Rice Research Institute is located at:

A. Melbourn

B. Manila

C. Kolkota

D. Vienna

84. 'Bhang', opium and tobacco are respectively obtained from which of the following group of genera?

A. *Papaver, Cannabis, Nicotiana*

B. *Cannabis, Papaver, Nicotiana*

C. *Papaver, Nicotiana, Datura*

D. *Nicotiana,Cannabis,Papaver*

85. RR-2, a high yielding variety, is of which of the following crop?

A. Rice

B. Wheat

C. Gram

D. Sugarcane

86. Which of the following growth regulators does not support morphogenesis?

A. Brassinolide
B. TDZ
C. Abscisic acid
D. Zeatin

87. Phytotron is used for:

A. bombarding of electrons

B. liberation of protons

C. growing plants under controlled environment

D. producing mutations in the plants.

88. Which one of the following statements is correct?

A. Western blotting involves protein-DNA interactions and Northern blotting involves RNA-RNA interactions.

B. Southern blotting involves DNA-DNA interactions and Western blotting involves protein-DNA interactions.

C. Northern blotting involves RNA-DNA interactions and Southern blotting involves DNA-DNA interactions.

D. Northern blotting involves RNA-protein interactions and Western blotting involves protein-protein interactions.

89. Which one of the following selection marker genes could be used effectively for *in vitro* as well as field-level selection of transgenics by exposing plants to the selection agent?

A. *nptII*

B. *hpt*

C. amp^R

D. *bar*

90. Identify the correct feature of plant genetic transformation from the statements given below:

A. Given the availability of all proteins required for T-DNA synthesis, transport and integration into the host nuclear genome, transgenic plants can be generated even in the absence of a selection marker gene within the T-DNA.

B. High levels of transgene expression are always achieved by introducing multiple copies of the transgene into the nuclear genome.

C. Genetic transformation of plants can not be achieved by introducing a gene of interest into the chloroplast genome.

D. In biolistic transformation, protocols for regeneration of transformed plant cells is never required for development of transgenic plants.

91. The *vir* genes of disarmed *Agrobacterium* strains are located on the:

A. Assistant plasmid

B. Helper plasmid

C. Facilitator plasmid

D. F plasmid

92. A researcher failed to add the coloring agent (bromophenol blue and/or Xylene cyanol) in the 6X loading buffer used to prepare DNA samples for agarose gel electrophoresis. Which of the following would most likely occur on using such a loading buffer for sample preparation?

A. The samples would lack the density required to move into the well.

B. The DNA fragments would not migrate towards the positive electrode.

C. The running front of the samples would not be visible.

D. The DNA would get degraded during electrophoresis.

93. In the absence of any other confounding factors including transgene silencing, which of the following categories of transgenic traits in a plant would be the most susceptible to breakdown?

A. Improved quality of edible oil

B. Resistance to viral disease

C. Resistance to drought

D. Increased nutritional content of cereals

94. Domestication of crop plants heralded the transformation of humans from hunter-gatherers to growers of their own food. This process involved selection of plants with desirable characters/traits and their preferential multiplication over hundreds of years to meet human needs. Which of the following would be a logical consequence of this milestone event in crop evolution?

A. Increase in genetic diversity of selected traits and decreased genetic diversity of unselected traits

B. Reduction in genetic diversity of selected traits and decreased genetic diversity of unselected traits

C. No effect on genetic diversity of selected traits but decreased genetic diversity of unselected traits

D. Increase in genetic diversity of unselected as well as selected traits.

95. The amino acids present in the membrane spanning regions of transmembrane proteins are:

A. hydrophilic and positively charged
B. hydrophobic, and give rise to α-helices
C. aromatic
D. hydrophilic, and give rise to β-pleated sheets

96. Cells are attached to extracellular matrix with the help of:

A. Lamins
B. Collagens
C. Intergrins
D. Glycosaminoglycans

97. Plasmodesmata are characterized by:

A. continuous cell wall
B. continuous plasma membrane with an extension of ER
C. continuous cell wall and plasma membrane
D. extension of cell wall and ER

98. A cell was subjected to mutagenic treatment causing damage to DNA. Which of the following cell division stages the cell would not cross?

A. G1-S
B. S-G2
C. G2-M
D. G0-G1

99. A mutagenic agent that causes DNA damage led to higher transcriptional activity of p53 in a group of cells. The cells are likely to undergo:

A. oncogenic response
B. necrotic response
C. apoptotic response
D. no effect on cell cycle

100. The search for the causal agent of disease of which crop led to the discovery of viroids?

A. Tomato
B. Potato
C. Cabbage
D. Cauliflower

101. The stationary phase in paper chromatography employed for the separation of amino acids with butanol:acetic acid:water as the developing solvent is:

A. Acetic acid bound to paper
B. Water bound to paper
C. Paper itself
D. Butanol bound to paper

102. Which of the following features distinguishes amylose from glycogen?

A. A polymer of only glucose molecules
B. Glucose molecules linked to each other by α (1$\rightarrow$4) linkages
C. Absence of α (1$\rightarrow$6) linkages
D. Being a storage form of carbohydrates

103. Unidirectional import of cargo proteins carrying nuclear localization signals is ensured by:

A. asymmetric distribution of proteins, responsible for GTP hydrolysis and GTP exchange, across the nuclear envelope
B. capability of Ran protein to bind to both GTP and GDP
C. specific binding of cargo proteins to importin
D. export of Ran-GDP by NTF2

104. Intermediate filaments are apolar, unlike other cytoskeletal elements, because:

A. the central rod domains of two polypeptides wind to each other in an anti-parallel fashion to form dimers
B. the central rod domains of two polypeptides wind to each other in a parallel fashion to form dimers
C. dimers formed by two polypeptides associate in staggered and anti-parallel fashion to form tetramers
D. tetramers associate end-to-end to form protofilaments

105. The three-dimensional structures of plant proteins available at NCBI can be viewed using:

A. Cn3D
B. RASMOL
C. CHIME
D. all of the above

106. Members of a gene family found interspersed in the genomes of closely-related plants are called:

A. Analogs
B. Paralogs
C. Homologs
D. Ohnologs

107. Unigene (unique gene clusters) at NCBI consists of:

A. Nonredundant groups of ESTs

B. Orthologs and paralogs

C. Highly expressed transcripts as well as rare messenger RNAs

D. All of the above

108. Sequence-tagged sites (STS):

A. map to specific linkage groups

B. are unique for every plant species

C. comprise of polymorphic SNPs

D. All of the above

109. Stephen Altschul developed popular heuristic and threading algorithms used in:

A. CLUSTAL

B. BLAST

C. PFAM

D. UPGMA

110. Which of the following statements about the composition of DNA is false?

A. A/T = C/G

B. T/A = G/C

C. A+T = G+C

D. A+G = C+T

111. Which one of the following techniques can be used to determine the transcription start site?

A. Western blotting

B. Northern blotting

C. Primer extension

D. DNA footprinting

☐

112. Which of the following statements is true for *rho* factor?

A. Causes transcription termination of all genes in *E. coli*

B. Is present in both prokaryotes and eukaryotes

C. Is present only in prokaryotes

D. Both A and C

☐

113. Which of the following approaches cannot be used for targeted gene disruption?

A. RNAi

B. Homologous recombination

C. CRISPR

D. Heterologous recombination

☐

114. A eukaryotic gene containing seven exons and six introns needs to be expressed in *E. coli*. This would require:

A. fusion of a prokaryotic promoter with the genomic clone of the gene

B. fusion of a prokaryotic promoter with the cDNA sequence

C. fusion of a eukaryotic promoter with the cDNA sequence

D. both B and C

☐

115. Which of the following bases present in tRNA anticodon region can base pair with three different bases in mRNA:

A. I
B. U
C. D
D. A

☐

116. Which of the following statements is not true for the genetic code? It is:

A. overlapping
B. universal
C. degenerate
D. triplet in nature

☐

117. An additional mutation (in a different gene) that restores the wild-type phenotype in a mutant organism is called:

A. Silent mutation
B. Suppressor mutation
C. Null mutation
D. Dominant negative mutation

☐

118. miRNAs are generated from:

A. Nuclear DNA
B. Chloroplast DNA
C. Mitochondrial DNA
D. Do not require DNA for their generation

☐

119. A lac operon would be inducible in:

A. absence of both lactose and glucose

B. presence of both lactose and glucose

C. absence of lactose and presence of glucose

D. presence of lactose and absence of glucose

120. Which of the following is a co-dominant marker?

A. AFLP

B. RAPD

C. ISSR

D. RFLP

121. A boy, whose parents and grandparents had normal vision, is color-blind. What are the genotypes for his mother and his maternal grandmother, respectively?

A. X^BX^b and X^BX^B

B. X^BX^B and X^BX^b

C. X^BX^b and X^BX^b

D. X^BX^B and X^BX^B

122. The idea that for any particular trait, the pair of alleles of each parent separate and only one allele from each parent passes to an offspring is Mendel's principle of:

A. Independent assortment

B. Hybridization

C. Segregation

D. Dominance

123. ‘LOD’ score is a measure of:

A. the interference of one crossover with another.

B. number of genes in an organism.

C. the probability of linkage between two loci.

D. the number of chromosomes in a cell.

☐

124. A population comprised 65, 30 and 15 individuals with "BB", ‘Bb’ and ‘bb’ genotypes, respectively. The frequency of the "b" allele in the population is:

A. 0.27

B. 0.59

C. 0.41

D. 0.73

☐

125. Sequencing of which of the following would provide maximum phylogenetic information in eukaryotes?

A. DNA

B. mRNA

C. Protein

D. tRNA

☐

126. Synapomorphy implies that the character is:

A. shared by any two unrelated taxa.

B. shared by any two closely related taxa.

C. shared by any two closely related taxa and their common ancestor.

D. present in one of the two closely related taxa and their common ancestor.

☐

127. Which of the following is not used as a model system in developmental genetics?

A. *Arabidopsis thaliana*

B. *Drosophila melanogaster*

C. *Caenorhabditis elegens*

D. *Allium sativum*

128. *Ac-Ds* transposable elements are found in:

A. *Antirrhinum majus*

B. *Zea mays*

C. *Escherichia coli*

D. *Drosophila melanogaster*

129. F_2 individuals obtained in a polygenic cross showed a total of nine phenotypes and 1/256 individuals expressing either of the parental phenotypes. How many genes are expected to control such a trait?

A. 3

B. 4

C. 5

D. 6

130. Maternal lineages in human beings and most other organisms can be traced using:

A. Mitochondrial DNA

B. Chloroplast DNA

C. Nuclear DNA

D. Ribosomal DNA

131. The major effect of UV radiation that results in mutations is due to:

A. dimerization of purines

B. dimerization of pyrimidines

C. deamination of purines

D. deamination of pyrimidines

132. Which is the best solvent among the given examples? The dielectric constant of each is given in the bracket.

A. H_2O (78.4)

B. Methanol (33.6)

C. Ethanol (24.3)

D. Benzene (2.3)

133. Which of the following is considered the most important factor for global warming?

A. CO_2

B. CFCs

C. Methane

D. Nitrogen oxides

134. Under certain conditions, scientists have got cell-like structure but without its true organization. They are called:

A. Eobionts

B. Protists

C. Coacervates

D. Microbes

135. Plant cells are generally without:

A. Lysosomes

B. Cell Wall

C. Plastids

D. Vacuoles

☐

136. The phenomenon which defies the independent assortment is:

A. Segregation

B. Crossing Over

C. Dominance

D. Linkage

☐

137. The United Nation's Millennium Development Goals include one of the following:

A. eradicate extreme poverty and hunger

B. combating global warming

C. reducing child marriage

D. recognizing new nations

☐

138. What is the most commonly cited and accepted report for defining sustainable development?

A. Brundtland World Commission on Environment and Development

B. Brutland World Committee on Environment and Development

C. Brundtland World on Committee Environment and Sustainable Development

D. Brundtland World Commission on Environment and Sustainable Development

☐

139. The two global biodiversity hotspots present in the Indian sub-continents are:

A. Western and Eastern Ghats

B. Western and Eastern Himalaya

C. Western Ghats, Sri Lanka and Indo-Burma

D. Western Ghats and Lakshadweep

☐

140. Biotic and abiotic factors govern the existence of plants across biomes. What actually controls the nutritional requirement of *Nepenthes khasiana* (pitcher plant)?

A. Climate, edaphic factors and insect diversity

B. Root growth

C. Anthropogenic pressure

D. Canopy gap

☐

141. Climate change is affecting most ecosystems. Which of the following aquatic ecosystems is the most affected?

A. Coral reefs

B. Estuaries

C. Mangroves

D. Freshwater wetlands

☐

142. Which one of the following nutrients act as a limiting factor for plant growth and function?

A. Sulphur

B. Potassium

C. Phosphorus

D. Sodium

☐

143. Fire is an ecological factor and plants adapt to it by various strategies. Why is prescribed burning preferred for biological refuges?

A. To drive away pests and pathogens
B. To remove the hiding grounds for large predators
C. To return vital life giving nutrients to the soil
D. To eliminate unwanted vegetation

144. Which one of the following elements is provided by the symbiotic association of mycorrhiza and plants:

A. Carbon
B. Phosphorus
C. Potassium
D. Sulphur

145. Which of the following zones is not a part of Lake Ecosystem?

A. Neritic
B. Littoral
C. Limnetic
D. Profundal

146. Forests and woodlands are known to be climax communities in the terrestrial environment. What are the factors inhibiting the conversion of grassland to a climax forest community?

A. Rainfall, anthropogenic disturbance and wild fire
B. Temperature, high wind velocity and wild fire
C. Climate, edaphic factors and wildlife
D. Altitude, precipitation and human interference

147. Which of the following is the most fragile of all biomes?

A. Boreal

B. Tundra

C. Tropical

D. Chapparals

☐

148. Which of the following statements is not true?

A. Inorganic nutrients are recycled in an ecosystem

B. Energy flows through the ecosystem in the form of C-C bonds

C. Energy is recycled in an ecosystem

D. Respiration process releases energy

☐

149. A trophic level refers to:

A. area in the tropics

B. an organism's position in a food chain

C. an organism's position in an ecosystem

D. an organism's position in a biome

☐

150. Which one of the following is not a fresh water biome?

A. Lotic

B. Lentic

C. Wetland

D. Estuary

☐

Section B

1. (a) Differentiate between lytic and lysogenic cycles. (3 marks)

(b) Comment on the industrial uses of red algae. (2 marks)

2. (a) Differentiate between ascospore and basidiospore. (3 marks)

(b) Write short note on Ti-plasmid. (2 marks)

3. (a) Draw a labeled diagram of mature ovule of *Pinus.* (3 marks)

(b) Highlight two ecological roles of bryophytes. (2 marks)

4. (a) Describe any two methods to overcome self-incompatibility in plants.

(3 marks)

(b) Illustrate the development of Crucifer embryo. (2 marks)

5. (a) Write distinguishing characters of the family Asteraceae. (3 marks)

(b) Write a brief note on Biological species concept. (2 marks)

6. (a) What do you understand by oxygenase activity of ribulose 1,5-bisphosphate carboxylase/ oxygenase (RuBisCo). Is it desirable for the plants? Justify your answer. (3 marks)

(b) What is the difference between transpiration and guttation? (2 marks)

7. (a) What is the difference between a local sequence alignment and a global sequence alignment? How are these alignments useful in obtaining robust multiple sequence alignments? (3 marks)

(b) Describe the regulatory controls (both positive and negative) of the *lac* operon? (2 marks)

8. (a) Highlight the differences among Bhang, Ganja and Hashish. (3 marks)

(b) Write a brief note on Golden Rice. (2 marks)

9. (a) The ability to taste chemical phenylthiocarbamide (PTC) results from a dominant allele (T) and not to taste PTC is due to homozygous recessive alleles (t). Albinism is also a single locus trait with normal pigment being dominant (A) and the lack of it is recessive (a). A normally pigmented woman who cannot taste PTC has a father who is an albino taster. She marries a homozygous, normally pigmented man who is a taster but who has a mother that does not taste PTC. What are the possible genotypes and phenotypes of the possible children? (3 marks)

(b) The progeny obtained from the mating between closely related individuals exhibits reduced fitness. Name the phenomenon and briefly discuss the reasons. (2 marks)

10. (a) The mangrove vegetation is a boon to the pristine environment of Sunderbans. List the problems which are harming the unique ecosystem of Mangroves in Sunderbans. (3 marks)

(b) Comment on the mechanism of Ozone layer depletion and the factors associated with it. (2 marks)

Rough work