K-12

ENTRANCE EXAMINATION, 2016
M.Sc. Plant Biology and Biotechnology

Time: 2 hours **Maximum Marks: 100**

HALL TICKET NO.

INSTRUCTIONS

Please read carefully before answering the questions

1. Enter your **Hall Ticket number** both on the **top of this page** and on the **OMR answer sheet**.
2. Answers are to be marked only on the **OMR answer sheet** following the instructions provided there upon.
3. Hand over the OMR answer sheet at the end of the examination to the Invigilator.
4. The question paper contains **100 questions** (**Part-A**: Question Nos. **1-25** and **Part-B**: Questions Nos. **26-100**) of multiple choice typed in **15** pages, including this page. **One OMR answer sheet** is provided separately.
5. The marks obtained in **Part-A** will be used for resolving the tie cases.
6. Each question carries one mark.
7. There is **negative marking** for wrong answers, in **PARTS A and B**. For each wrong answer, 0.33 marks will be deducted.
8. Calculators and mobile phones are **not** allowed.

K-12

Part-A

1. If a gene has a different effect depending on whether it is inherited maternally or paternally, this is called

   a. DNA
   b. incomplete dominance
   c. imprinting
   d. karyotype

2. Which molecule in the nucleus controls the copying of DNA?

   a. carcinogen
   b. protein kinase
   c. polymerase
   d. cyclin

3. What chemical do plants absorb through the roots to allow them to make proteins?

   a. nitrate
   b. phosphate
   c. zinc
   d. uranium

4. In which direction do the sodium (Na^+) and potassium (K^+) ions move in the sodium/potassium pump?

   a. Na^+ into the cell, K^+ out
   b. K^+ into the cell, Na^+ out
   c. Na^+ into the cell, K^+ in
   d. K^+ out of the cell, Na^+ out

5. Which one of the following plants does not have xylem?

   a. *Pinus radiata*
   b. *Pisum sativum*
   c. *Pteris vittata*
   d. *Marchantia polymorpha*

6. Which among the following reagents is used to distinguish between phenol and benzoic acid?

   a. Neutral $FeCl_3$
   b. Aqueous NaOH
   c. Tollen's reagent
   d. Molisch reagent

7. The polar transport is characteristic of the plant hormone

   a. Abscisic acid
   b. Gibberellic acid
   c. Indole acetic acid
   d. Jasmonic acid

8. Darwin showed that all species can rapidly increase in population, but most wild populations are _____ over time.

   a. decreasing
   b. stable
   c. increasing
   d. none of the above

9. Zygotic meiosis is a characteristic feature of

a. Algae
b. Pteridophytes
c. Gymnosperms
d. Bryophytes

10. Death of protoplasm is a pre-requisite for a vital function like

a. transport of sap
b. absorption of water
c. gaseous exchange
d. transport of food

11. A **vybrid** is the progeny obtained from a cross between

a. two hybrid varieties
b. two facultative apomicts
c. two obligate apomicts
d. two somatic hybrids

12. Two cells A and B are contiguous. Cell A has osmotic pressure 10 atm, turgor pressure 7 atm and diffusion pressure deficit of 3 atm. Cell B has osmotic pressure 8 atm, turgor pressure 3 atm and diffusion pressure deficit of 5 atm. The result will be

a. no movement of water
b. equilibrium between the two cells
c. movement of water from cell A to B
d. movement of water from cell B to A

13. One set of the plants were grown at 12 hours day and 12 hours night period cycles and they flowered while in the other set, night phase was interrupted by a flash of light and the plants did not produce flowers. Under which one of the following categories will you place this plant?

a. long day
b. day neutral
c. darkness neutral
d. short day

14. What is a spheroplast?

a. It refers to a bacterium or a plant cell bound by its plasma membrane, the cell wall being deficient or lacking and the whole having a spherical form
b. It refers to a bacterium or a plant cell bound by its plasma membrane, along with the cell wall and the whole having a spherical form
c. It refers to plant cell organelles which are having a spherical form
d. It refers to a bacterium or a plant cell without plasma membrane, having only cell wall and the whole having a spherical form

15. In a non-dividing cell, a complex of DNA and proteins would be

a. ribosomes
b. chromatin
c. codons
d. anticodons

K-12

16. Glyphosate is a systemic herbicide which acts by inhibition of

a. Enolpyruvate shikimate-3-phosphate synthase of the aromatic amino acid biosynthetic pathway
b. Ribulose 1,5-bisphosphate carboxylase of the Calvin cycle
c. Chorismate synthase of the aromatic amino acid biosynthetic pathway
d. Phosphoglycerate kinase of the Calvin cycle

17. Why do restriction enzymes not destroy the DNA of the organisms that make them?

a. Modification enzymes inactivate the restriction enzymes until needed
b. Their genomes do not contain the restriction site that their own enzymes recognize
c. Restriction enzymes are secreted and are not found in the producer cells
d. Modification enzymes protect their DNA by methylation

18. PCR can be used to synthesize RNA provided that

a. RNA polymerase is used instead of *Taq* polymerase
b. Both RNA polymerase and *Taq* polymerase are used
c. Ribonucleoside triphosphates are used instead of dNTP's
d. None of the above allow RNA to be made by PCR

19. The number of cells present in angiosperm embryo sac are

a. five
b. six
c. seven
d. eight

20. Why are plants more readily manipulated by genetic engineering than animals?

a. plant genes do not contain introns
b. more vectors are available for transferring recombinant DNA into plant cells
c. a somatic plant cell can often give rise to a complete plant
d. genes can be inserted into plant cells by microinjection

21. Which of the following have no enzymes of their own?

a. bacteria
b. viruses
c. cyanobacteria
d. all of these

22. All of the following karyotypes are found in spontaneous abortions. Which of the following is least likely to be found in a live-born infant?

a. 46, XY
b. 45, X
c. 47, XX, +21
d. 47, XX, +16

23. An organism with two or more different cell lines originating from a single zygote is called a

a. Syndrome
b. Chimera
c. Mosaic
d. Heterozygote

24. Kinase reactions

a. inhibit ATP breakdown
b. involve the addition of a phosphate group
c. involve the addition or removal of an amino acid to a polypeptide chain
d. involve the transfer of hydrogen atoms

25. Complete the following statement correctly:
FAD is a prosthetic group, ...

a. ...it is readily exchanged with the solvent.
b. ...it is loosely associated with the enzyme.
c. ...it is an artificial substitute for NADH.
d. ... it is tightly bound to the enzyme.

Part-B

26. What is the other name for the chromosome that defines the genetic gender of an individual?

a. gonosome
b. autosome
c. karyotype
d. allosome

27. The amount of water lost by transpiration from plant is:

a. 90%
b. 50%
c. 10%
d. 30%

28. Which of the following metal ion is part of plastocyanin molecule?

a. Copper
b. Manganese
c. Magnesium
d. Aluminum

29. Two solutions of a substance (non-electrolyte) are mixed in the following manner: 480 mL of 1.5 M first solution + 520 mL of 1.2 M second solution. What is the molarity of the final mixture?

a. 1.20 M
b. 1.344 M
c. 1.50 M
d. 2.70 M

30. In which of the following crosses in pea plant, 1:1:1:1 phenotypic ratio will be obtained:

a. TTRR & ttrr
b. TtRr & ttrr
c. TtRr & Ttrr
d. TtRr & TtRr

31. The transgenic rice with high carotenoids level is popularly called

a. Orange rice
b. Red rice
c. Golden rice
d. Yellow rice

32. A man heterozygous for the gene causing haemolytic jaundice marries a normal woman for this gene. The disease is due to dominant gene but only 10% of the individuals having genotype that can cause disease actually develop disease. What proportion of the children of the above couple have the probability to have the disease?

a. 1/20
b. 1/5
c. 1/10
d. 1/2

33. Which of the following statements about allosteric control of enzymatic activity is false?

a. Allosteric effectors give rise to sigmoidal V_0 vs [S] kinetic plots
b. Allosteric proteins are generally composed of several subunits
c. An effector may either inhibit or activate an enzyme
d. Heterotropic allosteric effectors compete with substrate for binding sites

34. The energy charge of the cell is:

a. the difference between the charge on the outside and inside of a cell
b. generated by the sodium-potassium ATPase
c. the overall rate of energy use by the cell
d. the extent to which the total adenine nucleotide pool is phosphorylated

35. In X chromosome inactivation, all of the X chromosome genes are inactivated.

a. true
b. false
c. not sure
d. impossible

36. A **lod** score refers to:

a. locus of DNA
b. log odds
c. location of DNA
d. mRNA

37. The basis of precipitation of proteins by ammonium sulfate is best described by which of the following statements?

a. Proteins become insoluble when they bind the ammonium ion
b. Proteins become insoluble when they bind sulfate ion
c. Addition of ammonium sulfate adjusts the pH to the isoelectric point of the proteins
d. Ammonium sulfate binds water molecules, making them less available for hydration of proteins

38. Cell division cannot be stopped in which phase of the cell cycle?

a. G1 phase
b. G2 phase
c. S phase
d. Prophase

39. Plants like *Aegle marmelos*, *Ocimum sanctum* and *Ficus religiosa* are a group of plants designated as

a. Traditional food crops
b. Sacred species
c. Medicinal Plants
d. Lesser known food plants

40. Measuring the absorption of ultra violet radiation at 260 nm can be used to assay the concentration of DNA and RNA because

a. The base of each nucleotide absorbs at 260 nm
b. The phosphate group of each nucleotide absorbs at 260 nm
c. The pentose sugar of each nucleotide absorbs at 260 nm
d. None of the above is correct

41. Subject that deals with factors that affect the earth and air pollution is termed as

a. Dendroclimatology
b. Climate Change
c. Dendrohydrology
d. Dendrochronology

42. Chromosomes which replicate using multiple origins are

a. Mammalian
b. Bacterial
c. Prokaryotic
d. Viral

43. Which is correct about conduction of substances?

a. organic food moves up through phloem
b. organic food moves up through xylem
c. inorganic food moves upwardly and downwardly through xylem
d. organic food moves upwardly and downwardly through phloem

44. Topoisomerases are enzymes with

a. Both polymerization and unwinding activity
b. Both nuclease and ligase activity
c. Both transcription and ligase activity
d. Both polymerization and nuclease activity

45. A common structural feature of sieve tube elements and vessel elements is

a. pores on lateral walls
b. enucleate condition
c. thick secondary walls
d. presence of P protein

46. Movement of water through semipermeable membrane produces

a. wall pressure
b. turgor pressure
c. osmotic pressure
d. suction pressure

47. Acid concentration of CAM plants is more at

a. dawn
b. dusk
c. night
d. day

48. Cell elongation in internodal regions of green plants occurs due to the action of

a. gibberellins
b. auxins
c. ethylene
d. cytokinins

49. In tissue culture, a low cytokinin to auxin ratio causes

a. Root differentiation
b. Flower differentiation
c. Shoot differentiation
d. Tuber formation

50. Which among the following is a mismatch?

a. Osmotrophs - Dissolved organic/inorganic nutrients
b. Phagotrophs - Feed by engulfing
c. Mixotrophs - Organic and inorganic carbon as nutrient source
d. Oligotrophs - Nutrient rich

51. Find out the odd one among the following:

a. Lactose, Sucrose, Maltose
b. Glucose, Fructose, Talose
c. Ribose, Xylose, Arabinose
d. Galactose, Talose, Lyxose

52. Plant conservation day is celebrated every year on

a. May 18th
b. June 5th
c. August 21st
d. September 30th

53. Lithotrophs use inorganic compounds as

a. Carbon source
b. Nitrogen source
c. Electron donors
d. Energy source

54. Which among the following is not a component of bacterial cell wall?

a. Mycolic acid
b. D-Amino acids
c. Sugars
d. Terpenoids

55. This bacterium causes tumour formation on a wide variety of plant species and orders the plant to proliferate its cells and makes food for itself. This bacterium also helps in genetic transformation of crop plants.

a. *Azotobacter chroococcum*
b. *Xanthomonas oryza*
c. *Bacillus thuringiensis*
d. *Agrobacterium tumefaciens*

56. Identify the mismatch

a. Negative staining – *Klebsiella*
b. Acid-fast staining – *Mycobacterium*
c. Gram staining – *Clostidium*
d. Malachite green – *Escherichia*

57. Which of the following acids does not exhibit optical isomerism?

a. Lactic acid
b. Tartaric acid
c. Maleic acid
d. α-amino acids

58. The water stress mediated stomatal closure in leaf is mediated by plant hormone

a. Salicylic acid
b. Gibberellic acid
c. Abscisic acid
d. Ethylene

59. If the molar amount of G in a DNA sample is 20%, what is the molar amount of T in the sample?

a. 20%
b. 30%
c. 40%
d. 60%

60. A gymnospermic leaf carries 16 chromosomes. The number of chromosomes in its endosperm will be

a. 12
b. 8
c. 16
d. 24

61. Term applied to plants having separate male and female plants is

a. Monoecious
b. Monogamous
c. Polygamous
d. Dioecious

62. An abandoned, idled, or polluted site is called

a. Whitefield
b. Blackfield
c. Brownfield
d. Redfield

63. Strutevant's detailed mapping studies of the X chromosome of Drosophila established that

a. genes are carried on chromosomes
b. the sex-determination is controlled by the X and Y chromosomes
c. the different pairs of chromosomes assort independently
d. genes are arranged in a linear order on the chromosome

64. Dimethyl benzene is also known as

a. Toluene
b. Cumene
c. Xylene
d. Styrene

65. Glycine is a precursor of

a. Proteins
b. Lipids
c. Porphyrins
d. Carbohydrates

66. Pick the correct electron transfer route that occurs during the light-dependent reactions in plants.

a. P680 - H_2O - P700 - $NADP^+$
b. P700 - $NADP^+$ - H_2O - P680
c. H_2O - P680 - $NADP^+$ - P700
d. H_2O - P680 - P700 - $NADP^+$

67. In *Drosophila melanogaster*, singed bristles (sn) and cut wings (ct) are both caused by recessive, X-linked alleles. The wild type alleles (sn^+ and ct^+) are responsible for straight bristles and intact wings, respectively. A female homozygous for sn and ct^+ is crossed to a sn^+ct male. The F1 flies are interbred. The F2 males are distributed as follows:

sn ct 14
sn ct^+ 34
sn^+ ct 37
sn^+ ct^+ 15

What is the map distance between sn and ct?

a. 14.5 map units
b. 29 map units
c. 35.5 map units
d. 24 map units

68. The cell that undergoes programmed cell death to become functional is

a. phloem sieve tube member
b. xylem vessel member
c. stomatal guard cell
d. root cap cell

69. The best approach for preventing over ripening of banana is

a. putting them in a bag or in a cup board
b. exposing them to heat
c. dipping them in ascorbic acid
d. by keeping them with other ripened fruits at room temperature

70. Which of the following statements about Mendel's breeding experiments is incorrect?

a. the parental (P) plants were true breeding
b. All of the F1 progeny resembled one of the parental (P) plants, but only some of the F2 progeny did
c. Half of the F1 progeny had the same phenotype as one of the parental (P) plants, and the other half had the same phenotype as the other parent
d. the traits that disappear in the F1 reappear in the F2 generation

71. A pedigree chart shows

a. the genotypic ratios of the offspring
b. the types of gametes produced by the parents
c. the genotypes of any parents
d. the mode of inheritance of a specific gene

72. Man dominated ecosystem is called

a. Geosystem
b. Biome
c. Noosystem
d. Community

73. *Vibrio cholerae* has

a. Monotrichous flagella
b. Bipolar single flagella
c. Peritrichous flagella
d. Lophotrichous flagella

74. Which one among the following is correct for IMViC (Indole; Methyl red; Voges-Proskauer; Citrate) test for *Klebsiella pneumonia*

a. MR +ve; VP +ve; Indole –ve
b. MR –ve; VP –ve; Indole +ve
c. MR +ve; VP –ve; Indole +ve
d. MR –ve; VP +ve; Indole -ve

75. In plants, inulin and pectin are

a. reserve material
b. wastes
c. excretory material
d. insect attracting material

76. If the whole chain is used in a non-overlapping frame, how many amino acids are defined by this DNA sequence: ATGTTTGGACTA?

a. Three
b. Four
c. Six
d. Twelve

77. One of the organic compounds is frequently used in several molecular biology and biochemistry experiments. This organic compound is prepared in 3 steps in the laboratory. This compound is prepared by heating ethyl alcohol or acetone with bleaching powder. The bleaching powder acts as source of chlorine and calcium hydroxide. The finally formed organic compound is

a. TRIS-HCl
b. Chloroform
c. β-mercaptoethanol
d. Polyethylene glycol

78. Grignard reagents are highly reactive and used in the synthesis of alkanes, alkenes, alcohols, and aldehydes, etc. Which of the following compounds are Grignard reagents?

a. Methyl magnesium iodide and ethyl magnesium bromide
b. Methyl bromide and ethyl iodide
c. Lithium dimethyl copper and methyl lithium bromide
d. Tetracarbonyl nickel and diethyl zinc

79. What is the meaning of the term "Sanguivorous"?

a. Parasite which feeds on the blood of cattle
b. Parasite which grows in saliva of mammals
c. Parasite which grows on plant roots present on heavy metal polluted area
d. These are animals which can sustain extreme high or cold temperatures

80. This compound/gas produces painful blisters on the skin and has very destructive effect on the lungs and air passages. This compound/gas is prepared by treating ethylene with sulphur monochloride. This compound/gas is

a. Phosgene
b. Ethyl isocyanate
c. Cyanogen Chloride gas
d. Mustard gas

81. Lectin is a

a. Protein
b. Lipid
c. Monosaccharide
d. Polysaccharide

82. The genus *Laminaria* that is used for the manufacture of **iodine** belongs to

a. Algae
b. Fungi
c. Bryophytes
d. Pteridophytes

83. One of the following class of compounds acts as an attractant for Rhizobium-mediated legume root nodulation

a. Alkaloids
b. Flavonoids
c. Terpenoids
d. Carbohydrates

84. A research scholar isolated genomic DNA from rice leaf in the lab and he checked the quality and quantity of DNA using agarose gel electrophoresis. Further, he took a certain amount of DNA in three different tubes and added *BamH*I, *Hind*III and *Not*I separately. After few hours of incubation at required temperature, he again checked the final product using agarose gel electrophoresis. What are *BamH*I, *Hind*III and *Not*I?

a. *BamH*I and *Hind*III are restriction endonucleases; *Not*I is the name of DNA probe which is responsible for detection of conserved sequence
b. *Hind*III and *Not*I are restriction endonucleases; *BamH*I is a protein denaturing agent isolated from Bamboo plant
c. *BamH*I is a protein denaturing agent isolated from Bamboo plant; *Hind*III is a chemical which is used for DNA cleaning and purification; *Not*I is chemical which does not allow RNA or cell debris to stay with DNA.
d. *BamH*I, *Hind*III and *Not*I are all restriction endonucleases

85. The female sex organ of the bryophytes is called

a. Antheridium
b. Archegonium
c. Phycobiont
d. Storobili

86. The biological role of restriction enzymes in bacteria is to

a. Repair DNA
b. Induce DNA crossover
c. Cleave foreign DNA
d. None of the above

87. When carboxylic acids react with alcohols in the presence of a strong catalyst like H_2SO_4 or HCl, this leads to formation of

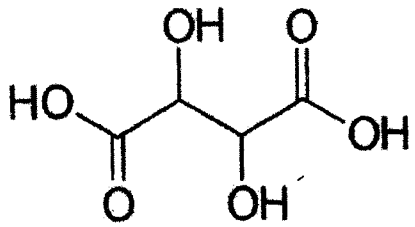
a. Amide
b. Aldehyde and ketone
c. Hydroxy and halo acids
d. Esters

88. Which of the following is known as Hinsberg reagent?

a. Benzene sulphonyl chloride
b. Thiophenol
c. Oxalyl Chloride
d. Phosphoryl chloride

K-12

89. The following structure of an organic acid is found naturally in many plant species. What is the name of this organic acid?



a. Tartaric acid
b. Citric acid
c. Glucuronic acid
d. Gluconic acid

90. Which of the following eukaryotic cell wall components are nitrogenous compounds?

a. lignin
b. cellulose
c. chitin
d. β-glucan

91. A special pigment complex found in cyanobacteria is called

a. phycobilisome
b. phycoerythrine
c. light harvesting complex
d. Phytochrome

92. Citric acid cycle occurs in

a. grana
b. cytoplasm
c. cristae
d. mitochondrial matrix

93. α-helix has

a. 3.4 amino acid residues/turn
c. 3.6 amino acid residues/turn
b. 3.0 amino acid residues/turn
d. 3.8 amino acid residues/turn

94. The enzyme **Dehydrogenase** can be classified as

a. Oxidoreductase
b. Transferase
c. Hydrolase
d. Ligase

95. A silent mutation is most likely to result from

a. substitution of the first base of a codon
b. substitution of the third base of a codon
c. conversion of a nonsense codon into a sense codon
d. conversion of a sense codon into a nonsense codon

96. Which genus of bacteria listed below grows best at 110°C?

a. *Sulfolobus*
b. *Halobacterium*
c. *Methanosarcina*
d. *Escherichia*

97. If a trait has a heritability of 60%, how much of the variation is caused by genes?

a. 40%
b. 60%
c. 20%
d. 80%

98. A mouse eats plant seeds. If the mouse is eaten by a snake, and the snake in turn is eaten by an eagle, the eagle is a

a. producer
b. primary consumer
c. secondary consumer
d. tertiary consumer

99. Match items in Column I with those in Column II:

Column I	**Column II**
A. Peritrichous flagellation	J. *Ginkgo*
B. Living fossil	K. *Macrocystis*
C. Rhizophore	L. *Escherichia coli*
D. Smallest flowering plant	M. *Selaginella*
E. Largest perennial alga	N. *Wolffia*

Select the correct answer from the following.

a. A – L; B – J; C – M; D – N; E – K
b. A – K; B – J; C – L; D – M; E – N
c. A – N; B – L; C – K; D – N; E – J
d. A – J; B – K; C – N; D – L; E – K

100. Which of the following micro-organisms is used for production of citric acid in industries?

a. *Aspergillus niger*
b. *Rhizopus nigricans*
c. *Lactobacillus bulgaris*
d. *Penicillium citrinum*

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