Biotechnology Eligibility Test (BET) for DBT-JRF Award (2010-11)

Government of India, Ministry of Science & Technology, Department of Biotechnology, New Delhi

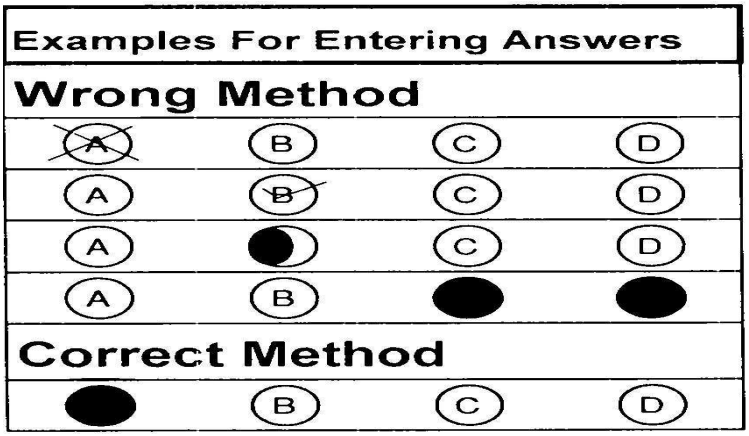
(Coordinated by University of Pune)

April 18, 2010 **Total Marks – 300** **Duration 10.00 a.m. - 12.30 p.m.**

N.B. 1) All questions in Section A are **compulsory.**
2) Answer any 50 questions from Section B.
3) In case more than 50 are attempted, first 50 will be considered.
4) Each question carries 3 marks; for every wrong answer, one mark will be deducted.
5) Write your seat no. strictly inside the space provided on the Answer sheet.
6) Answers marked inside the question paper will not be evaluated.
7) Please return the question paper along with the Answer sheet.

Instructions for filling the Answer sheet:

1) There is only one correct answer for each question and once a mark has been made the same cannot be altered.
2) All entries in the circle must be made by **BLACK ink Ball Point Pen** only. Do not try to alter the entry.
3) Oval should be darkened completely so that the numeral inside the oval is not visible.
4) Do not make any stray marks for rough work on the sheet.
5) Do not use marker, white fluid or any other device to hide the shading already done.
6) More than one entry of an answer will be considered wrong, and negative marking will be done as above.
7) Mark your answer as shown in the example.



Section A

1. Which one of the following microscopic techniques is best suited to visualize the topology and distribution of transmembrane protein of a cell membrane?
   (A) Scanning electron microscopy
   (B) Transmission electron microscopy
   (C) Freeze-fracture electron microscopy
   (D) Thin-section electron microscopy

2. Which of the following compounds mimics aminoacyl t-RNA and blocks protein synthesis ?
   (A) puromycin
   (B) kirromycin
   (C) streptomycin
   (D) neomycin

3. A novel type II restriction enzyme has been isolated from a thermophilic bacteria. This restriction endonuclease recognizes 5'ATAANNNTTAT3' (N= any nucleotide) and cuts after third 'A' in the above sequence. What is the fate of DNA after restriction digestion ?
   (A) a 3 nucleotide long 5´ overhang
   (B) a 7 nucleotide long 5´ overhang
   (C) a 4 nucleotide long 5´ overhang
   (D) a 3 nucleotide long 3´ overhang

4. Pyrosequencing derives its name from the fact that
   (A) the bases are detected by pyrolysis
   (B) it uses enzyme apyrase to detect the bases
   (C) it detects pyrophosphate released during base incorporation
   (D) it generates pyrograms as output

5. A mammalian cell has an outstretched double stranded DNA of 1.2 meter which duplicates in 4hrs. If it duplicates at the rate of 20µmeter/min, how many origins of replication are there in the DNA?
   (A) 2500
   (B) 250
   (C) 25
   (D) 1

6. An extracellular ligand will
   (A) elicit the same response in various cells that have a receptor for the ligand
   (B) elicit the same response but to varying degrees in various cells that have a receptor for the ligand
   (C) may elicit different responses in various cells that have a receptor for the ligand
   (D) elicit the same response in all types of cells because receptors have to be identical to bind to the same ligand

7. In presence of a significant quantity of IFN γ, what will be the response of a T cell to an antigen presenting cell?
   (A) T cell will become anergic
   (B) T cell will get activated and start secreting IFN γ
   (C) T cell will get activated and start secreting IL4
   (D) T cell will become a T cytotoxic cell

8. cis-trans isomerization of the peptide bond preceding an amino acid X is known to be critical in the folding of proteins by slowing down the folding reaction. The amino acid X is
   (A) isoleucine
   (B) tryptophan
   (C) proline
   (D) histidine

9. When immature B cells mature in the bone marrow, they need to interact with
   (A) stem cells present in the bone marrow
   (B) stromal cells and cytokines such as IL7
   (C) mature B cells present in the bone marrow
   (D) antigen presenting cells with different B cell epitopes presented on MHC II molecules

10. Antibodies which can cross placenta and are involved in allergic reactions, respectively are
    (A) IgG and IgA
    (B) IgM and IgE
    (C) IgG and IgE
    (D) IgD and IgM

11. Somatic mutations of immunoglobulin genes account for
    (A) allelic exclusion
    (B) class switching from IgM to IgG
    (C) affinity maturation
    (D) class switching from IgG to IgA

12. Yellow mosaic of legumes is caused by Mung bean yellow mosaic virus which belongs to
    (A) Potexvirus group
    (B) Potyvirus group
    (C) Carlavirus group

(D) Geminiviruses group

13. Cell cycle progression from one phase to another is primarily controlled by
(A) phosphorylation of cyclin
(B) proteolysis of cyclin
(C) dephosphorylation of cyclin
(D) proteolysis of cyclin dependent kinase

14. Elevation of intracellular inositol triphosphate (IP_3) results in the release of Ca^{2+} from which of the following organelles?
(A) Mitochondria
(B) Smooth endoplasmic reticulum
(C) Peroxisome
(D) Golgi-complex

15. Resting membrane potential of a biological membrane is close to the theoretical Nernst potential for the ions that are
(A) least abundant
(B) most abundant
(C) impermeable
(D) permeable

16. Testosterone hormone necessary for spermatogenesis is secreted by
(A) sertoli cells
(B) leydig cells
(C) spermatozoa
(D) cowpers gland

17. When Hfr strain of *E. coli* is crossed with F^- strain, recombinants obtained are
(A) always F^+
(B) always HFr^+
(C) rarely F^+
(D) rarely HFr^+

18. Archea is considered as a separate group from bacteria and eukaryotes, based on
(A) genome sequence
(B) 16S rRNA gene sequence
(C) 23S rRNA gene sequence
(D) EFTu sequence

19. Which one of the following viruses does not replicate in the cytoplasm of host cells?
(A) Picornaviruses, e.g., poliovirus
(B) Poxviruses, e.g., vaccinia virus
(C) Rhabdoviruses, e.g., rabies virus
(D) Hepadnaviruses, e.g., hepatitis B virus

20. Which one of the following statements is incorrect about Retroviruses?
(A) Retroviruses are the only family of viruses to encode Reverse Transcriptase
(B) They are the only RNA viruses whose genome is produced by cellular transcription machinery
(C) They are the only (+) sense RNA viruses whose genome does not serve directly as mRNA immediately after infection
(D) They have high mutation rates

21. Which one of the following organisms is used in Ames test?
(A) *E. coli*
(B) *Streptococcus aureus*
(C) *Pseudomonas aerogenosa*
(D) Salmonella typhimurium

22. Which of the following protozoan parasites replicates inside the lysosomes?
(A) *Toxoplasma*
(B) *Leishmania*
(C) *Trypanosoma*
(D) *Plasmodium*

23. Which one of the following repetitive motifs is responsible for the formation of triple helix in collagen?
(A) Ala-X-Y
(B) Gly-X-Y
(C) Cys-X-Y
(D) Pro-X-Y

24. Which of the following processes occurs in the formation of disulfide bridge between two cysteine residues?
(A) Reduction of sulfhydral group
(B) Electrostatic interaction
(C) Oxidation of sulfhydral group
(D) Hydrogen bond formation

25. Electrophoresis of a purified protein in SDS-PAGE in the presence of 2-marcaptoethanol yields two bands of 35 kDa and 45 kDa. However, in a gel filtration chromatography, the same protein elutes as 80 kDa. What conclusion can be drawn from the above observation?
(A) Protein is not purified to homogeneity
(B) Two bands generated in SDS-PAGE due to degradation
(C) Protein is a multimer
(D) Protein is a heterodimer

26. Cholesterol contributes to which of the following properties of biological membranes?
(A) Membrane rigidity
(B) Membrane fluidity
(C) Membrane permeability
(D) Membrane osmolarity

27. Active site of all serine proteases consists of
(A) Ser- Glu -Asp
(B) Ser- Glu - Met
(C) Ser-His-Asp
(D) Ala-Glu-Met

28. Conversion of glucose to glucose-6-phosphate requires energy. However, critically ill patients are treated with intravenous infusion of glucose rather than glucose -6-phosphate because
(A) glucose-6-phosphate is unable to enter into cells
(B) glucose-6-phosphate is degraded very fast
(C) exogenous glucose-6-phosphate is toxic to the cells
(D) exogenous glucose-6-phosphate will competitively inhibit endogenous enzymes

29. Analysis of a nucleotide sequence reveals the proportion of A : T : C : G :: 0.40 : 0.85 :1.56 : 1. Type of DNA concluded from this study is a
(A) purine rich DNA
(B) cruciform DNA
(C) double stranded DNA
(D) single stranded DNA

30. Which of the following properties is common to all cytoskeletal motor proteins like kinesins, dyneins and myosins?
(A) GTPase activity
(B) ATPase activity
(C) Actin binding domain
(D) DNA binding domain

31. A dNTP master mix is prepared by combining 50µl each of 10mM dNTP stock. Two micro liters from this dNTP mix are added to the PCR master mix of 25µl reaction volume. What is the total dNTP concentration in the PCR reaction?
(A) 200µM
(B) 400 µM
(C) 800 µM
(D) 250 µM

32. Which of the following statements is correct for a reaction A + B $\Leftrightarrow$ AB?
(A) Larger the value of the equilibrium constant, weaker is the binding between A and B
(B) Lower the value of the equilibrium constant, stronger is the binding between A and B
(C) Larger the value of the equilibrium constant, stronger is the binding between A and B
(D) This is a third order reaction

33. The amino acids with Phi and Psi values (-60, -40); (-59,-47) and (-80, 120) will be adopting which of the following conformation?
(A) Helix-helix-extended
(B) Helix-coil-extended
(C) Extended-extended-loop
(D) Loop-loop-coil

34. A BSA stock solution is diluted 10 folds with phosphate buffer. The absorbance of the solution in a quartz cuvette of pathlength 1 mm at 281.5 nm is 0.330. If the extinction coefficient of the protein is 0.66 ml/mg.cm, the concentration of the stock protein solution would be
(A) 5 mg/ml
(B) 20 mg/ml
(C) 33 mg/ml
(D) 50 mg/ml

35. Sodium dodecyl sulphate, an anionic detergent commonly used in SDS-Polyacrylamide gel electrophoresis, works in facilitating electrophoretic separation of a mixture of proteins by its ability to bind to the
(A) negatively charged amino acid side chains in proteins
(B) hydrophobic side chains in proteins
(C) positively charged amino acid side chains in proteins
(D) peptide group in proteins

36. Regulation of fatty acid biosynthesis occurs at the enzymatic step catalyzed by
(A) carnitine acyltransferase I
(B) acetyl CoA carboxylase
(C) pyruvate carboxylase
(D) citrate synthase

37. Which of the following is a lipid with a signal-transducing activity?
(A) Phosphatidyl serine
(B) Phosphatidyl ethanolamine

(C) Phosphatidyl inositol 4,5-bisphosphate
(D) Phospholipase A2

38. Which one of the following antibiotics attaches to 50S ribosome and inhibits peptidyl-transferase activity?
(A) Penicillin
(B) Chloramphenicol
(C) Trimethoprim
(D) Amphotericin

39. The amino acid sequence of a novel membrane protein contains four immunoglobulin like domains and six fibronectin like repeats. This protein is most likely a
(A) hormone responsive ion channel
(B) cell adhesion molecule
(C) G-protein
(D) transcription factor

40. In a population of 200 individuals which is at equilibrium, the frequency of one of the alleles under study is 0.11. What is the expected frequency of heterozygous individual?
(A) 0.89
(B) 0.0979
(C) 0.1958
(D) 0.842

41. Increased genetic diversity following extended time in a tissue culture is a problem called
(A) gene alteration
(B) temporal modification
(C) somaclonal variation
(D) culture shock

42. To produce plants that are homozygous for all traits, the best choice is
(A) cell suspension culture
(B) callus culture
(C) anther/ pollen culture
(D) plant organ culture

43. Dye injected into a plant cell might be able to enter an adjacent cell through
(A) tight junction
(B) microtubule
(C) desmosome
(D) plasmodesma

44. If you want to use a plant tissue culture as a chemical factory for vitamins, which of the following will you choose?
(A) Suspension cultures
(B) Callus cultures
(C) Organ cultures
(D) Anther/pollen cultures

45. In which one of the following fermentations an inhibitor is added to increase the productivity?
(A) Rifamycin B fermentation
(B) Tetracycline fermentation
(C) Glutamic acid fermentation
(D) Citric acid fermentation

46. In which of the following cases, the enzyme substrate complex is irreversible in nature?
(A) Competitive inhibition
(B) Non-competitive inhibition
(C) Un-competitive inhibition
(D) Both competitive and non-competitive inhibition

47. A computer separates an organization's internal network from the public part through a
(A) firewall
(B) circuit-level gateway
(C) security domains
(D) interior node

48. A set of closely related genes or genetic markers that are inherited as a single unit is
(A) cistron
(B) gene families
(C) Haplotype
(D) Haploid

49. The mouse model for type II diabetes mellitus is
(A) NZB mouse
(B) SCID mouse
(C) Nude mouse
(D) NOD mouse

50. Which of the following stages of embryos is used for transfer into cows?
(A) Mid morula stage
(B) Late morula stage
(C) Very early morula stage
(D) Blastocyst stage

Section B

51. Balanced genetic polymorphism occurs when there is selection against
    (A) heterozygotes
    (B) all genotypes
    (C) all homozygotes
    (D) only homozygous recessive

52. Which one of the following statements is not true about chemokines?
    (A) They are small molecular weight proteins
    (B) They may bind to more than one receptor type
    (C) They are secreted only by activated T-cells
    (D) They are secreted by leukocytes

53. Xth nerve is an example of
    (A) mixed cranial nerve
    (B) sensory cranial nerve
    (C) spinal nerve
    (D) motor nerve

54. The symbiotic bacteria responsible for producing bioluminescence is
    (A) *Vibrio cholerae*
    (B) *Pseudomonas putida*
    (C) *Vibrio fischeri*
    (D) *Chromobacterium* sp.

55. Which among the following viruses is known for its antigenic variation?
    (A) Rabies
    (B) Influenza
    (C) Yellow fever
    (D) Japanese encephalitis

56. Independently folded functional unit of a protein is called a
    (A) motif
    (B) fold
    (C) domain
    (D) module

57. Homology modelling can be used to predict the 3D structure of only
    (A) paralogs
    (B) orthologs
    (C) xenologs
    (D) homologs

58. A mapping method for identifying markers linked to a trait of our interest in a natural population is called
    (A) linkage mapping
    (B) association mapping
    (C) transcriptome mapping
    (D) RFLP mapping

59. In an antigen-antibody interaction study using Surface Plasmon Resonance technique, it was observed that the antigen concentration was 9 times the dissociation constant, K_d. The percentage of the antibody in the bound form would be
    (A) 10%
    (B) 90%
    (C) 99%
    (D) 100%

60. The Philadelphia chromosome is
    (A) an example of gene amplification
    (B) a product of a reciprocal translocation
    (C) a characteristic of Burkitt's lymphoma
    (D) an example of duplication

61. If an X-linked recessive disorder is in Hardy-Weinberg equilibrium and the incidence in males is 1 in 100, then the expected incidence of affected homozygous females would be
    (A) 1 in 1000
    (B) 1 in 4000
    (C) 1 in 10 000
    (D) 1 in 40 000

62. In a Robertsonian translocation fusion occurs at the
    (A) telomeres
    (B) centromeres
    (C) end of short arms
    (D) end of long arms

63. For extraction of penicillin from fermentation broth pH is decreased. This is done due to
    (A) more ionization of penicillin is required for extraction
    (B) less ionization of penicillin is required for extraction
    (C) pH is decreased to reduce the contamination
    (D) pH is decreased to precipitate the antibiotic

64. In Ramachandran plot, the values of the dihedral angle ψ (psi) is based on rotation around
    (A) N-C^{α} bond
    (B) C^{α}-C' bond
    (C) C'-N bond
    (D) N-H bond

65. P-value/E-value provided by sequence similarity search algorithms is a
(A) measure of similarity
(B) measure of distance
(C) parameter to distinguish true relationships
(D) measure of % homology

66. A hypothetical relaxed circular plasmid has 4500 bp. If for supercoiled form of this plasmid the twist is 440 and the writhe is -20, then the plasmid can be considered as a
(A) nicked circular plasmid
(B) positively supercoiled plasmid
(C) negatively supercoiled plasmid
(D) relaxed circular plasmid

67. Restriction enzymes produced by *E. coli*, do not cut self DNA because cells are
(A) $RecA^+$
(B) Dam^+
(C) $RecA^-$
(D) Dam^-

68. Which of the following bacteria is not naturally competent?
(A) *Bacillus subtilis*
(B) *E. coli*
(C) *Streptococcus peumoniae*
(D) *Hemophilus influeanzae*

69. The enzyme used in SoLiD sequencing technology is
(A) sequenase
(B) DNA polymerase
(C) DNA Ligase
(D) Taq Polymerase

70. Which one of the following methods helps to analyse energy architecture of proteins using 3D structure and thereby evaluating the quality of protein structure?
(A) ProsaII
(B) Procheck
(C) Ramachandran plot
(D) Phyre

71. The stability of a recombinant protein can be enhanced by
(A) altering the C-terminal region of the protein
(B) exclusion of PEST sequences from the protein
(C) production of compound similar to detergents to prevent formation of inclusion bodies
(D) altering the N-terminus by adding leucine or phenyl alanine by genetic manipulation

72. Which of the following RNAs functions by seed pairing?
(A) mRNA
(B) tRNA
(C) rRNA
(D) miRNA

73. Which of the following does *not* participate in the formation of antigen-antibody/ligand-receptor complexes?
(A) Hydrophobic bonds
(B) Covalent bonds
(C) Electrostatic interactions
(D) Hydrogen bonds

74. Which of the following features is not found in heterogeneous nuclear RNAs (hnRNAs)?
(A) intron
(B) polycistronic coding
(C) polyadenylation at 3'-end
(D) 5-' cap structure

75. PRINTS database contains
(A) Single motifs
(B) Multiple motifs
(C) Single domains
(D) Multiple domains

76. Which of the following conditions does not favour denaturation of double- stranded DNA?
(A) heating to 100 degrees Celsius
(B) adding high concentration of sodium chloride
(C) decreasing the ionic strength of the solution
(D) treatment with alkali to raise the pH to 10

77. The average length attained by a chromosome varies from
(A) 30 to 1000 nm
(B) 0.5 to 30 μm
(C) 30 μm to 1 mm
(D) 1 mm to 10 mm

78. The cytological representation of Klinefelter syndrome is
(A) 44A + XO
(B) 44A + XXO
(C) 44A + XXY
(D) 43A + XYY

79. Which of the following can induce polyploidy?
(A) Cytochalasin
(B) Colchicine
(C) Quinine
(D) Hydrazin

80. Deoxy position of deoxyribose in DNA is at
(A) 1^{st} Carbon
(B) 3^{rd} Carbon
(C) 2^{nd} Carbon
(D) 5^{th} Carbon

81. *E. coli* with mutation in operator region of lac operon and containing suppressors will
(A) produce β galactosidase even when lactose is absent
(B) produce β galactosidase only in the presence of lactose
(C) will not produce β galactosidase even in the presence of lactose
(D) will produce β galactosidase even in the presence of glucose

82. Which of the following non-coding RNAs is involved in RNA editing?
(A) Sn RNA
(B) Si RNA
(C) gRNA
(D) Mi RNA

83. In an experimental condition, *in vitro* translation of repeating sequence of CAA produced three polypeptides, polyglutamine, polyasperagine and polythreonine. If the codon for glutamine and threonine are CAA and ACA respectively, what will be the codon for asparagine?
(A) AAC
(B) CAC
(C) CCA
(D) ACC

84. Which one of the following statements about prion proteins is incorrect?
(A) Prion proteins form cross-beta filaments
(B) Prion proteins are heat resistant
(C) Prion proteins are protease sensitive
(D) Prion proteins can convert the normally folded prion protein to pathological form

85. RT-PCR reaction sequentially uses
(A) RNA dependent DNA polymerase & DNA dependent DNA polymerase
(B) RNA dependent DNA polymerase & DNA polymerase 1
(C) RNA polymerase & DNA dependent DNA polymerase
(D) RNA polymerase & DNA polymerase 1

86. The linear and circular forms of the same DNA molecule can be distinguished using
(A) Absorbance at 260 nm
(B) Endonuclease digestion
(C) Viscosity of the solution
(D) Exonuclease digestion

87. Protein-protein interaction can be evaluated by all of the following except
(A) Far-Western blotting
(B) Chromatin immunoprecipitation
(C) Yeast-two hybrid system
(D) Co-immunoprecipitation

88. Which of the following directly reverses DNA damage?
(A) AP endonuclease
(B) UVr-ABC
(C) MutS and MutL
(D) Methyltransferase

89. When DNA molecules from a complex genome are denatured and then returned to conditions that favor duplex formation, the strands reanneal. Which of the following statements about the renaturation is incorrect?
(A) strands with the same overall A+T composition will anneal in the fastest category
(B) the slowly annealing fraction contains most of the genes
(C) only strands with complementary base sequences will anneal stably
(D) strands derived from highly repeated sequences anneal rapidly because the rate of the reaction is concentration dependent

90. If you were to use *E. coli* DNA polymerase instead of Taq Polymerase in a classical PCR-reaction, you will have to
(A) add fresh enzyme after each denaturation step
(B) carry out denaturation step at $50^{o}C$ instead of $95^{0}C$
(C) use different primers
(D) use water bath instead of thermal block

91. A BLAST hit with STS division of GenBank helps you to understand
    (A) only location of the sequence in the genome
    (B) only expression of the sequence
    (C) both location and expression of the sequence
    (D) first pass survey sequences

92. In pET expression vectors, high level of expression of cloned gene is achieved using
    (A) T7 promoter
    (B) SP6 promoter
    (C) λ–P_L promoter
    (D) Trp promoter

93. Which of the following techniques can be used to determine the alpha-amylase gene polymorphism?
    (A) Southern blot
    (B) Slot blot
    (C) Dot blot
    (D) Northern blot

94. Which of the following transgenic crops occupies the largest area in the world?
    (A) Herbicide tolerant soybean
    (B) Herbicide tolerant maize
    (C) Insect resistant cotton
    (D) Insect resistant potato

95. In order to develop iron-rich rice which of the following genes was used for creating genetically modified plants?
    (A) Ferritin
    (B) Phytic acid
    (C) Phytic acid and Ferritin
    (D) Transferrin and Ferritin

96. Viable seeds can be produced without fertilization of the egg in a process called
    (A) Apospory
    (B) Apomixis
    (C) Parthenogenesis
    (D) Meiosis

97. Which of the following genes in *Arabidopsis* mediates interactions between floral meristem and floral organ identity genes?
    (A) SRE
    (B) MADS box
    (C) UFO
    (D) AP2

98. LEAs are classified as
    (A) shoot development proteins
    (B) seed storage proteins
    (C) mutant derived proteins
    (D) leaf development proteins

99. Engineering plants using chitinase gene leads to development of
    (A) viral resistance
    (B) bruchid resistance
    (C) bacterial resistance
    (D) cold tolerance

100. Grain number (Gn1) in rice is regulated by
    (A) OsMADS1
    (B) cytokinin oxidase
    (C) gibberellin oxidase
    (D) histidine kinase

101. Glyphosate--resistant gene *gox* is isolated from
    (A) *Arthrobacter sp.*
    (B) *Achromobacter sp.*
    (C) *Bacillus sp.*
    (D) *Streptomyces sp.*

102. The gene responsible for dwarfing character in rice is
    (A) Tift 23A
    (B) Norin 10
    (C) Dee-geo-woo-gen
    (D) Opaque 2

103. The first GM potato developed at Central Potato Research Institute, Shimla, for increasing protein content in tubers contains a transgene from
    (A) Chickpea
    (B) Pigeon pea
    (C) Cabbage
    (D) Amaranthus

104. Marker-free plants can be developed by
    (A) Co-transformation
    (B) Insertion
    (C) deletion
    (D) inversion

105. SUMOplot is a software used to predict
    (A) succinyl modification site
    (B) serine modification site
    (C) ubiquitin attachment site
    (D) hydrophobicity graph

106. Which of the following plants contain the largest genome?
    (A) *Arabidopsis thaliana*
    (B) *Fritillaria assyriaca*
    (C) *Zea mays*
    (D) *Triticum dicoccum*

107. A hybrid between species followed by polyploidy or chromosome doubling is known as
(A) Autopolyploid
(B) Aneuploid
(C) Haploid
(D) Allopolyploid

108. The zygote : endosperm : maternal tissue ratio in a well developed seed is
(A) 1:1:1
(B) 2:1:2
(C) 1:3:1
(D) 1:2:1

109. ABA catabolism is mediated by
(A) ABA-8' carboxylase
(B) ABA-8' hydroxylase
(C) ABA-8' aminotransferase
(D) ABA-8' oxygenase

110. Nodulating genes in rhizobium are influenced by the presence of which one of the following in the roots?
(A) flavones
(B) lignin
(C) tannins
(D) cellulose

111. Aroma in rice is due to
(A) Acetyl choline
(B) 4-benzyl pyrroline
(C) 2-ethyl pyrroline
(D) 2-acetyl-1-pyrroline

112. The most preferred choice for development of hybrid plants from a male sterile line would be
(A) Pollen culture
(B) Anther culture
(C) Ovary culture
(D) Meristem culture

113. The transplastomic lines bear no risk of gene escape through pollens because
(A) Pollens degenerate before fertilization
(B) Transformed mitochondrial DNA is lost during pollen maturation
(C) Transformed chloroplast DNA is lost during pollen maturation
(D) Transformed genomic DNA is maternally inherited

114. Somatic embryos from cotyledon explant would develop in which of the following sequences?
(A) Globular, torpedo, heart, cotyledonary stage
(B) Globular, heart, torpedo and cotyledonary stage
(C) Cotyledonary, heart, globular and torpedo
(D) Cotyledonary, torpedo, heart and globular

115. Which of the following is responsible for the protection of target molecules from reactive oxygen species?
(A) Halliwell-Asada pathway
(B) Calvin cycle
(C) Krebs cycle
(D) Pentose phosphate pathway

116. Which of the following enzymes is not responsible for dissipation of hydrogen peroxide?
(A) Ascorbate peroxidase
(B) Catalase
(C) Guaiacol peroxidase
(D) Superoxide dismutase

117. Among the following reporter genes which is the best that can be used for studying gene expression in a real time manner in plants?
(A) Luciferase
(B) GUS
(C) Green Fluorescent Protein
(D) Chloramphenicol Acetyl Transferase

118. The protein(s) which remains attached to the T-DNA during transfer to plant cells is/are
(A) Vir D2
(B) Vir E2
(C) Vir G
(D) Both Vir D2 and E2

119. Clean gene technology means creating
(A) transgenic plants with marker genes
(B) transgenic plants with provision of removing marker gene after transformation
(C) plants obtained with conventional breeding approach
(D) transgenic plants obtained through plastid transformation

120. Nitrogen use efficiency of the plants can be regulated by overexpressing which of the following genes?
(A) BZip
(B) Dof
(C) Leucine zipper
(D) Zinc finger

121. The herbicide that kills plants by blocking the photosynthetic electron flow of photosystem I is
(A) Diuron
(B) Paraquat
(C) Glyphosate
(D) Atrazine

122. In submerged plants the root tip stimulates the activity of
(A) ACC synthase
(B) ACC oxidase
(C) ACC synthase & ACC oxidase
(D) ACC kinase

123. In a microbial system, how are true and apparent growth yields related ?
(A) True growth yield is more than apparent growth yield
(B) True growth yield is less than apparent growth yield
(C) True growth yield is equal to apparent growth yield
(D) True growth yield and apparent growth yield are not related at all

124. In a CSTR system, at steady state, which one of the following is true?
(A) Only product concentration remains constant
(B) Only substrate concentration remains constant
(C) Cell mass and substrate concentration remain constant
(D) Cell mass, substrate and product concentration remain constant

125. For a new chemical entity, to be a good enzyme inhibitor, it should have a
(A) higher dissociation constant [Ki] for enzyme–inhibitor complex
(B) lower dissociation constant [Ki] for enzyme–inhibitor complex
(C) competitive type of inhibition
(D) uncompetitive type of inhibition

126. The deactivation energy of the common contaminants in a fermentation medium is approximately
(A) 10-20 Kcal/mole
(B) 20-30 Kcal/mole
(C) 30-40 Kcal/mole
(D) 60-80 Kcal/mole

127. Which one of the following is true for scaling-up medium sterilization process?
(A) Nutrient quality is a dependent variable
(B) Nutrient quality is an independent variable
(C) Nutrient quality does not change at all
(D) Number of contaminants is an independent variable

128. In which way agitation does not help aeration in a stirred tank reactor?
(A) Agitation breaks the air bubbles into smaller one
(B) Agitation increases the residence time of air bubble
(C) Agitation increases the bubble escape from the reactor
(D) Agitation does not allow the bubbles to coalesce

129. Separation factor in solvent extraction process increases if
(A) volume of organic solvent increases
(B) volume of organic solvent decreases
(C) volume of aqueous phase increases
(D) partition coefficient of solute decreases

130. Which one of the following extraction methods will be most suitable in a solvent extraction system with a solute of low partition coefficient ?
(A) Multistage batch extraction
(B) Single batch extraction
(C) Counter current extraction
(D) Co-current extraction

131. Which of the following statements is correct?
(A) Hidden auxotrophy is not desirable for an industrial strain
(B) Hidden auxotrophy is highly desirable for an industrial strain
(C) Hidden auxotrophy does not play any role in an industrial strain
(D) Hidden auxotrophy is not at all associated with an industrial strain

132. In the case of adsorption/ desorption kinetics which of the following is true
(A) The rate of adsorption decreases from the beginning
(B) The rate of adsorption increases from the beginning
(C) The rate of desorption decreases from the beginning
(D) The adsorption and desorption rates are always in equilibrium

133. Which of the following is not obtained from plant sources
(A) Nattokinase

(B) Papain
(C) Bromelain
(D) Dornase α

134. The 'Head space' volume kept in the aerobic reactor ideally is
(A) 10 -15% of reactor volume
(B) 40-50% of reactor volume
(C) 20-25% of reactor volume
(D) 10% of reactor volume

135. At equilibrium the receptor occupancy is related to drug concentration by
(A) Henderson-Haselbach equation
(B) Hill-Langmuir equation
(C) Lineweaver-Burk equation
(D) Langmuir adsorption isotherm

136. Which of the following plant hormones is synthesized from an amino acid precursor?
(A) Ethylene
(B) Auxins
(C) Cytokinin
(D) Abscisic acid

137. The kinetics of microbial growth in a batch culture system is represented by
(A) Henry's law
(B) Michaelis-Menten equation
(C) Arrhenius equation
(D) Monod equation

138. The first, second, third and fourth number in EC stands for
(A) Class name, subclass, hydroxyl group acceptor, phosphoryl group acceptor
(B) Class name, subclass, phoshoryl group acceptor, acetyl group acceptor
(C) Class name, subclass, phoshoryl group acceptor, hydroxyl group acceptor
(D) Class name, subclass, acetyl group acceptor, hydroxyl group acceptor

139. A prochiral ketone can be reduced by oxidoreductase up to a maximum of
(A) 25% reduction
(B) 50% reduction
(C) 75% reduction
(D) 100% reduction

140. Phenyl acetic acid in penicillin fermentation is used as
(A) Inhibitor
(B) Inducer
(C) Osmoregulator
(D) Precursor

141. The quantity of heat required to evaporate 1 kg of a saturated liquid is called
(A) Specific heat
(B) Volumetric heat
(C) Sensible heat
(D) Latent heat

142. In a mass transfer system the unit of diffusivity is
(A) m^2/h
(B) m/h
(C) m.K /h
(D) h/ m^2

143. A stagnant liquid film of 0.4 mm thickness is held between two parallel plates. The top plate is maintained at 40^0C and the bottom plate is maintained at 30^0C. If the thermal conductivity of the liquid is 0.14 W/(m K), then the steady state heat flux (W/m^2) assuming one-dimensional heat transfer is
(A) 3.5
(B) 350
(C) 3500
(D) 7000

144. Maintaining a constant residual substrate concentration in *E. coli* fed batch cultivation by exponential feeding is a
(A) Steady state process
(B) Unsteady state process
(C) Process with multiple steady states
(D) Quasi steady state process

145. Which of the following cytokines is secreted by both Th1 and Th2 cells?
(A) IL-2
(B) IL-3
(C) IL-4
(D) IFN-γ

146. C in CATH database stands for
(A) Conformation
(B) Configuration
(C) Classification
(D) Conservation

147. Which of the following types of genetic changes is least likely to be found in an oncogene in a tumor ?
(A) gene amplification
(B) chromosome translocation
(C) missense mutation

(D) nonsense mutation

148. Hemophilia A and Hemophilia B have nearly identical phenotypes, but they result from mutations in different genes on the X chromosome. This is an example of
(A) Locus heterogeneity
(B) Epistatic interaction
(C) Double heterozygosity
(D) Variable expressivity

149. Molecular analysis is performed on the three copies of chromosome 21 in a child with Down's syndrome using markers of DNA polymorphism for which both parents are heterozygous for different alleles. Two of the chromosomes (#21) have the same mother's alleles. Based on this information, when did the non-disjunction event most likely occur?
(A) Maternal meiosis I
(B) Maternal meiosis II
(C) Paternal meiosis I
(D) Paternal meosis II

150. Heterozygotes for the sickle cell anemia gene occur in a population with a frequency of about 1 in 10. If two phenotypically normal people from the population marry, what is the probability that their first child will have sickle cell anemia ?
(A) 1/10
(B) 1/40
(C) 1/100
(D) 1/400

151. Which one of the following is an example of structural chromosomal aberration?
(A) Edward's syndrome
(B) Down's syndrome
(C) Turner's syndrome
(D) Cru-du-chat syndrome

152. The frequency of autosomal dominant familial hypercholesterolemia, secondary to heterozygosity for an LDL-R mutation, is approximately 1/500. A 32-year-old affected man marries a genetically unrelated 20-year-old woman. What is the probability that their child will be affected with severe familial hypercholesterolemia secondary to compound heterozygosity for LDL-R mutation?
(A) 1/1,000,000
(B) 1/2,000
(C) 1/1,000
(D) 1/250

153. The "triplet repeat" in Huntington Disease refers to
(A) A nucleic acid repeat consisting of: T-A-G
(B) An amino acid repeat consisting of: Gly-X-Y
(C) An amino acid repeat consisting of: C-A-G
(D) A nucleic acid repeat consisting of: C-A-G

154. Myotonic dystrophy may show increasing severity and earlier age of onset in successive generations. This phenomenon is known as
(A) Locus heterogeneity
(B) Compound heterozygosity
(C) Variable expressivity
(D) Anticipation

155. Which one of the following statements is true about super antigens?
(A) They are processed in cytosol
(B) They are processed in endosome
(C) They do not require processing
(D) They activate large number of macrophages

156. Leukocyte adhesion deficiency leads to frequent incidences of
(A) cancer
(B) autoimmune disorder
(C) bacterial infection
(D) viral infection

157. Immunologically privileged sites are
(A) Thymus, eyes and Peyers patches
(B) Testicles, eyes and lymphnodes
(C) Testicles, eyes and brain
(D) Anterior eye chamber, Thymus and Bone marrow

158. Naive B cells express
(A) IgM and IgA
(B) IgD and IgE
(C) IgM and IgD
(D) IgM and IgG

159. IL-4 induces the expression of
(A) IgM, IgG3 and IgG2a
(B) IgG1 and IgE
(C) IgM, IgG1 and IgA
(D) IgG3, IgG2b and IgE

160. Mice are immunologically mature at
(A) 12 weeks

(B) 10 weeks
(C) 6 weeks
(D) 4 weeks

161. Cyclosporin A is used in the treatment of organ transplant patients because it
(A) inhibits TCR expression
(B) down regulates IL-2 production
(C) induces T-cell anergy
(D) down regulates antibody production

162. Natural Killer cells can be detected in human peripheral blood using
(A) anti-cd3 antibody
(B) anti-cd25 antibody
(C) anti-cd69 antibody
(D) anti-cd16 antibody

163. Which of the following cells secrete E-selectins?
(A) Eosinophils
(B) Endothelial cells
(C) Microglial cells
(D) Epithelial cells

164. A 6 month old child presents with fever, crepitation, ronchi and prolonged expiratory phase. What is the most common aetiological agent of this disease?
(A) Adenovirus
(B) Rhinovirus
(C) Respiratory syncytial virus
(D) Coronavirus

165. A patient presents with yellow colored urine, fever, nausea and loss of appetite, the following tests were done. Which of these is a diagnostic of acute viral hepatitis B?
(A) Presence of anti HBc IgM
(B) Presence of HBs antigen
(C) Presence of anti HBs
(D) Presence of delta antigen

166. Which of the following is/are selective media for *Vibrio cholerae?*
(A) Thayer –Martin medium
(B) Cefoxitin cycloserine fructose agar
(C) Skirrow's medium
(D) Thiosulfate-citrate-bile-sucrose agar

167. Routine laboratory diagnosis of bacterial pharyngitis needs to include procedures only for the detection of
(A) *Bordetella pertussis*
(B) *Corynebacterium diphtheriae*
(C) *Corynebacterium haemolyticum*
(D) Group A *Streptococcus* (GAS)

168. Which of the following is true regarding influenza viruses?
(A) Mutations are responsible for pandemics
(B) No effective vaccine is available
(C) HA protein is responsible for release of virus particles from infected cell
(D) Genome has eight segments

169. In embryonated hens' eggs
(A) Allantoic inoculation is best for primary isolation of influenza virus
(B) Chorioallantoic membrane is used for growing rubella virus
(C) The air sac is suitable for growing respiratory syncytial virus
(D) Yolk sac is used for growing rickettsiae

170. Rifampicin is a specific inhibitor of
(A) Bacterial RNA polymerase
(B) RNA polymerase II
(C) RNA polymerase I
(D) RNA polymerase III

171. A newly diagnosed adult TB patient is put on anti - tubercular therapy - isoniazid, refampin, ethambutol and pyrazinamide. He develops tingling sensation and numbness in his limbs due to deficiency of
(A) Protein
(B) Zinc
(C) Pyridoxine (B6)
(D) Riboflavin

172. Which of the following would be present in abnormal quantity in Burkitt's lymphoma patients' urine?
(A) Bence-Jones-Proteins
(B) Human Chronic Gonadotropin
(C) Carcinoembryonic antigen
(D) Alpha-fetoprotein

173. Human Herpes Virus 8 (HHV – 8) is associated with
(A) Erythema infectiosum
(B) Kaposi's Sarcoma
(C) Oral leukoplakia

(D) Infectious mononucleosis-like illness

174. The intervention, by which a specific point deep inside the brain may be accurately targeted by an object e.g., an electrode, is known as
(A) stereoscopy
(B) stereotaxic surgery
(C) craniotomy
(D) laparoscopy

175. Which of the following neurotransmitters containing neurons is maximally present in the dorsal raphe ?
(A) Dopaminergic
(B) Adrenergic
(C) Serotonergic
(D) Cholinergic

176. Cerebellar damage would primarily lead to
(A) difficulty in smelling
(B) postural disturbance
(C) loss of taste
(D) memory loss

177. In case of nerve impulse propagation between neurons, the first site of fatigue is at
(A) axon
(B) electrical synapse
(C) chemical synapse
(D) dendrite

178. Na^+-K^+ ATPase exchanges Na^+ and K^+ across cell membrane. The enzyme is a
(A) tetramer and consumes two ATP molecules in every cycle
(B) dimer and consumes two ATP molecules in every cycle
(C) monomer and consumes one ATP molecule in every cycle
(D) tetramer and consumes one ATP molecule in every cycle

179. Which of the following types of neurons is predominantly lost in Narcolepsy ?
(A) Cholinergic
(B) Orexinergic
(C) Noradrenergic
(D) Histaminergic

180. Retrograde transport may be used for
(A) nerve path tracing
(B) determining nerve fiber diameter
(C) determining soma size
(D) estimating number of dendrites

181. The conscious state of an individual may be best understood by studying ones
(A) electromyogram
(B) electrocardiogram
(C) electroretinogram
(D) electroencephalogram

182. Which of the following electrodes will be preferred for recording intracellular potential ?
(A) glass capillary electrode
(B) steel micro-electrode
(C) copper micro-electrode
(D) solid glass electrode

183. For recording fast physiological response e.g., action potential in neurons, one needs a
(A) Cathode Ray Oscilloscope
(B) Polygraph
(C) Spectrophotometer
(D) Confocal microscope

184. In vertebrates, nerve bundle usually contains
(A) many myelinated axons of different diameters as well as large number of unmyelinated fibres
(B) many unmyelinated fibres as well as large number of myelinated axons of same diameter
(C) only myelinated axons of same diameter
(D) only unmyelinated axons of different diameter

185. At certain condition (X), a neuron showed intracellular potential -50mV; while after some treatment (Y), it was -70mV. Given such a condition, which of the following statements is correct?
(A) The neuron is hyperpolarized under condition (X) as compared to that of the condition (Y)
(B) To induce a response, higher intensity stimulation is needed at condition (X) than in condition (Y)
(C) the treatment (Y) caused depolarization of the neuron
(D) the treatment (Y) induced hyperpolarization of the neuron

186. Sleeping sickness is caused by
(A) *Plasmodium vivax*
(B) *Leishmania donovani*
(C) *Trypanosoma cruzi*

(D) *Entamoeba histolytica*

187. Which of the following sets of cranial nerves falls under parasympathetic system?
(A) I, IV, V and X
(B) III, VII, IX and X
(C) II, VIII, IX, XI
(D) VI, XII, I and IV

188. Areas of low productivity are termed as
(A) oligotrophic
(B) heterotrophic
(C) hypotrophic
(D) eutrophic

189. Organisms that are plankton in the juvenile stage, but nekton or benthos in the adult stage are called
(A) meroplankton
(B) macroplankton
(C) holoplankton
(D) picoplankton

190. A giant bacterium measuring up to 0.75 mm and referred to as the "Sulfur Pearl" is
(A) *Thioploca* sp
(B) *Epulopiscium fishelsoni*
(C) *Thiomargarita nambiensis*
(D) *Beggiatoa* sp

191. How deep could the zone of detectable, ambient light extend in sea water?
(A) not more than10 meters
(B) up to 100 meters only
(C) in the range of 100 to 1000 meters
(D) greater than 1000 meters

192. The autochthonous probiotic bacteria used in aquaculture are isolated from
(A) microbial flora associated with seaweeds
(B) the gastrointestinal tract of aquaculture animals
(C) the sediments, especially from the intertidal region
(D) the microbial flora associated with mangrove plants

193. Foraminiferans and radiolarians are
(A) non-photosynthetic protists
(B) photosynthetic protists
(C) microscopic bacteria.
(D) biogenic sediments.

194. With regard to ocean waters, which one of the following is not a depth-wise division?
(A) Epipelagic
(B) Mesopelagic
(C) Abyssopelgic
(D) Neritopelagic

195. Organisms which can be used for producing silicon like component for use in the field of nanotechnology are
(A) diatoms
(B) rhabdovirus
(C) Gracilaria corticata
(D) *Sargassum tennerimum*

196. Marine bacteria that can grow over a wide range of temperature are referred to as
(A) thermophiles
(B) thermotolerants
(C) stenothermals
(D) eurythermals

197. In polar oceans, the main factor affecting the phytoplankton growth is
(A) depletion of nutrients in water
(B) vertical migration of nutrients
(C) shortage of sunlight
(D) depletion of phosphates

198. Which one of the following is a peptide toxin?
(A) Saxitoxin
(B) Bryostatin
(C) Cephalotoxin
(D) Dolastatin

199. Organisms which reproduce in sea water and live as adults in fresh water are called
(A) catadromous
(B) anadromous
(C) migratory
(D) epipelagic

200. Which one of the following compounds is not produced by *Octopus* ?
(A) Maculotoxin
(B) Cephalotoxin
(C) Maiotoxin
(D) Eledoisin

201. Which of the following statements about krill is not true?
(A) They are crustacean and have a exoskeleton made of chitin
(B) Very few species are herbivorous
(C) Commercial fishing of krill is

done in Southern Ocean and in the waters around Japan

(D) Most species are bioluminescent

202. Carrageenan is composed of repeating units of
(A) galactose
(B) glucose
(C) glucose and galactose
(D) mannose

203. Which one of the following factors does not influence the rate of oxygen transfer in an aerobic fermentation system ?
(A) Agitation rate
(B) Viscosity of the broth
(C) Temperature of the broth
(D) pH of the broth

204. During protoplast isolation from *Gracilaria corticata*, which one of the following is added as an osmoticum?
(A) glucose
(B) mannose
(C)mannitol
(D) fructose

205. The first group of organisms that colonize the hydrothermal vents are
(A) tube worms
(B) chemolithotrophic bacteria
(C) chemoautotrophic sulfur bacteria
(D) crabs

206. What are zooxanthallae?
(A) Deep sea dwelling brightly pigmented fish
(B) Algae living in corals
(C) A species of crab
(D) *Xanthomonas*-infected zooplankton

207. Which of the following statements is not true for giant tube worms observed at hydrothermal vents?
(A) Digestive tract of tube worms produces combination of thermostable proteases and polysaccharases
(B) The tube worms obtained their nutrients from symbiotic chemolithotropic bacteria
(C) The tube worms have the fastest growth rate compared to any known marine invertebrates
(D) The hemoglobin present in tube worm binds both H_2S and O_2

208. Isolation of large number of protoplasts from *Gracilaria* sp. is achieved by treating with
(A) cellulase only
(B) papain enzyme
(C) macerozyme and agarase
(D) carrageenase

209. Marine snow is
(A) a continuous shower of organic detritus falling from the upper layer of water
(B) formation of ice crystals in the upper layer of ocean during winter
(C) a common name given to a cephalopod sp in Antarctica which has the ability to grow at low temperatures
(D) a common name for white crabs which are observed in the Arctic region

210. Glofish is
(A) a patented zebra fish which has been genetically modified with GFP
(B) a commercial name given to tuna fish created by cloning growth hormone gene
(C) an angler fish harboring bioluminescent bacteria
(D) a cutter-shark fish which catches its prey with the help of bioluminescent bacteria residing near the gills

211. DsRed is a
(A) red fluorescent protein observed in *Aequorea victoria*
(B) common name given to red tide observed on the coast of Taiwan
(C) red fluorescent protein isolated from coral *Discosoma* genus
(D) red bioluminescent bacteria seen in certain species of copepod

212. The bacterial pathogen which is most detrimental to shrimp aquaculture is
(A) *Vibrio* sp.
(B) *Pseudomonas* sp.
(C) *Flavobacterium* sp.
(D) *Micrococcus* sp.

213. Abortions in infectious bovine rhinotracheitis are sequelae of
(A) genital form
(B) respiratory form
(C) enteric form
(D) gastric form

214. Infectious bronchitis virus infects
(A) chicken
(B) chicken and duck
(C) duck and turkey
(D) chicken and peacock

215. "Rat-tail" like appearance of horse tail is due to
(A) *Strongylus vulgaris*
(B) *Anoplocephala perfoliata*
(C) *Haemonchus species*
(D) *Oxyuris equi*

216. Which one of the following protozoans is transmitted by ingestion of tick?
(A) *Haemoproteus columbae*
(B) *Ehrlichia canis*
(C) *Hepatozoon canis*
(D) *Histomonas meleagridis*

217. Bovine group A rotavirus contains
(A) ss RNA
(B) ds RNA
(C) ss DNA
(D) ds DNA

218. Large calf syndrome primarily occurs in
(A) naturally born calves
(B) transgenic calves
(C) calves produced by IVF
(D) artificial insemination

219. Scrapie is caused by
(A) Fungal protein
(B) Bacterial protein
(C) Plant lipoprotein
(D) Prion

220. Intestinal flora cannot digest
(A) Cellulose
(B) Lignin
(C) Pectin
(D) Starch

221. *Xenopsylla cheopis* is the vector for
(A) Indian tick typus
(B) Epidemic typus
(C) Plague
(D) Kala azar

222. The most important and efficient amplifier of Japanese encephalitis virus is
(A) Cow
(B) Pig
(C) Horse
(D) Bird

223. The amino acids in curly brackets in a Prosite pattern mean
(A) They are acceptable
(B) They are not acceptable
(C) Any one amino acid among them is acceptable
(D) Any amino acid excluding them is acceptable

224. Most predominant antibody in serum is
(A) IgG
(B) IgD
(C) IgE
(D) IgA

225. Sperm DNA is covered by
(A) Lipids
(B) Protamines
(C) Carbohydrates
(D) Histones

226. Replication of papillomavirus is restricted to
(A) epithelial cells
(B) nerve cells
(C) fibroblasts
(D) reticulo-endothelial cells

227. 'Weak calf syndrome' in pregnant cows at 80-125 days of gestation period is caused by
(A) BVD virus
(B) Pseudorabies virus
(C) IBR Virus
(D) MCF virus

228. Blister is an example of which of the following inflammatory exudates?
(A) Fibrinous
(B) Suppurative
(C) Serous
(D) Hemorrhagic

229. Bovine keratitis is caused by
(A) *Morexella bovis*
(B) *Bordetella pertosis*
(C) *Staphylococcus*
(D) Bacteroides

230. All of the following are malignant neoplasms except
(A) Papilloma
(B) Liposarcoma
(C) Squamous cell carcinoma
(D) Neuroblastoma

231. Necrosis that develops in tissues subsequent to denaturation of structural and enzymatic proteins soon after death is appropriately referred to as
(A) Fat necrosis
(B) Liquefactive necrosis
(C) Coagulative necrosis
(D) Caseous necrosis

232. The demyelination of the central nervous system white matter produced by the canine distemper virus is an example of
(A) Fat necrosis
(B) Coagulation necrosis
(C) Zenker's necrosis
(D) Liquefactive necrosis

233. The discoloration of tissue by iron sulfide after somatic cell death is referred to as
(A) Hypostatic congestion
(B) Imbibition with hemoglobin
(C) Imbibition with bile
(D) Pseudomelanosis

234. The specific condition that occurs subsequent to the inhalation of carbon is referred to as
(A) Anthracosis
(B) Pneumoconiosis
(C) Siderosis
(D) Acanthosis

235. Severe deficiency of which of the following vitamins leads to hemolytic anemia in animals ?
(A) Vit A
(B) Vit E
(C) Vit D
(D) Vit K

236. Which of the following chemotherapeutic drugs has neuro-toxicity?
(A) Vincristine
(B) Cyclophosphamide
(C) Anthracyclines
(D) Adriamycin

237. The program used to convert raw sequence output to an ordered list of bases is called
(A) Base calling
(B) Neural network
(C) Local area network
(D) artificial network

238. Which of the following algorithms implements "once a gap, always a gap" policy?
(A) ClustalW
(B) Needleman & Wunsch
(C) Chou & Fasman
(D) FASTA

239. The sequence alignment tool for immunoglobulins, T-cell receptors, and HLA molecules available at the ImMunoGeneTics information system (IMGT) is
(A) IMGT/Collier-de-perles
(B) IMGT/V-Quest
(C) IMGT/Allele-align
(D) IMGT/Junction Analysis

240. Which of the following scoring matrices of proteins is a distance matrix?
(A) MDM series of matrices
(B) BLOSUM series of matrices
(C) Conformational Similarity Weight matrix
(D) Genetic Code Matrix

241. One PAM means one accepted point mutation per
(A) 10^2 residues
(B) 10 residues
(C) 10^3 residues
(D) 10^4 residues

242. Which of the following scoring matrices is one of the best to score an alignment of highly conserved protein sequences?
(A) BLOSUM 80 or PAM 120
(B) BLOSUM 62 or PAM 250
(C) BLOSUM 30 or PAM 120
(D) BLOSUM 90 or PAM 350

243. Which one of the following programs is used primarily for submission of complete genomes and batch submission of sequences to GenBank?
(A) BankIt
(B) Sequin
(C) tbl2asn
(D) WEBIN

244. In reconstruction of phylogenetic trees using molecular sequence data, a singleton site in MSA is considered to be
(A) an invariant site
(B) an informative variable site
(C) an uninformative variable site
(D) a conserved site

245. Which of the following identifiers in GenBank changes with sequence revision/updates?
(A) Accession
(B) GI
(C) Date
(D) Both a & b

246. EST division of EMBL database archives data in
(A) only 5’ to 3’ direction
(B) only 3’ to 5’ direction
(C) both 5’ to 3’ and 3’ to 5’ to represent clones from two ends
(D) either 5’ to 3’ or 3’ to 5’

247. Which of the following methods is used to predict the 3D structure of a protein when it has < 20% of sequence similarity with the available templates?
(A) Homology modelling
(B) Dynamic programming
(C) Fold recognition
(D) Progressive protein programming

248. Which of the following techniques is implemented to locate MUMs in MUMmer algorithm?
(A) Suffix tree generation
(B) Hash lookup table
(C) K-tuple
(D) Exact word match

249. Which one of the following techniques is used for the evaluation of phylogenetic trees?
(A) Null hypothesis
(B) Bootstrapping
(C) Chi-square
(D) Probability

250. NiceProt is
(A) Protein sequence database
(B) Derived Protein database
(C) Protein sequence view
(D) Nucleotide sequence view
