U-60

ENTRANCE EXAMINATION, 2010
Ph.D. Plant Sciences
Date: 01-06-2010

Time: 2 hours Maximum Marks: 75

HALL TICKET NO. [ ]

INSTRUCTIONS

Please read carefully before answering the questions

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

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

3. The question paper contains 75 questions (Part –A Q. Nos. 1-25; Part –B: Q. Nos. 26-75) of multiple-choice type printed in **15 pages**, including this page and the OMR answer sheet provided separately. Please check.

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

5. Each question carries one mark.

6. There is negative marking for wrong answers, in PARTS-A and B. For each wrong answer, 0.33 marks will be deducted.

7. Calculators and mobile phones are not allowed

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PART – A

1) In population in Hardy-Weinberg equilibrium, 75% of the individuals have a dominant allele for a particular gene (p = 0.75) and 25% have a recessive allele (q = 0.25). The proportion of homozygous recessive individuals in the F1 generation will be

   A. 2.5%
   B. 6.25%
   C. 18.75%
   D. 25%

2) Following antimicrobial drug inhibits formation of peptide bonds and thereby protein synthesis in bacteria

   A. Chloramphenicol
   B. Sulfonamide
   C. Tetracycline
   D. Erythromycin

3) The lateral diffusion rate of lipid molecules can be quantitatively determined by

   A. Immuno fluorescence
   B. Fluorescence photo-bleaching recovery technique
   C. Transverse diffusion test
   D. Calculating the ratio between saturated to unsaturated fatty acids

4) Which of the following is a site specific nuclease in T-DNA transfer

   A. *VirG*
   B. *VirA*
   C. *VirD1*
   D. *VirE2*

5) Trypsin specifically cleaves peptide bonds

   A. Between any negatively charged residue and proline
   B. After positively charged residues, if the next residue is not proline
   C. Between Lysine and proline
   D. Non-polar amino acids

6) Which of the following is a mobile electron carrier protein in the photosynthetic electron transport

   A. Plastoquinone
   B. Plastocyanin
   C. Phycocyanin
   D. D1 protein

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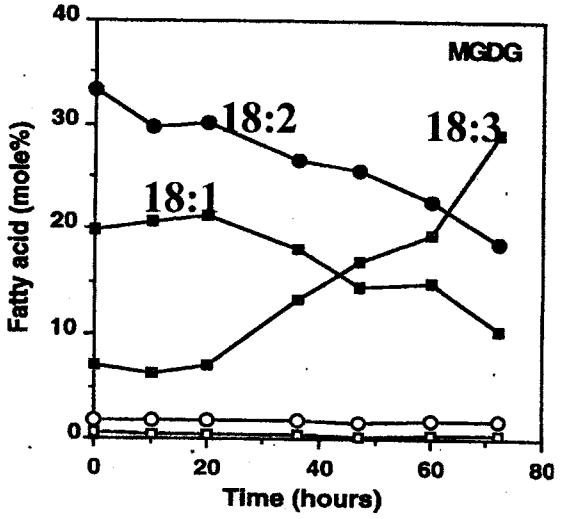
7) Gene that code for functional β-galactosidase is a part of

A. pUC18
B. pBR322
C. pSF2124
D. pBR327

8) Mutation of a gene that codes for a negative regulator of genes X, Y and Z leads to

A. Inhibition of X,Y and Z transcription
B. Constitutive expression of X, Y and Z genes
C. Rapid degradation of X,Y and Z mRNA
D. Disappearance of X, Y and Z proteins

9) Based on the time dependent changes in the fatty acid composition of a bacterial membrane as shown in the following figure, identify the abiotic stress treatment given to the bacterial culture



A. Heat stress
B. Salt stress
C. Cold stress
D. Oxidative stress

10) The activity of one of the following enzymes is not regulated by protein phosphorylation-dephosphorylation

A. Sucrose-phosphate synthase
B. Pyruvate dehydrogenase complex
C. Dinitrogenase reductase
D. Nitrate reductase

11) In competitive inhibition

A. V_{max} unchanged and K_m increases
B. V_{max} decreases and K_m unchanged
C. Both V_{max} and K_m decrease
D. Both V_{max} and K_m increase

12) cDNA from control and treated *E.coli* cultures were labeled with Cy3 and Cy5 respectively and using these labeled cDNAs a DNA microarray experiment was performed. Cy5 / Cy3 ratio of genes A and B were 10 and 0.1 respectively. It means

A. Gene A is repressed and gene B is upregulated due to treatment
B. mRNA levels of Gene A is relatively higher than Gene B in the control *E.coli* cells
C. Gene A is upregulated and gene B is down regulated due to treatment
D. mRNA levels of Gene B is relatively higher than Gene A in the control *E.coli* cells

13) An example of antagonistic role of auxins and gibberellins is

A. Sequential senescence
B. Fruit growth
C. Root initiation in stem cuttings
D. Stem elongation

14) Which one of the following *E. coli* sigma subunit is required for transcription of heat inducible genes

A. σ 70
B. σ 32
C. σ 54
D. σ 28

15) The source of visible radiation in UV-Visible spectrophotometer is

A. Tungsten filament lamp
B. Hydrogen lamp
C. Deuterium lamp
D. Nernst glower

16) Based upon the features of F factor Shizuya *et al* in 1992 developed a high capacity insert vector, which is very much in use for preparing genomic library of higher organisms. What is the name of the vector?

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

17) When DNA solution is heated, the OD_{260}

A. Remains unchanged
B. Increases
C. Decreases
D. First decreases and then increases

18) In isoelectricfocssing the following substances are used to give a pH gradient

A. Veronal
B. Tris
C. Polyamino polycarboxylic acids
D. Phosphate buffer

19) Give an example of cationic detergent

A. Sodium dodecyl sulphate
B. Cetyltrimethyl ammonium bromide (CTAB)
C. β-mercaptoethanol
D. Urea

20) The fixative used for fats in electron microscopy is

A. Osmium tetroxide
B. Glutaraldehyde
C. Bromophenol blue
D. Glycerol

21) In an FT-IR spectrum, methyl group bending is seen at a frequency of (cm^{-1})

A. 1460
B. 1365
C. 2720
D. 2870

22) Physical relationship between two organisms with complementary physiological properties (each thrive for the other) are called:

A. Consortium
B. Parasitism
C. Amensalism
D. Symbiotic

23) Which of the following is incorrect about sex-linked dominance

A. No generations are skipped
B. Affected males must come from affected mothers
C. All the daughters, but none of the sons, of an affected father are affected
D. If both parents affected, all children will be affected

24) Tm of a DNA molecule is high, when

A. Its G+C content is low
B. Its A+T content is high
C. The salt concentration in the DNA solution is high
D. It is in circular form

25) Genomospecies are

A. Strains with approximately 97% or greater DNA-DNA relatedness at optimal conditions and with 5 °C or less ΔTm
B. Strains with approximately 70% or greater DNA-DNA relatedness at optimal conditions and with 10 °C or less ΔTm
C. Strains with approximately 70% or greater DNA-DNA relatedness at optimal conditions and with 5 °C or less ΔTm
D. Strains with approximately 97% or greater DNA-DNA relatedness at optimal conditions and with 10 °C or less ΔTm

PART-B

26) The pilus between the plant and *Agrobacterial* cells for T-DNA transfer is formed by

A. *VirA-VirG* complex
B. *VirD2-VirF* complex
C. *VirE1-VirE2* complex
D. *VirB-VirD4* complex

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27) One of following is an antiviral drug

A. Acyclovir
B. Flucytosine
C. Chloroquine
D. Erythromyicin

28) Ribosomes stalled on secondary structured mRNA are rescued by

A. Translation release factor
B. EF-Tu
C. tmRNA
D. tRNA

29) Polynucleotide ligase joins two DNA molecules together by forming a covalent bond between

A. Two OH groups of adjacent strands
B. A 3`OH group and a 5` PO_4 group
C. A 3` $PO_4$ group and a 5` OH group
D. Two carbon atoms of adjacent nucleotides on the same strand

30) The presence of horns in the Dorset breed of sheep is due to sex-influenced locus with horns dominant in males and recessive in females. Polled (hornless) males are mated to horned females. The fraction of F_2 expected to be polled is

A. 1/2
B. 3/4
C. 1/4
D. 3/8

31) Alkalophiles are those species which grows best at pH range

A. 7-8
B. 8-9
C. 8.5-11.5
D. 7.5-8.5

32) The most commonly used trait for counter-selection when genes are mapped by interrupted conjugation is

A. Lactose fermentation
B. Antibiotic resistance
C. Phage resistance
D. Vitamin synthesis

33) Asporogenic species are those

A. Which contain the majority of sporulation specific genes but the cells do not sporulate
B. Which contain the majority of sporulation specific genes and thus the cells sporulate
C. Which do not contain majority of sporulation specific genes but still the cells sporulate
D. Which contain all the sporulation specific genes and sporulate

34) The most widely used detector in GC is

A. Photocells
B. Photomultiplier
C. Thermocouple
D. Flame ionization detector

35) For any color to be developed in the aleurone layer of corn kernels, the dominant alleles at two loci plus the recessive condition at the third locus (A-R-ii) must be present. Any other genotypes will produce colorless aleurone. What phenotypic ratio of colored: colorless would be expected in the progeny from matings between parental plants of genotype AaRrIi?

A. 8 colored : 56 colorless
B. 9 colored : 55 colorless
C. 58 colored: 6 colorless
D. 52 colored : 12 colorless

36) Given the DNA codon of antisense strand as 3`TAC 5,` the anticodon that pairs with the corresponding mRNA codon could be

A. 3` CAT 5`
B. 3` UAC 5`
C. 5` AUG 3`
D. 3` CAU 5`

37) Genome annotation means

A. Removal of vector sequence from the clone and also removal of redundant overlapping sequences from the assembled sequence to make a final draft of pure genome sequence
B. The confirmation of genome sequence by an alternative method using some reliable molecular biology tools
C. Fingerprinting of all clones which was used in sequencing with different restriction enzymes
D. Obtaining biological information such as gene, promoter and other important sequence elements from unprocessed sequenced data

38) Yeast have which of the following characteristic?

A. Eukaryotic, unicellular absorptive heterotroph
B. Eukaryotic, multicellular absorptive heterotroph
C. Eukaryotic, multicellular photosynthetic autotroph
D. Prokaryotic, unicellular

39) Which of the following pairs is incorrectly matched?

A. *Azadirachta indica* – Meliaceae
B. *Ricinus communis* –Euphorbiaceae
C. *Jatropha curcus*- Fabaceae
D. *Tamarindus indica* - Caesalpiniaceae

40) The membrane-bound organelle which detoxifies molecules such as hydrogen peroxide in the cell is the

A. Glyoxysome
B. Peroxisome
C. Liposome
D. Chromosome

41) Mutations that destroy 'true" homeotic genes often result in

A. Formation of unrecognizable masses
B. Deletion of half an organism
C. Conversion of non-homologous segments into homologous segments
D. Conversion of homologous segments into non-homologous segments

42) A plant hormone derived from cell wall fragments is called as

A. Oligosaccharins
B. Extensin
C. Polyamine
D. Pectin

43) Many of the genes in lambda phage are clustered based on functional similarity. Which of these clusters could most likely be deleted and replaced with foreign DNA, making the recombinant phage a useful cloning vector?

A. Nucleases to destroy host DNA
B. Head capsomeres
C. Phage-specific RNA polymerase
D. Establishment and maintenance of lysogeny

44) Fruit ripening of mango is enhanced by application of

A. Jasmonic acid
B. Ethylene
C. Salicyclic acid
D. Abscisic acid

45) An enzyme introducing a carbon–carbon double bond into a fatty acid in a specific position is known as

A. Hydrolase
B. Catalase
C. Desaturase
D. Polymerase

46) In which form water is available to the plants?

A. Hygroscopic water
B. Gravitational water
C. Capillary water
D. Mineral water

47) Technique to identify possible interaction between two proteins

A. Western blotting
B. Gel mobility shift assay
C. DNA foot printing
D. Yeast-two hybrid system

48) Process in which plants are exploited to prevent migration of environmental contaminants to sites where they may pose a danger to human health.

A. Phytostabilisation
B. Phytovolatilization
C. Phytomobilization
D. Phytoinnoculation

49) The plant hormone derived from degradation of carotenoid is

A. Auxin
B. Kinetin
C. Abscisic acid
D. Salicylic acid

50) In the Mexican hairless breed of dogs, the hairless condition is produced by the heterozygous genotype (Hh). Normal dogs are homozygous recessive (hh). Puppies homozygous for 'H' allele are usually born dead with abnormalities of mouth and absence of external ears. If the average litter size at weaning is 8 in a mating between hairless dogs, what would be the average number of hairless and normal offspring from the mating between hairless and normal dogs?

A. 2 normal 4 hairless and 2 sparingly hairy
B. 4 hairless and 4 normal
C. 6 normal and 2 hairless
D. 2 normal and 6 hairless

51) Exploitation of microorganisms within the root zone of plants to remove contaminants from the environment

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

52) All of the following statements are correct regarding the Calvin cycle of photosynthesis EXCEPT

A. Elucidating the biochemical reactions of this cycle earned Dr. Melvin Calvin a Nobel Prize
B. The energy source utilized is the ATP and NADPH obtained through the light reactions
C. These reactions begin soon after sundown and end before sunrise
D. The 5-carbon sugar RuBP is constantly being regenerated

53) A natural or synthetic chemical that promotes the wetting, solubilization, and emulsification of various types of organic chemicals is known as

A. Surfactant
B. Biocatalyst
C. Siderophore
D. Allelochemical

54) A pair of codominant sex-linked alleles in a mammal produce red pigment when homozygous or hemizygous for A^1, colorless when homozygous or hemizygous for A^2 and pink when heterozygous. If a pink female is crossed to a white male, we expect among the progeny

A. 50% females are white
B. 50% of all the progeny are pink
C. 50% of males are pink
D. 25% of all progeny are white

55) Protein fluorescence arises primarily from which residue?

A. Arginine
B. Tryptophan
C. Tyrosine
D. Cysteine

56) Grana refers to

A. Glycolysis of glucose
B. A constant in quantum equation
C. A product of photosynthesis
D. Stacks of thylakoids in plastids of higher plants

57) Functional elucidation of a gene by mutation and subsequent phenotype characterization is known as

A. Forward genetics
B. Reverse genetics
C. Behavioral genetics
D. Genetic polymorphism

58) Which of the following is not a macronutrient?

A. That which is radioactive and can be traced by a Geiger counter
B. That which is required in a very minute amount
C. That which was discovered in the protoplasm
D. That which draws other elements out of protoplasm

59) The number of genotypes that would be obtained by crossing AaBbCcDd X AaBbCcDd (assuming dominance) is

A. 9
B. 18
C. 27
D. 81

60) Round-up is

A. A chemical that inhibits the synthesis of aromatic amino acids and when sprayed on plants makes them smell better
B. A chemical that rounds up pollinating insects and thus increases the number of seeds formed on sprayed plants
C. A chemical that rounds up and kills plant-eating insects and thus improves plant growth
D. A chemical that kills plants by inhibiting the synthesis of aromatic amino acids

61) Series of experiments involving, 1) restriction digestion of the genomic DNA from a plant material 2) ligation of an adapter to the digested DNA fragments 3) pre-amplification with unlabelled adapter primers 4) selective amplification using labeled primers with 2-3 extended selective nucleotides 5) analysis of the final finger print and visualization by autoradiography, are collectively called as

A. RAPD (Random Amplification of Polymorphic DNA)
B. RFLP (Restriction Fragment Length Polymorphism)
C. AFLP (Amplified Fragment Length Polymorphism)
D. SPAR (Single Primer Amplification Reaction)

62) *LYS2* is a selectable marker for

A. Bacteriophase λ
B. *E.coli*
C. Yeast
D. Protozoa

63) In an animal with X-O method of sex determination, which of the following could be the normal number of chromosomes in its somatic cells

A. 26 in males
B. 17 in females
C. 33 in females
D. 13 in males

64) For separation of protein molecule Polyacrylamide gels are commonly used. During preparation of gels APS and TEMED is used. What are APS and TEMED?

A. Ammonium persulphate and trichloroethelenemonoethyldiamine
B. Ammonium persulphate and tetramethylethylenediamine
C. Amino acid with pure sulphur and tetramethylethylenediamine
D. Ammonium persulphate and TEMED is not an abbreviated term, rather it itself is a name of a compound.

65) A deep-rooted plant that obtains water from the deep water table is called as

A. Phreatophyte
B. Hydrophyte
C. Xerophytes
D. Psammophyte

66) An overlapping series of clones or sequence reads that correspond to a contiguous segment of the source genome is known as

A. Sequence coverage
B. Repeated sequence
C. Contig
D. Segmental duplication

67) During isolation of DNA from plant cell, a particular ratio of phenol:chloroform:isoamyl alcohol is used. How do they work?

A. Phenol denature protein and isoamyl alcohol denature plasmid DNA
B. Phenol denature protein and isoamyl alcohol prevent loss of DNA and frothing
C. Phenol denature cell wall and isoamyl alcohol denature plasma membrane
D. This ratio helps in the final stage of DNA isolation for precipitation of DNA.

68) Which one of the compound does not exhibit UV absorption

A. n-hexane
B. Aniline
C. n-hexeadiene
D. Benzaldehyde

69) India participated in the International collaborative projects of highthrouput genome sequencing of

A. Long arm of chromosome 11 of rice and long arm of chromosome 11 of tomato
B. Long arm of chromosome 5 of rice and long arm of chromosome 5 of tomato
C. Short arm of chromosome 11 of rice and long arm of chromosome 11 of tomato
D. Long arm of chromosome 11 of rice and euchromatin regions of chromosome 5 of tomato

70) A plant population that reproduces by self pollination is an extreme example of

A. The bottleneck effect
B. The founder effect
C. Rapid gene flow
D. Assortative mating

71) Which of the following online software is used for gene prediction?

A. NCBI and EMBL
B. ClustalW and SMART
C. SWISS-PROT and Pfam
D. FGENESH and GENSCAN

72) PCR primers, Primer-F and Primer-R were supplied with the following specifications from Sigma Inc.,

Specifications	Primer F	Primer R
µg/OD	30.3	35.6
µg	262	337
µl for 100µM	421	565

Each primer was first dissolved in 1000 µl of TE buffer and then 10x times diluted. 2µl of each primer was then added to a PCR reaction mix (Total reaction volume = 25µl). What is the final concentration of primer "F "and "R" in the PCR reaction mix?

A. 52.4 and 67.4 ng
B. 52.4 and 67.4 µg
C. 26.2 and 33.7 ng
D. 52.4 and 67.4 pg

73) A member of a group that does not contain all the descendents of a common ancestor is known as

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

74) Which of the following antibiotics resistance gene is present in BAC vector?

A. Ampicillin
B. Kanamycin
C. Chloramphenicol
D. Tetracycline

75) DNA molecule in *E.coli* is heavy (fully labelled with N^{15}) and is allowed to replicate in a medium containing N^{14}, after one generation of replication the two daughter molecules

A. Will be similar in density, but will differ from that of parent DNA
B. Will differ in density from one another and also from that of the parent DNA
C. Will have the same density as that of the parent DNA
D. Will differ in density from one another but will resemble the parent molecules

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