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ENTRANCE EXAMINATION, 2012
M.Sc. Plant Biology and Biotechnology
06-06-2012

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.**

1. Answers are to be marked only on the **OMR answer sheet** following the instructions provided there upon.

3. Hand over both the question paper booklet and OMR answer sheet at the end of examination.

2. The question paper contains **100 questions** (**Part-A**: Question Nos. **1-25** and **Part-B**: Questions Nos. **26-100**) of multiple choice typed in **14** pages, including this page. **One OMR answer sheet** is provided separately. **Please check.**

5. The marks obtained in **Part-A** will be used for resolving the tie cases.

6. Each question carries one mark.

3. 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.

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Part-A

1. What are the essential elements that are bound to Chlorophyll, Heme and Plastocyanin respectively?

A. Mg, Fe, Cu
B. Cu, S, P
C. Mg, Fe, S
D. Ca, Fe, B

2. Plants use fats or lipids mainly for

A. carbon storage
B. energy storage
C. cell wall formation
D. biochemical reactions

3. The most commonly used reporter gene encoding green fluorescent protein, GFP was isolated from

A. *Xenopus laevis*
B. *Aequorea victoria*
C. *Arabidopsis thaliana*
D. *Catla catla*

4. A silent mutation is one that

A. results in a truncated polypeptide
B. replaces an amino acid with an equivalent amino acid in a polypeptide
C. does not change the amino acid sequence of the polypeptide
D. changes the reading frame of the mRNA leading to an altered polypeptide

5. The best choice for producing plants that are homozygous for all traits is

A. Protoplast culture
B. Cell suspension culture
C. Anther and pollen culture
D. Apical meristem culture

6. Which one of the following is unique to gymnosperm leaves?

A. sunken stomata
B. endodermis
C. minor veins
D. palisade layer

7. In a typical standard curve, which of the following is generally represented on the X-axis?

A. the effect of the chemical tested
B. the concentration of the chemical tested
C. the number of samples tested
D. none of the above

8. The expression of trp Operon in *E.Coli* is regulated in part by the availability of the amino acid Tryptophan. This regulatory process is called

A. Alternate splicing
B. Nonsense suppression
C. Attenuation
D. Anti-termination

9. A non coding RNA molecule which is hardly 400 nt in length, circular in nature and highly infectious to plants alone is called

A. Spiroplasma
B. Viroplasma
C. Viroid
D. Virus

10. Plasmids are inherited stably during cell division in bacteria, but they are not always equally apportioned into daughter cells and sometimes are lost. This loss of plasmids can occur spontaneously or be induced by treatments that inhibit plasmid replication but not host cell reproduction. The loss of plasmids is referred to as

A. Replicating loss
B. Curing
C. Conjugating loss
D. Rearing

11. Pseudomonas is one of the most important genera in the family Pseudomonadaceae. Some of the members of this genus, called fluorescent psuedomonads, show fluorescence. We detect this phenomenon of fluorescence by such pseudomonads by noting observations under

A. fluorescent microscope
B. bright field microscope
C. ultraviolet light
D. far red light

12. What is the correct path for water right from the time of absorption to transpiration in a plant?

A. stoma, spongy mesophyll, xylem, root hair
B. root hair, xylem, palisade mesophyll, xylem, stoma
C. root hair, xylem, spongy mesophyll, xylem, stoma
D. root hair, spongy mesophyll, xylem, stoma

13. Antibodies that are produced in transgenic plants expressing the antibody gene(s) of a mouse are called

A. Monoclonal antibodies
B. Plantibodies
C. Phytobodies
D. All the above

14. *Dichanthium, Cynodon* and *Digitaria* are examples of producers in

A. Grassland Ecosystem
B. Desert Ecosystem
C. Pond Ecosystem
D. Forest Ecosystem

15. Sanger DNA sequencing, site-directed mutagenesis and PCR are three important techniques routinely used in modern biology. Out of the common reactions shared by these techniques, pick the odd statement.

A. single stranded DNA template
B. DNA primer complementary to template
C. Annealing of the primer to the template
D. Initiation of reverse transcription

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16. An amphidiploid species was produced by making a cross between *Brassica oleracea* (2n =18) and *Brassica nigra* (2n = 16) followed by chromosome doubling of the hybrid. What is the chromosome number of the amphidiploid?

A. 18 B. 16 C. 34 D. 68

17. Which of the following organisms can be used for mapping the loci with respect to centromere?

A. *Neurospora crassa* B. *Saccharomyces cerevisiae*
C. *Chlamydomonas rheinhardii* D. *Aspergillus nidulans*

18. When 30% of chiasmata are formed between two loci, X and Y among the tetrads of an individual of the genotype Xy/xY, the percent of gametes expected to be 'Xy' are

A. 7.5% B. 15% C. 30% D. 42.5%

19. Capsid is a

A. chemical modification at the 5' end of most eukaryotic mRNA molecules
B. DNA binding site for the catabolic activator protein
C. protein coat that surrounds the DNA or RNA genome of virus
D. name of high insert capacity vector which has the characteristics of both plasmid and cosmid

20. Insectivorous plants evolved to combat the deficiency of ----------in the soil.

A. potassium B. manganese C. magnesium D. nitrogen

21. Cytoplasmic male sterility (CMS) in maize has been exploited for hybrid seed production. This trait is transmitted by the seed parent. CMS lines are maintained by

A. clonal propagation
B. self pollination
C. crossing with pollen from a restorer line
D. crossing with the genotype same as the CMS line

22. Banana bunchy top, citrus exocortis, witches broom disease of brinjal are caused by the following organisms respectively

A. Virus, Viroid, phytoplasma
B. Viroid, phytoplasma, Virus
C. Phytoplasma, Virus and Viroid
D. Phytoplasma, Mycoplasma and Virus

23. ---------- and---------- cause plant overgrowth due to increased cell division and abnormal cell enlargement respectively.

A. Hyperplasia and Hypertrophy
B. Hypertrophy and Hyperplasia
C. Hypercharantia and Hydropathy
D. Homothalism and Heterothalism

24. Of the following light sources, only ----------light is capable of retarding plant growth.

A. Green
B. Purple and red
C. Green and purple
D. Yellow and green

25. Leguminous plants exhibit biological nitrogen fixation in which

A. plants convert ammonia to nitrate
B. plants convert nitrogen to ammonia
C. bacteria convert nitrogen to ammonia
D. fungus growing on plants produce ammonia.

Part-B

26. The effect of light on seed germination is called

A. photoblastism
B. phototropism
C. photoperiodism
D. phototaxis

27. Plants exhibit vivipary when they are deficient in

A. abscisic acid
B. gibberellic acid
C. jasmonic acid
D. indole acetic acid

28. Myoglobin and the subunits of hemoglobin have

A. very different primary and tertiary structures
B. very similar primary and tertiary structures
C. very similar primary structures, but different tertiary structures
D. very similar tertiary structures, but different primary structures

29. Root hairs are found in the region of the root called----------
A. root cap
B. apical meristem
C. region of elongation
D. region of maturation

30. Which of the following statements is correct?

A. Mutations are errors in DNA that are always harmful
B. Mutations only occur in the presence of carcinogens
C. Mutations increase tumour growth
D. Mutations occur spontaneously at a low rate

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31. Phosphoric acid has a pKa of 2.14 and carbonic acid has a pKa of 3.77. Which is the weaker acid?

A. Phosphoric acid is weaker
B. Carbonic acid is weaker
C. Carbonic acid is stronger
D. Both are weaker

32. What is the essential element needed to make ATP?

A. Iron
B. Phosphorous
C. Calcium
D. Magnesium

33. Which of the following statements is true?

P. C4 plants don't have any RUBISCO enzyme
Q. Very few plant cells have mitochondria
R. Amylases breakdown starch into sugars
S. Starch synthase is the name of the plant enzyme that synthesizes starch

A. P, R
B. Q, P
C. R, S
D. Q, S

34. How does a sclereid differ from a sclerenchyma fiber?

A. The sclereid is dead at maturity whereas the fiber is alive at maturity
B. Sclereids have a thin secondary wall, whereas fibers have a thick one
C. Sclereids only have bordered pits, whereas fibers only have simple pits
D. Sclereids are short or branched, whereas fibers are long and narrow

35. A sequence of amino acids in a certain protein is found to be -Ser-Gly-Pro-Gly-. The sequence is most probably part of a

A. antiparallel β sheet
B. parallel β sheet
C. α helix
D. β turn

36. Which of the following plant hormones can induce parthenocarpy in many plants?

A. ethylene
B. auxin
C. cytokinin
D. jasmonic acid

37. A cell within a cell is found in

A. suspensor
B. sieve tube
C. pollen grain
D. tapetum

38. Which functional group of the protein is identified by Biuret test?

A. the carboxyl group
B. the amino group
C. the peptide bond
D. number of hydrogen atoms

39. Polysaccharides can be formed from monosaccharides by the removal of

A. water B. nitrogen C. starch D. oxygen

40. Which of the following statements is true?

A. Chlorophyll b is not essential for photosynthesis
B. Chlorophyll b is essential for photosynthesis
C. Chlorophyll a is not essential for photosynthesis
D. Both chlorophyll a and b are essential for photosynthesis

41. Starting with mitosis, what are the other stages of the cell cycle in the order in which they occur?

A. cytokinesis, G_1, S, G2
B. cytokinesis, S, G_1, S, G2
C. S, cytokinesis, G_1, S, G2
D. S, G_1, S, G2

42. An infant is born with dwarfism (tt). Which of the following statements is true about the parents?

A. Neither is a carrier of dwarfism
B. One parent may be a carrier, but the other may not be
C. Both must be dwarves
D. Both are carriers of dwarfism

43. What is the method that can be used for predicting 3D structure of a protein based on known structures from one or more related proteins?

A. Multiple sequence alignment B. Homology modeling
C. Phylogeny D. Docking

44. The frequency of a plant means

A. the number of individuals that are in the community
B. the importance of the species to the community
C. the amount of area the species covers in the community
D. the number of times the species is encountered in the community

45. Ferns cannot survive in dry areas and this is due to their

A. underground rhizomes B. small gametophyte
C. dominant sporophyte D. swimming sperm

46. In the tall tree water can move from the soil to the top of tree, by using following property of water?

A. Osmosis
B. Ionization
C. Capillary rise
D. Adhesion and cohesion of water molecules

47. When *E.coli* is grown on a medium containing glucose and lactose, the lac operon is not expressed. This is because glucose interferes with

A. removal of repressor
B. binding of activator
C. removal of activator
D. removal of repressor and binding of activator

48. Which of the following cells/tissue is not dead at functional maturity?

A. vessels
B. collenchyma
C. fibers
D. tracheids

49. Majority of bryophytes are smaller due to limitations in

A. photosynthesis
B. reproduction
C. sporophyte production
D. water transport

50. Some of the halophilic microbes accumulate high concentrations of intracellular glycerol to counterbalance the osmotic pressure from the high level of extracellular salt. One such organism is used for microbial production of glycerol. Choose the organism that is used for glycerol production.

A. *Halobacterium halobium*
B. *Rhodobacter halogens*
C. *Dunaliella salina*
D. *Clostridium acetobutylicum*

51. Reverse transcriptase is an enzyme which converts an 'RNA molecule into a complementary cDNA molecule' in the presence of some additives is basically isolated from

A. Crustaceous bacteria
B. Viroids
C. Murine Leukemia virus
D. Molecutes

52. An *E.coli* deficient in DNA polymerase I would be deficient in

A. Transcription
B. Replication
C. Repair
D. Methylation

53. Halophytes are special type of Xerophilous plants which inhabit saline soils; they develop a special type of negatively geotropic roots called

A. Phytosiderophores
B. Pneumatophores
C. Pnemathodes
D. Hydathodes

54. Who proposed the dual theory that lichens are made of Algae and Fungi?

A. Simon Schwendener
B. Theoder Dainer
C. Stanley Christopher
D. Valerian V Dolja

55. The embryo in a seed gives rise to the new

A. sporophyte
B. gametophyte
C. microgametophyte
D. megagametophyte

56. Periodontosis may lead to fall out of tooth out of its socket. Identify the bacterium causing such a condition.

A. *Streptococcus gordonii*
B. *Streptococcus oralis*
C. *Bacteroides oralis*
D. *Porphyromonas gingivalis*

57. The Ames test is used to

A. identify bacterial viruses
B. find the rate of DNA replication
C. test the potency of antibiotics
D. measure the mutagenic effects of various chemical compounds

58. The term 'Cyclosis' refers to

A. the alternate name of Glycolysis pathway
B. the movement of cytoplasm within the eukaryotic cells
C. the release of hydrolytic enzymes from lysosomes
D. the lysis of cell wall by the action of self antimicrobial compounds

59. Which of the following is the biodiversity hot-spot of India?

A. Jammu and Kashmir Valley
B. Andman and Nicobar Island
C. Eastern Himalayas and Western Ghats
D. Desert of Rajasthan

60. Buds that develop on roots are referred to as

A. axillary
B. adventitious
C. terminal
D. pseudobuds

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61. How many different types of gametes an individual of genotype AaBbCcDD will produce?

A. 4 B. 8 C. 12 D. 16

62. In Sweet pea plants, flowers are either purple or white which are determined by two unlinked genes. The alleles of the first gene are P and p and those of the second gene are W and w. The plant must possess at least one P and W allele to bear purple flowers. The genotypes lacking the dominant P and W alleles result in the formation of white flowers. If two purple-flowered plants of genotype PpWw are crossed, then the expected phenotypic ratio of offspring would be

A. 3 purple : 1 white
B. 13 purple: 3 white
C. 9 purple : 7 white
D. 15 purple : 1 white

63. Which vector is constructed using F- episomal factor of *E. coli*?

A. YAC vector
B. PAC vector
C. Fosmid vector
D. BAC vector

64. A procedure that uses ultrasound to cause random breaks in DNA molecule is

A. excitation
B. sonication
C. homogenization
D. splicing

65. The cell wall of this genus is distinctly different from other groups of bacteria by virtue of the high amount of mycolic acids.

A. *Hansenula*
B. *Mycobacterium*
C. *Mycoplasma*
D. *Corynebacterium*

66. Autoclaving is the method of sterilization of glassware, certain buffers and media. Usually, at what temperature and pressure it is used in the laboratory?

A. 221° C and 15 pounds of psi respectively
B. 121° C and 15 pounds of psi respectively
C. 115° C and 121 pounds of psi respectively
D. 221° C and 115 pounds of psi respectively

67. 'Agrobacterium' genetically transforms the plant roots and produces 'crown galls', the major genes involved in this process are

A. Nif and tet
B. Vir and T-DNA
C. Octopine and napoline
D. Auxins and cytokinins

68. The genetic material in general is 'DNA' in majority of the cases of evolution, however, single stranded RNA (negative sense, positive sense and ambisense), double stranded RNA, single stranded DNA and double stranded DNA in the form of linear and circular modes are available in these organisms

A. Bacteria B. Lichens C. Viruses D. Fungi

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69. Which of the following types of bonds is LEAST likely to stabilize the 3-Dimensional folding of most proteins?

A. Disulfide Bond
B. Hydrogen bond
C. Ester bond
D. Electrostatic bonds

70. Which is **NOT** involved in the processing of mRNA precursors in eukaryotic cells?

A. Capping of 5' end
B. Poly-A tailing
C. Transport of pre-mRNA to cytoplasm
D. Excision of Introns

71. When the guard cells have a ---------- water pressure, they become---------- and close the stoma.

A. low, turgid
B. low, flaccid
C. high, turgid
D. high, flaccid

72. If the frequency for the recessive allele is 0.4, then what is the frequency of the homozygous dominant individuals?

A. 0.6 B. 0.36 C. 0.16 D.0.4

73. Which of the following statements about cystine is correct?

A. Cystine forms when the —CH2—SH R group is oxidized to form a —CH2—S—S—CH2— disulfide bridge between two cysteines.
B. Cystine is an example of a nonstandard amino acid, derived by linking two standard amino acids.
C. Cystine is formed by the oxidation of the carboxylic acid group on cysteine.
D. Two cystines are released when a —CH2—S—S—CH2— disulfide bridge is reduced to —CH2—SH.

74. In plant cells, ---------- divides the cytoplasm into two cells.

A. mitotic spindle
B. centriole
C. cleavage furrow
D. cell plate

75. Crossing-over generally occurs in ----------during meiosis.

A. Prophase I
B. Prophase II
C. Telophase I
D. Telophase II

76. Which of the following is considered a macronutrient for most plants?

A. Iron
B. Copper
C. Magnesium
D. Manganese

77. A part of the biosphere that absorbs more carbon dioxide than it releases is called

A. carbon sink
B. acid mine
C. carbon source
D. peat bog

78. Which of the following statements is true?

A. Shoot apical meristem is indeterminate; where as floral meristem is determinate
B. Shoot apical meristem is determinate; where as floral meristem is indeterminate
C. Both shoot apical meristem and floral meristem are indeterminate
D. Both shoot apical meristem and floral meristem are determinate

79. Pineapple has 13 spirals in one direction and 8 in the other. These numbers are successors in ----------sequence

A. Hofmeister
B. Fibonacci
C. Da vinci
D. Avogadro

80. Stomata are found in all shoot organs except

A. petioles
B. sepals
C. petals
D. leaves

81. Plants cells are

A. omnipotent
B. totipotent
C. pluripotent
D. quasipotent

82. Frameshift mutations often arise because of

A. inversion
B. insertion
C. transversion
D. tautomerisation

83. In size exclusion chromatography, molecules that are ---- move around the beads in the matrix and therefore move through the column--------.

A. small, quickly
B. polar, quickly
C. large, slowly
D. large, quickly

84. Red rot disease of sugar cane is caused by

A. *Colletotrichum falcatum*
B. *Ustilago hordeii*
C. *Magnaporthe griesea*
D. *Alternaria mali*

85. Groundnuts, cotton seeds, etc contain aflatoxins. These are produced by

A. *Fusarium oxysporum*
B. *Aspergillus flavus*
C. *Penicillium expansum*
D. *Agrobacterium tumefaciens*

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86. In Heterosis, ---------- can be observed.

A. superiority of the parents over the F1 hybrid
B. superiority of the heterozygote over either homozygotes
C. cumulative effect of additive genes
D. presence of polygenes

87. Caraway, cumin, fennel, asafoetida are commonly used spices in Indian cooking and they are well known for their medicinal properties. They belong to the family

A. Rubiaceae
B. Umbelliferae
C. Solanaceae
D. Labiateae

88. In contrast to bacteria, eukaryotic chromosomes need multiple DNA replication origins because

A. eukaryotic chromosomes cannot usually replicate bidirectionally
B. eukaryotic genomes are not usually circular, like the bacterial chromosome
C. the processivity of the eukaryotic DNA polymerase is much less than the bacterial enzyme
D. their replication rate is much slower, and it would take too long with only a single origin per chromosome

89. Which of the following statements is true?

A. A photon of blue light carries more energy than a photon of red light
B. A photon of blue light carries less energy than a photon of red light
C. A photon of red light carries more energy than a photon of blue light
D. Photons of both blue and red light carry equal energy

90. The transcription of DNA to messenger RNA occurs

A. on the ribosomes
B. in the cytosol
C. in the nucleus
D. only during cell division

91. Which of the following statements is <u>NOT true</u> about X-linked recessive characters in human beings?

A. More males than females are affected
B. If a female has the characteristic; all her sons will show it.
C. Females can be carriers of the gene without showing it
D. All the sons of an affected male will show the phenotype under study.

92. When equal volumes of two buffers of pH 4 and 6 of identical ionic strengths are mixed, the resultant pH of the solution will be

A. close to 4
B. close to 5
C. close to 6
D. exactly 5

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93. Penicillin and semisynthetic derivatives are often used to treat bacterial infections. What is the target of such penicillins in bacteria?

A. Protein synthesis
B. Cell wall synthesis
C. DNA synthesis
D. RNA synthesis

94. Transcription termination in bacteria is either dependent or independent (mostly based on intrinsic features) of this factor.

A. Delta B. Sigma C. Theta D. Rho

95. Inhibition of folic acid biosynthesis in bacteria is achieved by the use of a synthetic antibiotic that binds to dihydrofolate reductase. Identify the compound.

A. Quinoline
B. Trimethoprim
C. Sulfonamide
D. Macrolide

96. The *Drosophila* flies of genotype XO would be

A. Sterile males
B. Sterile females
C. display both male and female characters
D. will not survive

97. Identify the corresponding target sites for the following (L,M,N,O) restriction endonucleases

Restriction Endonucleases	Target Site
L. *EcoRI*	1. GGATCC
M. *BamHI*	2. CCCGGG
N. *Hind III*	3. GAATTC
O. *SmaI*	4. CTGCAG
	5. AAGCTT

A. L-3; M-5; N-1; O-2
B. L-5; M-1; N-2; O-3
C. L-3; M-2; N-5; O-2
D. L-3, M-1; N-5; O-2

98. A bacterial cell divides once every minute. It takes these dividing cells an hour to fill a glass. How much time is needed to fill half of the glass?

A. 30 min B. 15 min C. 29 min D. 59 min

99. A technique for identifying individual chromosomes in a cell is

A. giemsa staining
B. inversion analysis
C. S-banding
D. G-banding

100. Which of the following depicts the three-point test cross?

A. AABBCC X aabbcc
B. AaBbCC X aabbcc
C. AaBbCc X aabbcc
D. aaBbCc X aabbcc