D-62

ENTRANCE EXAMINATION - 2013
Ph.D. Plant Sciences

Time: 2 hours

Maximum Marks: 75

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 to the Invigilator before leaving the examination hall.

4. The question paper contains **75** questions. **Part-A**: Question Nos. **1-25** and **Part-B**: Questions Nos. **26-75** of multiple-choice printed 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.

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. Whittaker's five-kingdom classification of living things is based on

   A. Cell type only
   B. Nutrition only
   C. Cell type and level of organization
   D. Cell type, level of organization and nutrition type

2. The necessary ingredients for DNA synthesis can be mixed together in a PCR tube. The DNA polymerase is from *Thermus aquaticus* and the template is from a human cell. The DNA synthesized would be most similar to:

   A. human DNA
   B. human RNA
   C. *T. aquaticus* DNA
   D. a mixture of *T. aquaticus* and human DNA

3. Which is the most stable form of DNA under normal physiological conditions

   A. A-DNA
   B. H-DNA
   C. B-DNA
   D. Z-DNA

4. Match the following biological subjects from the Column A with their best description in Column B and mark the correct answer

Column A	Column B
L. Agrostology	1. the study of insect pests
M. Palynology	2. the study of pollen grains
N. Entomology	3. the study of autosome
O. Autecology	4. the study of ecology of individual organisms or species
	5. the study of grasses

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

5. Root pressure is maximum when transpiration is

   A. low and absorption is high
   B. high and absorption is also high
   C. low and absorption is also low
   D. high and absorption is very low

6. All of the following are involved in translating information into proteins EXCEPT:

   A. rRNA
   B. siRNA
   C. tRNA
   D. snRNA

7. In nucleotides, phosphate is attached to sugar by

   A. Salt bond
   B. Hydrogen bond
   C. Ester bond
   D. Glycosidic bond

8. The bonding of two amino acid molecules to form a larger protein molecule requires

   A. the release of a water molecule
   B. the release of a carbon dioxide molecule
   C. the addition of a nitrogen atom
   D. the addition of a water molecule

9. All of the below mentioned amino acids can participate in hydrogen bonding EXCEPT one –

   A. Serine
   B. Cysteine
   C. Threonine
   D. Valine

10. Following its synthesis, an oligonucleotide is dissolved in 1.5 mL of water. You dilute 50 µL of the oligonucleotide into a total volume of 1000 µL and read the absorbance of the diluted sample at 260 nm. An A_{260} of 0.264 is obtained. How many OD units are present in the 1.5 mL of oligonucleotide stock?

    A. 0.26
    B. 0.79
    C. 2.64
    D. 7.92

11. You are given two different protein solutions containing proteins A and B. You forgot to label those extremely valuable samples. Proteins A and B exclusively contain alpha/beta barrel and beta barrel respectively. Which of the following is the easiest biophysical technique that can be used to identity protein A and protein B without ambiguity?

    A. Fluorescence spectroscopy
    B. CD spectroscopy
    C. NMR spectroscopy
    D. X-Ray crystallography

12. The first step in two-dimensional gel electrophoresis generates a series of protein bands by isoelectric focusing. In a second step, a strip of this gel is turned 90 degrees, placed on another gel containing SDS, and electric current is again applied. In this second step:

A. the individual bands become stained so that the isoelectric focus pattern can be visualized
B. the proteins with similar isoelectric points become further separated according to their molecular weights
C. the individual bands become visualized by interacting with protein-specific antibodies in the second gel
D. the proteins in the bands separate more completely because the second electric current is in the opposite polarity to the first current

13. Aymmetric divisions are known to drive plant development. The earliest marker for asymmetry during embryogenesis is

A. abscisic acid
B. auxin
C. gibberellins
D. nitric oxide

14. In a given population, only the 'A' and 'B' alleles are present in the ABO system: there are no individuals with type 'O' blood or with 'O' alleles in the particular population. If 200 people have type A blood, 75 have type AB blood, and 25 have type B blood, the allelic frequencies of 'p' and 'q' in the population are

A. 0.666 and 0.394
B. 0.792 and 0.208
C. 0.833 and 0.167
D. 0.916 and 0.084

15. The major events that occur during Meiosis 1 (reductional division) are listed below. Which of these is INCORRECT with respect to description of events in that stage?

A. Prophase 1: Synapsis of homologous chromosomes and crossing over
B. Metaphase 1: Homologous pairs of chromosomes line up on the metaphase plate
C. Anaphase 1: Sister chromatids of each homologous chromosomes move toward opposite poles
D. Telophase 1: Chromosomes arrive at the spindle poles

16. If the A and B loci are 40 cm apart and an AAbb individual and an aaBB individual mate, the proportion of Ab gametes produced by the F_1 individual will be

A. 10%
B. 20%
C. 30%
D. 40%

17. Eco-friendly biological pesticides are available. Identify one such pesticide among the following:

A. *Bacillus amyloliquifaniens*
B. *Bacillus thuringiensis*
C. *Bacillus cerens*
D. *Bacillus ferrikidans*

18. Hallucinogenic alkaloids produced by this fungus can lead to altered behavior, abortion, and death if grains infected with this fungus are eaten. Identify, among the following, the fungus that produces such compounds.

A. *Agaricus campestris*
B. *Aspergillus flavus*
C. *Claviceps purpurea*
D. *Penicillium notatum*

19. Sulfamethoxazole is a member of sulfonamide group of antimetabolites that are often used as bacteriostatic antibacterial drugs. Such drugs affect bacterial growth by

A. Binding to the plasma membrane and disrupt its structure and permeability properties
B. Binding to 23S rRNA of large ribosomal subunit (50S) to inhibit peptide chain elongation during protein synthesis
C. Inhibiting the folic acid biosynthesis by competing with *p*-aminobenzoic acid
D. Inhibiting DNA-dependent RNA polymerase

20. Which of the following is the CORRECT sequence for the movement of electrons during the light-dependent reactions of plants?

A. Water to P_{680} to P_{700} to $NADP^+$
B. Water to P_{600} to P_{700} to $NADP^+$
C. P_{680} to P_{700} to water to $NADP^+$
D. P_{680} to water to P_{700} to $NADP^+$

21. Stokes shift is?

A. difference in absorption
B. difference in wavelength of fluorescence
C. difference in wavelength of absorption and fluorescence emission maxima
D. difference in wavenumber of infrared and frequency

22. Plants growing in shading plants are:

A. Heliophytes
B. Sciophytes
C. Bryophytes
D. Epiphytes

23. "The step virus growth cycle" is a technique to understand virus replication. This technique is given by

A. Emory Ellis & Max Delbruck
B. Walter Reed & Erwin Popper
C. Frederick Twort & Felix Herelle
D. Max Theiler & George Hirst

24. The lowest pH known till now at which bacteria can grow

A. 1.0
B. 0.7
C. 1.7
D. 2.0

25. Serpentine ecosystem is located in

A. Gangetic plain
B. Kutch
C. Andaman & Nicobar
D. Bihar

PART – B

26. The proofreading of newly synthesized DNA, to excise incorrect nucleotides which have been inserted, is done by:

A. Restriction endonucleases
B. DNA gyrase
C. DNA ligase
D. DNA polymerase III

27. Which of the following statements is FALSE concerning a mating between F^+ and F^- cell?

A. the F^- cell is converted to an F^+ cell
B. the F^+ cell is converted to an F^- cell
C. chromosomal genes are rarely transferred
D. the genes involved in pilus formation are transferred at high frequency

28. Which is the correct order, from smallest to largest number of base pairs?

A. plasmid, transposon, chromosomal DNA
B. chromosomal DNA, transposon, plasmid
C. transposon, plasmid, chromosomal DNA
D. plasmid, chromosomal DNA, transposon

29. Which of the following statements about the use of mass spectrometry in protein investigation is NOT correct?

A. Mass spectrometry involves ionized molecules in the gas phase
B. Mass spectrometry is used for analysing the sequence of peptides
C. Ionic fragments are separated according to their mass-to-charge ratio in Mass spectrometry
D. Mass spectrometry involves the separation of ionic fragments on a gel

30. Ultraviolet light can damage a DNA strand causing

A. two adjacent purine residue to form a covalently bounded dimer
B. two adjacent pyrimidine residues to form covalently bonded dimer
C. disruption of phosphodiesterase linkage
D. disruption of non-covalent linkage

31. Repressor binds to DNA sequence and regulates the transcription. This sequence is called

A. Attenuator
B. Terminator
C. Anti-terminator
D. Operator

32. Antibiotics such as Ciprofloxacin and Flouroquinolines work by inhibiting a specific enzyme. This enzyme is normally necessary to relieve torsional strain that is caused by the unwinding of the helix. What is the name of this enzyme?

A. DNA ligase
B. Topoisomerase (DNA Gyrase)
C. Single-stranded binding protein
D. Primase

33. The region of DNA known as TATA BOX is the site for binding of

A. DNA polymerase
B. DNA topoisomerase
C. DNA dependent RNA polymerase
D. Polynucleotide phosphorylase

34. Once transcribed, eukaryotic mRNA typically undergoes substantial alteration that results primarily from

A. excision of introns
B. union with ribosomes
C. linkage to histone molecules
D. fusion into circular forms known as plasmids

35. Protein secondary structures such as α helices and β sheets are stabilized mainly by

A. disulfide bond formation
B. Van der Waals forces
C. hydrogen bond formation
D. hydrophobic interactions

36. When you measure the amount of a protein in a solution by UV absorbance, you are actually detecting the UV absorbance of predominantly which amino acid?

A. Tryptophan
B. Arginine
C. Methionine
D. Histidine

37. If 10 gm of sodium chloride (NaCl; FW 58.44) are dissolved into 100 ml of water, what is the molar concentration of sodium chloride in the solution?

A. 0.17
B. 0.58
C. 1.71
D. 5.84

38. As far as the absorbance of DNA at 260nm is concerned, which of the following is correct?

A. individual nucleotides>ss DNA>dsDNA
B. dsDNA>ssDNA> individual nucleotides
C. ssDNA>dsDNA> individual nucleotides
D. absorbance remains same

39. The enzyme that catalyzes peptide bond between two amino acids is located in the

A. smaller subunit of Ribosome
B. larger subunit of Ribosome
C. leader region of mRNA
D. central part of tRNA

40. Which of the following promoters has been used in Barnase-Barstar system in genetic engineering for pollination control?

A. CaMv35S
B. P-Nos
C. TA-29
D. PPR-10

41. Which of the following database is exclusively designed to study Protein-Protein Interactions (PPI)?

A. Pubmed
B. STRING
C. SWISS-MODEL Repository
D. Protein Databank (PDB)

42. Gregor Mendel's approach to the study of heredity was effective for several reasons. Compared to previous geneticists, the unique characteristics of Mendel' work was

A. choosing the garden pea for his experiment
B. crossing true-breeding plants
C. producing hybrids
D. keeping records of numbers of different progeny

43. Bacterial gastroenteritis is the disease of major concern in relation to consumption foods such as meats, poultry, and eggs. Often, the onset of symptoms occurs after an incubation time as short as eight hours. The organism associated with such food spoilage is

A. Bacillus cereus
B. Cyclospora cayetanensis
C. Escherichia coli
D. Salmonella enteritidis

44. Various species of fungi provide a unique opportunity for tetrad analysis because

A. they have two mating types
B. they multiply rapidly
C. they can grow vegetatively as haploids
D. they house all four haploid products of each meiosis in ascus

45. Which out of the following is a peptide antibiotic?

A. Erythromycin
B. Gramicidin
C. Ciprofloxacin
D. Tetracycline

46. Strigolactone, a recently discovered plant hormone plays a great role in the regulation of

A. fruit ripening
B. cell division
C. cell death
D. shoot branching

47. The archaebacteria can tolerate extremes of heat and pH due to

A. the presence of branched chain lipids in the cell membrane
B. the absence of pepdidoglycans in the cell walls
C. the presence of an extra layer of of capsule around the cell walls
D. being the most ancient organisms

48. What is common component among: ATP, FAD and NAD?

A. Phenolic Acid
B. Adenine
C. A heme group
D. Flavin

49. Identify insectivorous plant

A. Physalis
B. Elaeis
C. Sarracenia
D. Euphorbia

50. Bat pollinated flowers are called

A. Anemophilous
B. Chiropterophilous
C. Hydrophilous
D. Entmophilous

51. The most commonly microorganism associated during the early stages of production of different types of cheese world over is

A. *Geotrichum candidum*
B. *Lactococcus lactis*
C. *Lactobacillus plantarum*
D. *Pediococcus cerevisiae*

52. Phenyl alanine is similar to tyrosine in the same way that

A. Phe is similar to Trp
B. Ser is similar to Thr
C. Ala is similar Ser
D. Val is similar to Thr

53. In the liquid form of water how many hydrogen bonds can potentially takes place?

A. One
B. Two
C. Three
D. Four

54. The Henderson-Hasselbalch equation:

A. Relates the pH of a solution to the pK_a and the concentrations of acid and conjugate base
B. Does not explain the behavior of di- or tri-basic weak acids
C. Employs the same value for pK_a for all weak acids
D. Is equally useful with solutions of acetic acid and hydrochloric acid

55. The light reaction of photosynthesis DOES NOT include

A. Chemiosmosis
B. Charge Separation
C. Electron transport
D. Oxygen liberation

56. An organism grown in the presence of 1-14 C-labeled glucose produced isopropyl alcohol as the major product and has labeled carbons at 1 and 3. What does the result indicate?

A. Isopropyl alcohol results from the tail-to-tail condensation of acetyl CoA, followed by decarboxylation.
B. Isopropyl alcohol results from the head-to-tail condensation of acetyl CoA, followed by decarboxylation.
C. Isoprophyl alcohol results from the tail-to-tail condensation of pyruvate followed by decarboxylation.
D. Isopropyl alcohol results from head-to-tail condensation of pyruvate followed by decarboxylation.

57. A characteristic feature of a panmictic population is:

A. Gene erosion
B. Genetic drift
C. Gene pooling
D. Genetic balance

58. How many microspores would be produced from 200 actively dividing microspore mother cells during the process of microsporogenesis in a maturing anther lobe:

A. 50
B. 200
C. 400
D. 800

59. The chromosomes in which DNA replicates innumerable times with no cytokinesis:

A. Meiotic chromosomes
B. Mitotic chromosomes
C. Polytene chromosomes
D. Polyploid chromosomes

60. The ploidy of matured endosperm cells is:

A. N
B. 2n
C. 3n
D. 4n

61. Pappus of Compositae is a modification of

A. Calyx
B. Corolla
C. Androecium
D. Bracts

62. A potentially stable and heritable change in gene expression that occurs without a change in DNA sequence is called

A. functional genomics
B. epigenetics
C. association genetics
D. Mendelian genetics

63. The edible part in Garlic is

A. Leaves
B. Stem
C. Bracts
D. Stipules

64. Largest number of cultured bacteria belong to the phylum

A. Deinococcus
B. Firmicutes
C. Bacteroidetes
D. Proteobacteria

65. Identify an organisms containing bacteriolchlorophyll-g

A. *Chromatium*
B. *Rhodopseudomonas*
C. *Heliobacter*
D. *Chlorobium*

66. One of the following platforms is used for whole cell fingerprinting

A. FT-IR
B. GC-MS
C. LC-MS
D. MALDI-TOF

67. *TERMINAL FLOWER 1* (*TFL1*), a meristem identity gene, is a marker for----------

A. shoot apical meristem
B. root apical meristem
C. inflorescence meristem
D. floral meristem

68. If the new leaves are pale green, turn yellow-green as they enlarge; plants show sparse growth; lack fruits or with few fruits, pale in color, the plants are said to be deficient in

A. Nitrogen
B. Copper
C. Boron
D. Magnesium

69. Starch is insoluble in water. Yet it is accumulated in large quantities in potato tubers because:

A. soil microorganisms deposit starch in tubers
B. it is synthesized in potato tuber itself
C. it is translocated from the leaves to the tubers in the form of sugars
D. it is useful for tuber consumption

70. Isoschizomers are

A. restriction endonucleases isolated from different organisms and cleave within the same target sequences
B. different enzymes having same isoelectric point
C. different enzymes having common coenzymes
D. different enzymes having common prosthetic group

71. Photolyase is a

A. light activated peptidase
B. light activated enzyme involved in photosynthesis
C. DNA repair enzyme
D. Phtorespiratory enzyme

72. Hypoxanthin is resulted from _____ of Adenine

A. alkylation
B. deamination
C. adduct formation
D. epoxidation

73. Marshall Nirenberg and Heinrich Matthaei offered the direct evidence that

A. RNA sequences code for specific amino acids
B. DNA is genetic material
C. Proteins are synthesized from N-terminal end to C-terminal end
D. Proteins are synthesized from C-terminal end to N-terminal end

74. Cyathium inflorescence found in the genus

A. *Ficus*
B. *Ricinus*
C. *Euphorbia*
D. *Ocimum*

75. What is SMART ?

A. A curated collection of protein domain
B. It is an abbreviation of Sequence of Monomers Are Repeating Ten-times in a DNA molecule
C. It is an abbreviation of Sequence of Microsatellite Amplified RT-PCR product
D. It is a gene prediction software

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