ENTRANCE EXAMINATION - 2012
Ph.D. Plant Sciences

Time: 2 hours

Maximum Marks: 75

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


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 mark will be deducted.

8. Calculators and mobile phones are not allowed.
PART - A

1. An increase in some phenomenon at a constant rate over a specified time period.

   A. Geometric growth  
   B. Exponential  
   C. Arithmetic growth  
   D. Non-linear

2. Which of the following plant hormones is incorrectly paired with its function?

   A. cytokinin – promotes senescence  
   B. gibberellin – stimulates seed germination  
   C. abscisic acid – promotes seed and bud dormancy  
   D. ethylene – promotes fruit ripening

3. A mixture containing the following compounds is passed through a column in a gel filtration chromatography, which excludes all protein of MW 100,000 and higher: protein A MW = 30,000, protein B MW = 200,000, protein C MW = 90,000, protein D MW = 50,000, protein E MW = 250,000. What will be the order of elution of these proteins?

   A. Protein E, Protein B, Protein C, Protein D, Protein A  
   B. Protein E + Protein B, Protein C, Protein D, Protein A  
   C. Protein A, Protein D, Protein C, Protein B, Protein E  
   D. Protein E + Protein B, Protein A, Protein D, Protein C

4. Verticillaster fluorescence is a feature of

   A. Malvaceae  
   B. Liliaceae  
   C. Labiatae  
   D. Cruciferae

5. Which of the following regarding epigenetic inheritance is false?

   A. It does not involve changes in DNA sequence  
   B. It involves functionally relevant modifications to the genome such as histone modification  
   C. Epigenetic changes are not preserved when cells divide  
   D. Epigenetic inheritance can be reset during gametogenesis
6. If you could connect and active xylem vessel from a shoot to an active phloem sieve-tube member from a leaf using a "micropipe," which way would the solution flow between the two?

A. The solution would flow from xylem to phloem.
B. The solution would flow from phloem to xylem.
C. The solution would flow back and forth from one to another.
D. The solution would not flow between the two.

7. If the map distance between genes A and B is 5 map units and the map distance between B and C is 15 map units, what is the map distance between A and C?

A. 5 map units
B. 10 map units
C. 20 map units
D. Either 10 map units or 20 map units depending on the order of genes

8. If a cell with a solute potential of –0.2 MPa and a pressure potential of 0.4 MPa is placed in a chamber filled with pure water that is pressurized with 0.5 MPa, what will happen?

A. Water will flow out of the cell.
B. Water will flow into the cell.
C. The cell will be crushed.
D. The cell will explode.

9. The fungus that causes southern corn leaf blight is known to produce this host specific toxin.

A. HT toxin
B. HV toxin
C. HC toxin
D. HS toxin

10. Primitive bryophytes are called

A. Club mosses
B. Horse tails
C. Liver worts
D. Ferns
11. The bioluminescent dinoflagellates are

A. Noctiluca and Gonyaulax  
B. Gymnodinium and Cerastium  
C. Dinobryon and Distephanus  
D. Pinnularia and Acetabularia

12. Which one of the following is living but non-nucleated:

A. Sieve tube  
B. Companion cells  
C. Phloem fibre  
D. Phloem parenchyma

13. Uranyl acetate is used as a negative strain in this technique

A. Confocal microscopy  
B. Epifluorescence  
C. Electron microscopy  
D. Compound microscope

14. Protoplasts can be made from the plant cells using these enzyme combinations

A. Cellulase and Pectinase  
B. Replicase and Ligase  
C. Protease and Chitinase  
D. DNAse and RNase

15. A large ecosystem that has distinct climate, geology, and organisms; e.g., desert, tundra, grassland, savanna, woodland, coniferous forest, temperate deciduous forest, and tropical rain forest.

A. Ecotone  
B. Microcosm  
C. Global ecosystem  
D. Biome

16. Roger Beachy is known for this landmark discovery in plant pathology.

A. Transgenic plants resistant to insects  
B. Transgenic plants resistant to fungal pathogens  
C. Transgenic plants resistant to bacterial pathogens  
D. Transgenic plants resistant to plant viruses
17. During Calvin cycle, the last enzyme involved in RuBP regeneration is

A. phosphoribulokinase
B. Rubisco
C. phosphopentosepimerase
D. phosphopentoseisomerase

18. A local movement that began in India in the early 1980s and is opposed to governmental deforestation programs.

A. Green movement
B. Afforestation
C. Heat Island
D. Chipko movement

19. Salicylic acid is known to induce systemic acquired resistance SAR in plants. Identify one among the following, which is also known to induce SAR.

A. Succinic acid
B. Gluconic acid
C. 2,6-dichloroisonicotinic acid
D. Chorismic acid

20. A major route for biosynthesis of secondary products in plants is

A. C₄ pathway
B. Shikimate pathway
C. CAM pathway
D. GS-GOGAT system

21. Number of ‘High Energy P’ bonds are required to translate a 279 aa protein

A. 279
B. 558
C. 837
D. 1116

22. One of the following proteins is positioned as the tip of the pilus formed between the Agrobacterium and plant cell

A. VirB1
B. VirB11
C. VirB5
D. VirA
23. A reaction medium of 500 ml containing 20 mM Tris-HCl buffer pH 7.5, 0.5 mM MgCl2 and 0.05% NaN3 has to be prepared using the stock solutions of 1 M Tris-HCl pH 7.5; 100 mM MgCl2 and 5% NaN3 solution. The volumes of stocks should be mixed as

A. 10 ml of Tris-HCl, 5 ml of MgCl2 and 2.5 ml of NaN3 in 482.5 ml of ddH2O  
B. 50 ml of Tris-HCl, 5 ml of MgCl2 and 2.5 ml of NaN3 in 442.5 ml of ddH2O  
C. 10 ml of Tris-HCl, 2.5 ml of MgCl2 and 5 ml of NaN3 in 482.5 ml of ddH2O  
D. 50 ml of Tris-HCl, 2.5 ml of MgCl2 and 5 ml of NaN3 in 442.5 ml of ddH2O

24. Which of the following is a marker gene in chloroplast transformation studies

A. Phosphomannase isomerase  
B. Xylose isomerase  
C. Chloramphenicol acetyl transferase  
D. Aminoglycoside adenyl transferase

25. Primary amino sequence of a protein from five plant species is given to you. Which of the following tools would you use to know the homology between the sequences?

A. BLAST  
B. TargetP  
C. CLUSTALW  
D. Primer Express
PART - B

26. The largest family in the flowering plants is

A. Graminae
B. Compositae
C. Orchidaceae
D. Leguminosae

27. What is “Phosgene”?

A. It is a type of pseudo gene which is predicted by a software
B. It is type a gene which is rich in phosphoric acids
C. It is colorless poisonous gas
D. It is a type antibiotic which inhibits bacterial gene expression

28. The practice of reducing or eliminating tillage operations and leaving crop residues on the soil to prevent erosion.

A. Green manure
B. Biofertilizer
C. Conservation tillage
D. Green revolution

29. One of enzymes highly sensitive to and is inhibited by oxygen is

A. Rubisco
B. cytochrome oxidase
C. polyphenol oxidase
D. nitrogenase

30. Fraction I protein in plants is also known as

A. bovine serum albumin
B. seed protein
C. protein fraction
D. Rubisco

31. The following gives rise to the endomembrane system in a cell

A. Plasma membrane
B. Mitochondria
C. Endoplasmic Reticulum
D. Golgi Apparatus
32. Recently, which company's GM-Brinjal has not been given permission for commercial cultivation

A. Nuzvid seeds  
B. Advanta India  
C. Raas Seeds  
D. Mahyco

33. One of the following statements related to 'Phytoene' is wrong

A. Belongs to the class of terpenoids  
B. Precursor of Carotenoids  
C. Synthesised from two molecules of geranylgeranyl diphosphate  
D. Precursor of phospho-enol-pyruvate

34. Fertilization in Pteridophytes is

A. Apogamy  
B. Syngamy  
C. Apospory  
D. Siphanogamy

35. Find out the mismatch for the following enzymes and their products

A. Pyruvate dehydrogenase – Acetyl CoA, CO₂, NADH  
B. Pyruvate decarboxylase – Acetaldehyde, CO₂  
C. Pyruvate-formate lyase – Acetyl CoA, Formate, NAD  
D. Pyruvate oxidase – Acetyl PO₄, CO₂, FADH

36. Cinchona plant belongs to

A. Apocyanaceae  
B. Asteraceae  
C. Rubiaceae  
D. Lamiaceae

37. Biological modification that allows species to better exist in a specific environment for short term.

A. Ecotype  
B. Ecad  
C. Acclimation  
D. Adaptation
38. In tetrad analysis, non-parental ditype asci can result from:

A. single crossovers between linked genes  
B. single crossovers between a gene and a centromer  
C. double crossovers between linked genes  
D. double crossovers between a gene and a centromere

39. A mixture of several herbicides that is considered to be a carcinogen because it is contaminated with dioxin.

A. Agent orange  
B. Multi-Weedicide  
C. Pesticide  
D. Chlorofluorocarbons CFCs

40. Which one of the following statements about the epidermis is false?

A. On the plant body, only leaves are covered by a cuticle  
B. The vast majority of epidermal cells are parenchymatous  
C. Guard cells are normally the only epidermal cells to have well developed chloroplasts  
D. Subsidiary cells are associated with guard cells in many plant groups

41. An organism with two different alleles is called

A. homozygous for that trait  
B. homologous for the allele  
C. heterozygous for that trait  
D. heterologous for the allele

42. In higher plants, cytochrome c is typically located in

A. plasma membrane  
B. chloroplasts  
C. mitochondria  
D. cytoplasm

43. In a cross involving polygenic inheritance, only \( \frac{1}{1024} \) of the offspring in F2 generation were as extreme as one of the parents. How many gene pairs are involved?

A. 3  
B. 4  
C. 5  
D. 6
44. Designated sites that have been abandoned or underused because of real or perceived environmental contamination/pollution are called as

A. Green field  
B. Brown field  
C. White field  
D. Red field  

45. A column chromatography method that makes use of a specific ligand molecule that is attached to an insoluble matrix, and is capable of binding to the molecule being purified is known as

A. Ion exchange chromatography  
B. Partition chromatography  
C. Gel filtration chromatography  
D. Affinity chromatography  

46. Match the following diseases in group A with their causative agent in group B.

<table>
<thead>
<tr>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. Histoplasmosis</td>
<td>1. Virus</td>
</tr>
<tr>
<td>L. Encephalitis</td>
<td>2. Tapeworm</td>
</tr>
<tr>
<td>M. Cysticercosis</td>
<td>3. Fungi</td>
</tr>
<tr>
<td>N. Leishmaniasis</td>
<td>4. Bacteria</td>
</tr>
<tr>
<td></td>
<td>5. Protozoa</td>
</tr>
</tbody>
</table>

A. K-4; L-1; M-2; N-5  
B. K-2; L-4; M-1; N-5  
C. K-3; L-1; M-2; N-5  
D. K-3; L-1; M-5; N-2  

47. The alleles A, B and C are on the same maternal chromosome and a, b and c are on the same paternal chromosome. The only way that heterozygote will produce a gamete with alleles a, b and C is through

A. nondisjunction  
B. the laws of segregation  
C. the law of independent assortment  
D. crossing over
48. When leaves become water-stressed, they wilt, because........

A. increased ABA levels have caused the stomata to close
B. phloem transport has ceased leading to increased sugar levels
C. their mesophyll cells are no longer turgid
D. their guard cells are no longer turgid

49. Restoring a natural area by the addition of living organisms e.g., plants or bacteria.

A. Bioremediation
B. Phytoremediation
C. Phycoremediation
D. Rhizoremediation

50. Husk of coconut is made of:

A. Schlerenchyma
B. Parenchyma
C. Collenchyma
D. Prosenchyma

51. Identify the mismatch

A. Selective medium – Bismuth sulfite agar
B. Differential medium – MacConkey agar
C. Enrichment medium – Lysine iron agar
D. Characteristic medium – Sulfide, indole, motility SIM medium

52. A part of the biosphere that absorbs more carbon dioxide than it releases; e.g., oceans and rain forests.

A. Carbon sink
B. Acid mine
C. Peat bog
D. Alkaline soil

53. In Arabidopsis, expression of one of the genes was suppressed by RNA interference technology. The following technique can not be used for testing the levels of that specific gene product in the mutant series:

A. Northern analyses with total RNA of mutants
B. Southern analyses with genomic DNA of mutants
C. RT-PCR analyses with cDNA prepared with total RNA of mutants
D. Western analyses with total protein isolated from mutants
54. Which of the following is a symptom of magnesium deficiency?

A. Yellowing of younger leaves' prior to yellowing of older leaves.
B. Enhanced plant growth, since magnesium is toxic to plants.
C. Chlorosis
D. decreased transpiration

55. One of the following member do not belong to the family Enterobacteriaceae

A. *Proteus*
B. *Yersinia*
C. *Citrobacter*
D. *Vibrio*

56. Fatty acyl CoA in cytoplasm is transported to outer mitochondrial membrane for Beta-oxidation as

A. Glycolipids
B. Acyl carnitine
C. Acteyl CoA
D. Malonyl-CoA

57. Identify the mismatch

A. Bacitracin – inhibits cell wall synthesis
B. Fusidic acid – Binds to EF-G and blocks translocation
C. Dapsone – Interferes with folic acid synthesis
D. Polymyxin B – Inhibits the synthesis of the mycolic acid “cord factor”

58. Ammonia oxidation to nitrate depends on the following two bacteria

A. *Nitrosomonas-Nitrosospira*
B. *Azospirillum-Pseudomonas*
C. *Nitrobacter-Nitrococcus*
D. *Nitrosospora-Nitrococcus*

59. Seed dormancy inhibited mechanically by causing seed coat injury is called as:

A. Stratification
B. Scarification
C. Vernalization
D. Bahar treatment
60. Eukaryotic and multicellular body patterns are not found in

A. Monera  
B. Protista  
C. Fungi  
D. Animalia

61. Gene-for-gene hypothesis was given by:

A. Gregor Johann Mendel  
B. Darwin  
C. Robert Koch  
D. Harold Henry Flor

62. Presently, there are lot more variants of 'Green fluorescent proteins' are available and are used in *in vivo* imaging. However, the basic protein is isolated from

A. *Gloriosa superba*  
B. *Aequorea Victoria*  
C. *Thermus aquaticus*  
D. *Microsporilla graminia*

63. Tabtoxin is toxic to plant cells because it inactivates the enzyme glutamine synthetase, which leads to depletion of glutamine levels, and accumulation of

A. Aspartate  
B. Ammonia  
C. Acetic acid  
D. Benzoic acid

64. The two-carbon compound which acts as substrate for photorespiration is

A. glycine  
B. glycolate  
C. acetyl CoA  
D. malate

65. NADP-malic enzyme is located in the following compartment of bundle sheath cells

A. chloroplast  
B. mitochondria  
C. peroxisome  
D. cytoplasm
66. Mutations that involve a change in single nucleotide resulting in a codon that code for a different aminoacid are

A. missense mutation  
B. nonsense mutation  
C. frameshift mutations  
D. transversions

67. Ferrredoxin can be called as a

A. iron-sulphur protein  
B. porphyrin protein  
C. sulphur-magnesium protein  
D. non-haem protein

68. One of the following proteins of virulence region on the Ti Plasmid is autokinase

A. VirA  
B. VirD4  
C. VirB8  
D. VirH

69. A few fungi accumulate this metabolite during maturation of the aspersorium, which allows drawing of more water to build hydrostatic pressure.

A. Galaturonic acid  
B. Strigol  
C. Glycerol  
D. Cutin

70. One of the following Scientists is associated with the development of gene gun

A. Hargobind Khorana  
B. D. Baltimore  
C. Eric Reeves  
D. J.C. Sanford

71. Golden age of Gymnosperms

A. Paleozoic era  
B. Mesozoic era  
C. Coenozoic era  
D. Devonion period
72. An organism that lives part of its life as a parasite on another organism and the other part as a saprophyte is called

A. Hemibiotroph
B. Biotroph
C. Halophyte
D Lithophyte

73. Bulbosum system employed in barley for production of haploids involved all of the following **except**:

A. Wide hybridization
B. In vitro immature zygotic embryo culture
C. Elimination of the chromosomes of vulgare
D. Elimination of the chromosomes of bulbosum

74. Phaseollin is a very important compound that has great significance in deciding the fate of the host-pathogen interactions. This compound is

A. Produced by the pathogen
B. Produced by the host
C. Chemical fungicide
D. Biological weedicide

75. The entry of most of the bacterial pathogens into the plants occurs through the following.

A. Direct penetration of the cell walls
B. Enter through the wounds made by vectors
C. Physical contact with the infected plant
D. Natural openings of the plants

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