



Biotechnology Eligibility Test (BET) for DBT-JRF Award (2009-10)

Government of India, Ministry of Science & Technology,
Department of Biotechnology, New Delhi
(Coordinated by University of Pune)

April 19, 2009

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.

Examples For Entering Answers			
Wrong Method			
(A)	(B)	(C)	(D)
(A)	(B)	(C)	(D)
(A)	●	(C)	(D)
(A)	(B)	●	●
Correct Method			
●	(B)	(C)	(D)

Section A

- Which of the following does not apply to triplex DNA?
 - It is triple stranded in nature
 - It requires only Hoogsteen hydrogen bonding
 - It requires Watson-Crick hydrogen bonding
 - It forms at neutral or acidic pH
- A C-terminal KDEL motif will most often ensure
 - the protein to be folded by hsc70
 - the protein to be degraded by the ubiquitin-proteasome pathway
 - secretion of the protein
 - ER-retention of the protein
- 5-Methylcytosines are common sites for mutations because they
 - are not recognized by the proofreading activity of DNA polymerase
 - can mispair with adenine
 - can deaminate to thymidine
 - prevent discrimination between the daughter and parental strand
- Nickel Nitriloacetic acid columns are used in _____ chromatography
 - Ion exchange
 - Affinity
 - Size exclusion
 - Reverse phase
- The antibiotic that resembles the 3' end of the charged tRNA molecule is
 - Tetracycline
 - Puromycin
 - Kanamycin
 - Streptomycin.
- Mitochondria are involved in the following except
 - ATP production
 - Glycosylation
 - Fatty acid biosynthesis
 - TCA cycle
- Mycoplasmas are bacterial cells that
 - fail to reproduce in artificial media
 - have a rigid cell wall
 - are resistant to penicillin
 - stain well with Gram's stain
- The technique for identifying the nucleic acid sequences bound by a DNA/RNA binding protein is
 - Finger printing
 - Foot printing
 - Array printing
 - AFLP
- To know the structural similarity between two proteins, the server to use is
 - PRODOM
 - PROSITE
 - TREMBLE
 - DALI
- Which of the following is a molecular chaperone ?
 - Dna G
 - Dna A
 - Lysozyme
 - Dna K
- Activation of phospholipase C initiates a sequence of events including all of the following, except
 - release of inositol 4,5-bisphosphate from a phospholipid
 - increase in intracellular Ca^{2+} concentration
 - release of diacylglycerol from phospholipid
 - activation of protein kinase C
- 5' RACE is often necessary to
 - delete sequences from 5' end of the DNA strand
 - label 5' end of DNA with a dye
 - clone 5' region of genes from mRNA
 - add sequences at 5' end to facilitate annealing of a specific primer
- Activation of genes in euchromatic regions is an outcome of-----of histone N-terminal tails
 - deacylation
 - methylation
 - hyperacetylation
 - phosphorylation
- Integration of phage lambda genome into *E. coli* chromosome is by
 - COS sites
 - random integration by the function of λ element in the chromosome
 - site specific recombination
 - red gene mediated recombination
- 3' Overhangs of 2-bp length are found in
 - genome-length RNA of CaMV
 - subgenomic RNAs of RNA viruses
 - Taq polymerase-amplified DNA fragments
 - short RNA fragments involved in RNA silencing
- Matrix Attachment Regions are involved in
 - specific attachment of pathogens to the cell surface

- (B) formation of clathrin-coated vesicles
 (C) genomic compartmentalization creating chromatin domains favourable for transcription
 (D) transport of spliced mRNA from the nucleus to the cytoplasm
17. The biosafety problem due to spread of transgenes from transgenic plants to its wild relatives can be avoided by
 (A) developing transgenic plants with herbicide markers
 (B) Posi-Tech selection using non-antibiotic markers like *pmi*
 (C) developing transplastomic lines
 (D) elimination of markers using *Cre/lox* system
18. Full expression of the lac operon requires
 (A) lactose and cAMP
 (B) allolactose and cAMP
 (C) cAMP
 (D) lactose
19. An enzyme that induces double strand breaks in DNA and rejoins them is called
 (A) Restriction endonuclease
 (B) DNA gyrase
 (C) DNA ligase
 (D) DNA polymerase
20. Which of the following best describes interferon's suspected mode of action in producing resistance to viral infection?
 (A) It stimulates cell-mediated immunity
 (B) It stimulates humoral immunity
 (C) Its direct antiviral action is related to the suppression of messenger RNA formation
 (D) Its action is related to the synthesis of a protein that inhibits translation or transcription
21. The most sensitive method of detecting infection by cytomegalovirus (CMV) in the new born is
 (A) isolation of the virus
 (B) identification of characteristic cells in gastric secretions
 (C) detection of IgM antibody by immunofluorescence
 (D) direct detection of antigen by ELISA
22. In Staphylococci, antibiotic resistance genes can exist either on plasmids or chromosomes. The genes are carried by
 (A) Prophage
 (B) Free DNA
 (C) Transposons
 (D) Protein A
23. The main host defense against bacterial exotoxins is
 (A) activation of macrophages secreting proteases
 (B) Production of IgG and IgM antibodies
 (C) activation of helper T cells
 (D) modulation of the host cell receptors in response to the toxin
24. The effects of endotoxin include each of the following except
 (A) Opsonization
 (B) Fever
 (C) Activation of the coagulation cascade
 (D) Hypotension
25. Which of the following statements is true concerning Natural Killer (NK) cells?
 (A) They belong to T-cell lineage
 (B) They belong to B-cell lineage
 (C) They kill bacterially infected cells
 (D) They display cytotoxic effect on tumor cells
26. The E-value in a BLAST search measures
 (A) the probability that the search result is non-random
 (B) the significance of the search result
 (C) the probability that the search result is obtained randomly
 (D) the reliability of the search
27. During protein evolution the region of protein most prone to mutation is
 (A) functional domain
 (B) structurally conserved domain
 (C) connective loops
 (D) hydrophobic domain
28. Operon having positive and negative regulation by single regulatory protein is
 (A) lac operon
 (B) trp operon
 (C) ara operon
 (D) his operon
29. Uvr ABC endonuclease is present in which repair system?
 (A) Mismatch repair
 (B) Nucleotide excision repair
 (C) Base excision repair
 (D) SOS repair
30. The first commercially produced plant secondary metabolite using bioreactor technology is
 (A) shikonin
 (B) colchicine
 (C) cercosporin
 (D) cytokinin
31. You can patent a product/process only if it is
 (A) a major discovery reported in high impact journals

- (B) novel, non-obvious and usable
 (C) new and extension of earlier principles
 (D) new applications of a patented product
32. The hydrogen-bonding pattern in alpha helices is
 (A) n to $n+4$
 (B) n to $n+3$
 (C) n to $n+5$
 (D) $n-1$ to n
33. Calf thymus terminal deoxynucleotidyl transferase
 (A) adds nucleotide to the 3'OH terminus of a DNA molecule
 (B) adds nucleotide to the 5' P terminus of a DNA molecule
 (C) removes nucleotide from the 3'OH terminus of a DNA molecule
 (D) removes nucleotide from 5' P terminus of a DNA molecule
34. The rate of renaturation of DNA is governed by the equation
 (A) $dc/dt = -kC^2$
 (B) $dt/dc = -kC^2$
 (C) $dt/dc = kC^2$
 (D) $dc/dt = 2kC$
35. The enzyme of choice for converting DNA with 3'end overhang into a blunt ended one is
 (A) Klenow fragment of DNA Polymerase I
 (B) DNA Polymerase I holoenzyme
 (C) T4 DNA polymerase
 (D) S1 nuclease
36. If you want literature information, which is the best website to visit?
 (A) OMIM
 (B) Entrez
 (C) PubMed
 (D) PROSITE
37. What would be the likely explanation for the existence of pseudogenes?
 (A) gene duplication
 (B) gene duplication and mutation events
 (C) mutation events
 (D) unequal crossing over
38. The α -helical motifs of gene regulatory proteins generally bind to
 (A) major groove of A-DNA
 (B) minor groove of B-DNA
 (C) major groove of B-DNA
 (D) sugar-phosphate backbone of A-DNA
39. Which of the following ionizes at physiological pH?
 (A) glycine
 (B) alanine
 (C) histidine
 (D) purine
40. A peptide bond
 (A) has a partial double bond character
 (B) is stable in strong acids
 (C) occurs most commonly in *cis* configuration
 (D) is cleaved by agents that denature proteins, such as organic solvents and high concentrations of urea.
41. The complete denaturation of a protein leads to a loss of the following structure(s):
 (A) primary
 (B) primary and tertiary
 (C) primary and secondary
 (D) secondary and tertiary
42. HeLa cell line is derived from which type of carcinoma?
 (A) lung
 (B) colon
 (C) cervical
 (D) brain
43. Vinblastine, a chemotherapeutic agent, inhibits
 (A) microtubule polymerization
 (B) microtubule depolymerization
 (C) spindle formation
 (D) actin polarisation
44. Turner's syndrome is due to
 (A) XXY
 (B) XXO
 (C) XO
 (D) XXX
45. Which one of the following is not an antigen presenting cell?
 (A) dendritic Cell
 (B) B Cell
 (C) macrophage
 (D) Natural Killer cell
46. Bird flu in last decade was caused by
 (A) H5N1
 (B) H3N2
 (C) H1N1
 (D) H2N1
47. Ultraviolet radiation causes DNA damage by formation of
 (A) cytidine dimer
 (B) thymidine dimer
 (C) adenine dimer

- (D) guanine dimer
48. Autoreactive cells are present in our immune system due to
 (A) increased tolerance
 (B) defective thymic selection
 (C) peripheral deletion
 (D) breakdown of host immunity
49. Which one of the following microbes removes oil spills by digesting hydrocarbons?
 (A) *Helicobacter* sp.
 (B) *Pseudomonas* sp.
 (C) *Trichoderma* sp.
 (D) *Staphylococcus* sp.
50. Apart from gas transport Hemoglobin plays an important role in
 (A) red cell morphology
 (B) blood buffering
 (C) globin synthesis
 (D) bone marrow regeneration
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Section B

51. The smallest genome among the plants listed below is that of
 (A) *Gossypium* sp
 (B) *Oryza sativa*
 (C) *Arabidopsis thaliana*
 (D) *Arachis hypogaea*
52. Porins
 (A) are cytoskeletal proteins
 (B) form channels which allow passage of hydrophilic molecules
 (C) are fatty acids
 (D) are pores in the stem of a plant
53. nif genes which encode the nitrogenase complex and other enzymes involve
 (A) ammonification
 (B) nitrogen fixation
 (C) nitrification
 (D) denitrification
54. ABA is a
 (A) growth promoter
 (B) stress hormone
 (C) protein
 (D) polyamine
55. EMS is a mutagen capable of causing
 (A) large deletions
 (B) single base substitutions
 (C) translocations
 (D) chromosomal rearrangements
56. Enucleated protoplast is called
 (A) cybrid
 (B) tonoplast
 (C) cytoplasm
 (D) duplast
57. The gene which is suppressed by another nonallelic gene through interaction is known as
 (A) Epistatic
 (B) Incomplete
 (C) Hypostatic
 (D) Homologs
58. Cleistogamy occurs in
 (A) Rice
 (B) Barley
 (C) Maize
 (D) Pearl millet
59. Doubled haploid lines can be generated by
 (A) Protoplast fusion
 (B) Transformation
 (C) Anther culture
 (D) RNAi technology
60. A mapping method for identifying markers linked to a trait of interest in a natural population is called
 (A) Linkage mapping
 (B) Association mapping
 (C) Transcriptome mapping
 (D) Chromosome walking
61. Break down of Gibberellic acid is mediated by
 (A) GA 20 Oxidase
 (B) GA 2 Oxidase
 (C) GA 3 Oxidase
 (D) Kaurene Oxidase
62. SSR markers are
 (A) Dominant
 (B) Co-dominant
 (C) Epistatic
 (D) Recessive

63. Isopentenyl transferase is an enzyme involved in
 (A) cytokinin synthesis
 (B) auxin synthesis
 (C) proline synthesis
 (D) purine synthesis
64. Luciferase gene (*luc*) is isolated from
 (A) *E. coli*
 (B) *Aequorea victoria*
 (C) *Photinus pyralis*
 (D) *Bacillus* sp.
65. Slender (*slr*) mutant in rice is due to mutation in
 (A) GA signalling
 (B) ABA signalling
 (C) Auxin signalling
 (D) Cytokinin signaling
66. Biological nitrogen fixation occurs when atmospheric nitrogen is converted into
 (A) ammonia
 (B) nitrate
 (C) nitrite
 (D) nitrogen dioxide
67. It was possible to engineer genes of interest between right and left border of T-DNA of *Agrobacterium* for plant transformation because
 (A) T-DNA is nontoxic
 (B) T-DNA is not required by *Agrobacterium*
 (C) The *agrobacterium* genes essential for mobilization of the T-DNA lie outside the T-DNA
 (D) T-DNA cannot function in plants
68. Integration of more than one copy of transgene is not desirable because
 (A) It can make more transcript than needed
 (B) It can cause toxicity
 (C) It can cause mutation in the gene of interest
 (D) It can induce gene silencing
69. Systemic acquired resistance
 (A) is an enhanced resistance exhibited by uninfected plant tissue through a memory of previous infection
 (B) is a resistance exhibited by plants towards any pathogen
 (C) is a resistance acquired by a sensitive plant through breeding
 (D) is a resistance exhibited by bacterial pathogens towards a large number of antibiotics
70. rasiRNAs are involved in
 (A) heterochromatinization of DNA through histone tail modification
 (B) post transcriptional RNA degradation
 (C) degradation of proteins
 (D) heterochromatinization of DNA through methylation at cytosine residues
71. The first product of photosynthesis in C3 plants is
 (A) glycerate 3 phosphate
 (B) malate
 (C) glycerate 1,3 bisphosphate
 (D) phosphoenol pyruvate
72. Which of the following reactor systems is generally used to generate microbial mutants?
 (A) CSTR system
 (B) BSTR system
 (C) PBR system
 (D) FBR system
73. In microbial fermentation, generally inhibitors
 (A) are consumed by the microbes
 (B) are incorporated in the synthesized molecule
 (C) help in combating contamination
 (D) help in the production of desired products
74. Product yield coefficient is defined as
 (A) Cell mass formed: substrate utilized
 (B) Substrate utilized: cell mass formed
 (C) Product formed: substrate utilized
 (D) Substrate utilized : product formed
75. Which of the following reactors would have mixing profiles that are closest to plug flow?
 (A) A continuous air lift bioreactor
 (B) A continuous fluidized bed bioreactor
 (C) A continuous packed bed reactor
 (D) Continuous stirred tank reactors with biomass recycle
76. Which of the following antibiotics/toxicants acts by interfering with the phosphodiester bond formation?
 (A) Rifamycin
 (B) Actinomycin
 (C) α - amanitin
 (D) Penicillin
77. Diphtheria toxin blocks protein synthesis by
 (A) ADP ribosylation of EF-2
 (B) Phosphorylating EF-1
 (C) Inhibiting peptidyl transferase activity
 (D) ADP ribosylation of EF-G

78. By a single experiment how would you know that the stationary phase in a batch culture is due to substrate depletion or toxin accumulation?
- By adding highly concentrated substrate in the stationary phase
 - By adding more substrate in the stationary phase
 - By diluting the broth by sterilized water in the stationary phase
 - By extracting toxin from the broth in the stationary phase
79. The average value of dissolved oxygen concentration in water is
- 10 mg/l
 - 100 mg/l
 - 160 mg/l
 - 1 mg/l
80. Seitz filter is made of
- Diatomaceous earth
 - Porcelain
 - Asbestos pad
 - Sintered glass disks
81. A fungal disease Moniliasis is caused by
- Filobasidiella neoformans*
 - Candida albicans*
 - Blastomyces dermatitidis*
 - Histoplasma capsulatum*
82. Which of the following tests is done for the diagnosis of scarlet fever?
- Frei test
 - Tuberculin test
 - Ducrey test
 - Schultz-Charlton test
83. In a plant scale reactor temperature is controlled by passing cold water
- through jacket only
 - through internal coil only
 - through both jacket and internal coil
 - by sprinkling cold water on the wall of the reactor
84. The Robertsonian translocation that is most widely distributed in cattle populations worldwide is referred to as
- Roberson's anomaly
 - Anderson's anomaly
 - Gustavsson's anomaly
 - Smith's anomaly
85. An example of a motile microorganism is
- Brucella
 - Lactobacillus
 - Shigella
 - Pseudomonas
86. Which one of the following is an unprotected fermentation?
- Ethanol production
 - Citric acid production
 - Antibiotic production
 - Enzyme production
87. A method commonly used to determine the level of damage of animal cells in a culture medium is to monitor
- the concentration of lactate in the medium
 - the level of lactate oxidase activity in the medium
 - the level of lactate dehydrogenase activity
 - the level of laccase activity in the medium
88. Vortexing in stirred tank reactor can be reduced by using
- An axial flow impeller
 - A turbine impeller
 - Baffles in the reactor
 - Multiple impellers
89. In which type of chromatography are ion-pairing agents used for elution?
- Hydrophobic Interaction Chromatography
 - Reverse Phase Chromatography
 - Ion Exchange Chromatography
 - Immobilized Metal Anion Chromatography
90. Blocking of 'A' site on the ribosome and thereby inhibiting protein synthesis is the mechanism of action of
- Streptomycin
 - Tetracycline
 - Chloramphenicol
 - Erythromycin
91. *Clostridium tetanomorphum* is known to produce
- Vitamin A

- (B) Vitamin B
(C) Vitamin C
(D) Vitamin K
92. Multiple antigen peptides (MAPs) are peptide vaccines which are chemically 'stitched' together usually onto a
(A) Poly-lysine backbone
(B) Poly-arginine backbone
(C) Poly-methionine backbone
(D) Poly-histidine backbone
93. Which of the following antibiotics is produced by chemical synthesis?
(A) Penicillin
(B) Streptomycin
(C) Tetracycline
(D) Chloramphenicol
94. Which of the following obtains energy from the oxidation of inorganic or organic chemicals?
(A) Chemotroph
(B) Lithotroph
(C) Autotroph
(D) Heterotroph
95. A common clinical pathological finding during a viral infection is
(A) Neutrophilia
(B) Eosinophilia
(C) Leukopenia
(D) Basophilia
96. Regimes of the world with an unusually large concentration of various species are called
(A) Natural preserves
(B) Cloud forests
(C) Landscape
(D) Biodiversity hotspots
97. Deficiency of lipase enzyme can cause
(A) Muscle cramps
(B) Joint inflammation
(C) Hepatotoxicity
(D) Coma and death
98. Which of the following can be grown anaerobically?
(A) *E. coli*
(B) *S. aureus*
(C) *Pseudomonas*
(D) *Clostridia*
99. For which of the following, the units of rate constant and rate of reaction are same?
(A) 1st order reaction
(B) 2nd order reaction
(C) 3rd order reaction
(D) Zero order reaction
100. High density yeast culture represents
(A) Pseudoplastic rheology
(B) Dilatant rheology
(C) Bingham rheology
(D) Casson body rheology
101. In order to permeabilize yeast cell, it is best to treat with
(A) EDTA and Lysozyme
(B) β -(1, 3) glucanase and protease
(C) β -(1, 6) glucanase
(D) Alkaline hydroxylase
102. In Aqueous two phase extraction, proteins are highly influenced by _____ polymer phase
(A) Low molecular weight
(B) High molecular weight
(C) Similar molecular weight
(D) Medium molecular weight
103. In order to fractionate particles based on size which of the following is most suitable?
(A) Tubular centrifuge
(B) Multichamber centrifuge
(C) Disk stack centrifuge
(D) Decanter centrifuge
104. Which among the following purification steps initially requires high ionic strength in the sample?
(A) Ion exchange chromatography
(B) Hydrophobic interaction chromatography
(C) Chromatofocusing
(D) Preparative chromatography
105. Dynamic kinetic resolution of chiral molecules yields a maximum of
(A) 50% conversion
(B) 100% conversion
(C) 75% conversion
(D) 25% conversion

106. Unit of n^{th} order rate constant is
 (A) $(\text{mol L}^{-1})^{1-n} \text{sec}^{-1}$
 (B) $(\text{mol L}^{-1})^{n-1} \text{sec}^{-1}$
 (C) $(\text{mol}^{-1} \text{L})^{1-n} \text{sec}^{-1}$
 (D) $(\text{mol L}^{-1})^{n-1} \text{sec}$
107. The half life of the 1st order reaction is independent of
 (A) Square of final substrate
 (B) Initial substrate concentration
 (C) Final substrate concentration
 (D) Cube root of final substrate concentration
108. In a first order reaction $A \rightarrow B$. The plot _____ is a straight line
 (A) $[A]$ versus time (t)
 (B) $1/[A]$ versus time (t)
 (C) $\ln [A]$ versus time (t)
 (D) $1/\ln [A]$ versus time (t)
109. Bang's disease is caused by
 (A) *Corynebacterium pyogenes*
 (B) *Staphylococcus aureus*
 (C) *Brucella abortus*
 (D) *Salmonella dublin*
110. Catalytic efficiency allows a comparison of different enzymes. It is the ratio of
 (A) K_{cat}/K_m
 (B) K_m/K_{cat}
 (C) $V_{\text{max}}/K_{\text{cat}}$
 (D) $K_{\text{cat}}/V_{\text{max}}$
111. Gas gangrene is caused by the bacteria of the genus
 (A) Staphylococcus
 (B) Streptococcus
 (C) Clostridium
 (D) Corynebacterium
112. Random single displacement enzyme reactions resemble
 (A) Competitive inhibition
 (B) Uncompetitive inhibition
 (C) Irreversible inhibition
 (D) Noncompetitive inhibition
113. In an enzyme catalyzed reaction, $K_m = 4 \times 10^{-5}$ $\mu\text{mol/l}$, and the rate of reaction (V) at substrate concentration $[S] = 1.2 \times 10^{-2}$ M is 80 $\mu\text{mol/l-min}$.
 Assuming no inhibitor is present, V_{max} is practically equal to
 (A) 40 $\mu\text{mol/l-min}$
 (B) 80 $\mu\text{mol/l-min}$
 (C) 120 $\mu\text{mol/l-min}$
 (D) 4.8×10^2 $\mu\text{mol/l-min}$
114. The rate of reaction increases by increase in temperature because
 (A) Collision frequency increases
 (B) Energy of products decreases
 (C) Fraction of molecules possessing energy $\geq E_T$ (Threshold energy) increases
 (D) Mechanism of reaction is changed
115. If the concentration of the reactants is increased by "X", then the rate constant K becomes
 (A) $e^{K/X}$
 (B) K
 (C) K/X
 (D) X/K
116. Plug flow of both gas phase and liquid phase is a characteristic of
 (A) STR
 (B) Air-Lift reactor
 (C) Bubble column reactor
 (D) Fluidized bed reactor
117. The unit of volumetric oxygen transfer coefficient ($K_L a$) is
 (A) m^2h^{-1}
 (B) m^3h^{-1}
 (C) h^{-1}
 (D) mh^{-1}
118. Which of the following statements is not true in case of Chemostat?
 (A) An increase in flow rate leads to decrease in dissolved oxygen tension
 (B) Cell recycle leads to increased productivity
 (C) If operated with fixed flow rate, steady state is achieved by metabolic control
 (D) Maximum cell mass yield is obtained when operating at dilution rate greater than maximum specific growth rate
119. Bacteria utilize glucose preferentially over other sugars through a mechanism called
 (A) Operon repression

- (B) Enzyme repression
(C) Catabolite repression
(D) Catabolite induction
120. Syntrophism is a type of
(A) Commensalism
(B) Mutualism
(C) Parasitism
(D) Synergism
121. When organisms make toxic substances more toxic, the process is called
(A) Bioremediation
(B) Biomagnification
(C) Biotoxification
(D) Bioamplification
122. Non-superimposable mirror images having similar molecular formula are called
(A) *Cis-trans* isomers
(B) Geometric isomers
(C) Anomers
(D) Enantiomers
123. One of the following is not a zoonotic disease
(A) Rabies
(B) Anthrax
(C) Brucellosis
(D) Canine distemper
124. A protein antigen requires to be processed in order to make it
(A) induce tolerance
(B) facilitatory for clearance by spleen
(C) to produce strong NK cell response
(D) to form peptide-MHC complex
125. Diabetes insipidus is caused due to insufficient level of
(A) insulin
(B) ADH
(C) thyroxine
(D) TSH
126. Which of the following leukocytes is present in highest number in the human blood?
(A) neutrophil
(B) eosinophil
(C) basophil
(D) macrophage
127. In Parkinson's disease there is a predominant loss of
(A) dopaminergic neurons in the substantia nigra
(B) cholinergic neurons in the brain stem
(C) noradrenergic neurons in the locus coeruleus
(D) GABA-ergic neurons in the cortex
128. In Dengue fever the blood cell count that tends to decrease to a dangerous level is of
(A) basophil
(B) eosinophil
(C) platelet
(D) monocyte
129. The co-receptor responsible for the entry of HIV into the host cell is
(A) CCR1
(B) CCR5
(C) CXCR3
(D) CXCR7
130. Calcium present in which of the following spaces take part in the release of neurotransmitter?
(A) Vesicles at the presynaptic terminal
(B) Extracellular space
(C) Intracellular space
(D) Presynaptic terminal in free form
131. Maximum concentration of dopaminergic neurons is present in
(A) locus coeruleus
(B) red nucleus
(C) substantia nigra
(D) mammillary body
132. In Alzheimer's disease there is predominant loss of which type of neurons?
(A) Cholinergic
(B) Cholinoceptive
(C) Noradrenergic
(D) Noradrenoceptive
133. Under stress condition which of the following pairs of organs plays as haemopoietic organ other than bone marrow?
(A) Both liver and lymph node
(B) Both spleen and liver
(C) Both lymphnode and thymus
(D) Both spleen and thymus
134. Gene therapy through stem cells may be done using
(A) lentiviral vector
(B) plasmid vector
(C) episomal vector
(D) baculovirus vector
135. Defect in the SCID mice may be cured by inserting
(A) ADA gene
(B) SCID gene

- (C) SCDA gene
(D) DAA gene
136. Insufficiency of the adrenal cortex causes which of the following diseases?
(A) Cancer
(B) Gout
(C) Addison's disease
(D) Psoriasis
137. Primary colours of vision are
(A) red, black and yellow
(B) black, white and green
(C) orange, yellow and blue
(D) red, blue and green
138. Thermoregulatory centre is located in the
(A) cerebellum
(B) cerebral cortex
(C) preoptic area
(D) mammillary body
139. Which category of hypersensitivity best describes hemolytic disease of the newborn caused by Rh incompatibility?
(A) atopic or anaphylactic
(B) cytotoxic
(C) immune complex
(D) delayed type
140. FMD virus belongs to the family
(A) Parvoviridae
(B) Adenoviridae
(C) Flaviviridae
(D) Picornaviridae
141. Myasthenic syndromes are caused due to impairment of which of the following receptor types?
(A) Acetylcholinergic
(B) Dopaminergic
(C) GABA-ergic
(D) Histaminergic
142. DNA vaccination induces
(A) Cytotoxic T-cell response
(B) NK-cell response
(C) Antibody response
(D) Immediate hypersensitivity response
143. Graft rejection is induced by
(A) Antibody response
(B) T-helper cell response
(C) NK-T cell response
(D) Cytotoxic T-cell response
144. Antiviral cellular immunity is predominantly mediated by
(A) CD⁸⁺ cytotoxic T lymphocytes
(B) Natural Killer cells
(C) CD⁴⁺ T lymphocytes
(D) Dendritic cells
145. Type 2 diabetes is due to
(A) lack of utilization of insulin
(B) lack of insulin production
(C) lack of glucose synthesis
(D) high intake of glucose
146. Which of the following is the best way to detoxify the methanol toxicity if a person drinks methanol?
(A) Make the patient drink glucose water
(B) Intravenous injection with steroid
(C) Make the patient drink ethanol
(D) Make the patient drink lemon juice
147. Which of the following protozoan parasites replicates inside the lysosomes?
(A) *Toxoplasma*
(B) *Leishmania*
(C) *Trypanosoma*
(D) *Plasmodium*
148. Which of the following hormones initiates biological actions by crossing the plasma membrane and then binding to a receptor?
(A) Insulin
(B) Glucagon
(C) Estradiol
(D) Norepinephrine
149. Which of the following is not an RNA virus?
(A) Paramyxovirus
(B) HIV
(C) HPV
(D) Picornavirus
150. During vigorous exercise lactic acid gets accumulated in skeletal muscle due to
(A) lack of NADH
(B) lack of NAD⁺
(C) excess supply of CO₂
(D) excess supply of O₂
151. Structure of amyloid fibril is
(A) random coil
(B) β -sheet
(C) α -helix
(D) β -barrel

152. In meiosis
 (A) Chromosomes separate in meiosis I and chromatids separate in meiosis II
 (B) Chromosomes separate in meiosis II and chromatids separate in meiosis I
 (C) Chromosomes separate in both meiosis I and II
 (D) Chromatids separate in both meiosis I and II
153. Which one of the following viruses has been extensively used as expression vector for a number of foreign genes?
 (A) Vaccinia virus
 (B) Rotavirus
 (C) Rabies virus
 (D) Papilloma virus
154. Bovine group A rotavirus contains
 (A) ss RNA
 (B) ds RNA
 (C) ss DNA
 (D) ds DNA
155. Somatic mutation of immunoglobulin gene accounts for
 (A) allelic exclusion
 (B) class switching from IgM to IgG
 (C) affinity maturation
 (D) V(D)J recombination
156. The earliest thymocytes are
 (A) CD4⁻CD8⁻
 (B) CD4⁺CD8⁺
 (C) CD4⁺CD8⁻
 (D) CD4⁻CD8⁺
157. Which one of the following is an enveloped virus?
 (A) Adenovirus
 (B) SV40
 (C) Parvovirus
 (D) Influenza virus
158. Which one of the following mouse immunoglobulins has three domains in the constant region of the heavy chain?
 (A) IgG2b
 (B) IgG2a
 (C) IgE
 (D) IgA
159. Metabolic engineering of *E.coli* as a commercial source of the fuel ethanol involves alteration of its
 (A) Carbohydrate catabolic pathways
 (B) Fermentative pathways
 (C) TCA cycle
 (D) Ability to grow autotrophically
160. Locus coeruleus in the brain possesses maximum concentration of
 (A) cholinergic neurons
 (B) noradrenergic neurons
 (C) astrocytes
 (D) microglia
161. A tissue slice (non-dividing cells) was exposed for prolonged time to a chemical. The response of the slice to such chemical gradually reduced. However, if washed and left for sometime, the tissue started responding to the same chemical at the same concentration. The reduced response was likely to be due to
 (A) increased apoptosis of the cells
 (B) the cells were necrosed
 (C) the pH of the medium was changed
 (D) the receptors were desensitized/down-regulated
162. In albino Wistar rats the red colour of the blood is due to
 (A) lack of pigmentation
 (B) absence of porphyrin ring in the heme of haemoglobin
 (C) oxidized state of the iron in the heme
 (D) reduced state of the iron in the heme
163. Large calf syndrome primarily occurs in
 (A) Naturally born calves
 (B) Transgenic calves
 (C) Calves produced by IVF
 (D) Calves produced by Artificial insemination
164. Patients suffering from tetanus are given antiserum for therapy. This process of immunization is defined as
 (A) active immunization
 (B) prophylaxis
 (C) booster immunization
 (D) passive immunization
165. Which of the following is not a site in humans where invading microorganisms are filtered from body fluids passing through the site?
 (A) Liver
 (B) Heart
 (C) Lung
 (D) Spleen
166. Which of the following serologic tests involves competing antigen-antibody reactions?
 (A) Complement fixation
 (B) ELISA
 (C) Agglutination
 (D) Fluorescent-tagged immunoglobulins

167. Respiratory Quotient is given by
 (A) moles of CO₂ produced / moles of O₂ consumed
 (B) moles of O₂ consumed / moles of CO₂ produced
 (C) moles of biomass produced / moles of O₂ consumed
 (D) moles of biomass produced / moles of CO₂ produced
168. By using reference sequencing developed through human genome project, individual differences can now be analysed by using
 (A) SSLPs
 (B) SNPs
 (C) SNRPs
 (D) AFLPs
169. A person suffering from a killer disease SCID may be cured by inserting
 (A) ADA gene
 (B) SCID gene
 (C) SCDA gene
 (D) DAA gene
170. Vitamin E is
 (A) menaquinone
 (B) α-tocopherol
 (C) Phylloquinone
 (D) Retinol
171. A channel forming protein produced by cytotoxic T-cells is
 (A) Streptolysin
 (B) Channelin
 (C) Porin
 (D) Perforin
172. Cervical cancer is caused by
 (A) Papilloma virus
 (B) Herpes simplex virus
 (C) Hepatitis B virus
 (D) Vesicular stomatitis virus
173. The rate of impulse conduction in a nerve depends on
 (A) axon diameter and axon length
 (B) axon length and number of dendrites
 (C) axon diameter and thickness of myelination
 (D) myelination and nuclear size
174. Melatonin is secreted in the
 (A) day time before noon
 (B) day time after noon period
 (C) just before sun set
 (D) dark period
175. Heart rate would increase by the application of
 (A) acetylcholine
 (B) adrenaline
 (C) cold saline
 (D) cold glucose solution
176. Posture maintenance is mainly controlled by the
 (A) cerebrum
 (B) cerebellum
 (C) hypothalamus
 (D) mammillary bodies
177. Galactosemia is a recessive human disease that is treatable by restricting lactose and glucose in the diet. A couple is heterozygous for the galactosemia gene. If the couple has 4 children, what is the probability that none of the four will have galactosemia?
 (A) 1/16
 (B) 9/16
 (C) 1/256
 (D) 81/256
178. The genetic event that causes transition from membrane-bound to secretory form of IgM is
 (A) Somatic Hypermutation
 (B) V-D-J Recombination
 (C) Alternative Splicing
 (D) Gene Jumping
179. If the association constant for the binding of a given hapten to an antibody is 10⁹ M⁻¹ and second order rate constant for its binding is 10⁸ M⁻¹ s⁻¹ what would be the rate constant for the dissociation of the hapten from the antibody?
 (A) 10⁻¹ s⁻¹
 (B) 10 s⁻¹
 (C) 10¹⁷ s⁻¹
 (D) 10⁻¹⁷ s⁻¹
180. Idiotypic determinants of a given immunoglobulin molecule are located within
 (A) hypervariable regions of heavy and light chains
 (B) constant regions of light chains
 (C) constant regions of heavy chains
 (D) the hinge region
181. The best method to demonstrate IgG on the glomerular basement membrane in a kidney tissue section is
 (A) precipitin test
 (B) complement fixation test
 (C) agglutination test
 (D) indirect fluorescent-antibody test
182. Which one of the following substances is not released by activated helper T-cells?
 (A) interleukin-1

- (B) gamma interferon
(C) interleukin-2
(D) interleukin-4
183. Which of the following produce(s) analgesia and autonomic inhibition?
(A) Glycine
(B) Glutamate
(C) Acetylcholine
(D) Opiates
184. Which of the following blood cell count decreases rapidly in dengue ?
(A) Basophil
(B) Eosinophil
(C) Platelet
(D) Monocytes
185. Anti-malarial function of quinine is mediated by
(A) blocking the formation of hemoglobin in the host
(B) blocking the formation of hemozoin in the parasite
(C) triggering synthesis of hemoglobin in the host
(D) triggering synthesis of hemozoin in the parasite
186. SARS is caused by which of the following viruses?
(A) double stranded RNA
(B) positive sense RNA
(C) negative sense RNA
(D) double stranded DNA
187. An inhibitor of sodium dependent glucose transport across the plasma membrane is
(A) ouabain
(B) sodium azide
(C) dicumarol
(D) phlorhizin
188. Tyrosine hydroxylase immunopositive neurons are
(A) only noradrenergic
(B) only dopaminergic
(C) either dopaminergic or noradrenergic
(D) only serotonergic
189. In adult neurogenesis, which of the brain areas has been suggested to play a role in periodic clearance of outdated hippocampal memory traces?
(A) cortex
(B) brainstem
(C) dentate gyrus
(D) hypothalamus
190. Antibody to a hapten could be raised without hapten-carrier conjugate by injecting
(A) antiallotypic antibody
(B) antiisotypic antibody
(C) self antigen
(D) antiidotypic antibody
191. phi, psi angles of a peptide segment adopting alpha helical conformation would be around
(A) -78, +59
(B) +49,+26
(C) -57,-78
(D) -60,-40
192. Structurally independent unit of protein structure is a
(A) fold
(B) domain
(C) motif
(D) super-fold
193. The allowed region in the Ramachandran Plot for three residues (alanine, glycine and proline) decreases in the order:
(A) Pro > Gly > Ala
(B) Gly > Ala > Pro
(C) Ala > Pro > Gly
(D) Gly > Pro = Ala
194. Which residue, among alanine, arginine, proline and methionine has the lowest propensity to occur in an alpha-helix?
(A) alanine
(B) arginine
(C) proline
(D) methionine
195. Which of the following databases is derived from mRNA information?
(A) dbEST
(B) PDB
(C) OMIM
(D) HTGS
196. Which of the following amino acids is least mutable according to PAM scoring matrix?
(A) Alanine
(B) Glutamine
(C) Methionine
(D) Cysteine
197. You have two distantly related proteins. Which of the following sets is the best for comparing them?
(A) BLOSUM45 or PAM250
(B) BLOSUM45 or PAM1
(C) BLOSUM80 or PAM250
(D) BLOSUM80 or PAM1

198. In a sequence database of a given size, which of the following expressions is likely to retrieve more matches (X means any amino acid; any of the residues in square brackets can occupy that position)?
 (A) D-A-V-I-D
 (B) [DE]-A-V-I-[DE]
 (C) [DE]-[AVILM]-X-E
 (D) D-A-V-E
199. Which alignment is used to predict whether two sequences are homologous or not?
 (A) Local
 (B) Global
 (C) Pair-wise
 (D) Multiple
200. In sequence analysis, Twilight zone refers to
 (A) a zone of domain in a protein sequence
 (B) a zone of sequence similarity (0-20% identity) but statistically not significant
 (C) substitutions in sequence
 (D) a zone of sequence similarity that is statistically significant
201. BLOCKS refers to
 (A) gapped, aligned motif in a multiple sequence alignment
 (B) ungapped, aligned motif in a multiple sequence alignment
 (C) coding sequences
 (D) non-coding sequences
202. CpG islands and codon bias are tools used in eukaryotic genomics to
 (A) identify open reading frames
 (B) differentiate between eukaryotic and prokaryotic DNA sequences
 (C) Look for DNA-binding domains
 (D) determine STS
203. The type of algorithm that GENSCAN tool employs is
 (A) Neural network
 (B) Rule-based system
 (C) Hidden Markovs model
 (D) Statistics based
204. BLASTx is used to
 (A) search a nucleotide database using a nucleotide query
 (B) search protein database using a protein query
 (C) search protein database using a translated nucleotide query
 (D) search translated nucleotide database using a protein query
205. Which of the following is a retrieval system?
 (A) Entrez
 (B) Bioedit
 (C) Vecscreen
 (D) Rasmol
206. The Smith-Waterman algorithm was developed for
 (A) Local pairwise sequence alignment
 (B) Global pairwise sequence alignment
 (C) Multiple sequence alignment
 (D) Structural alignment
207. In Molecular Dynamics simulation the dependence is on
 (A) position only
 (B) momentum only
 (C) both position and momentum
 (D) either position or momentum
208. Homology modeling involves
 (A) alignment of the target sequence to the sequence of a template structure
 (B) alignment of the target sequence with multiple sequences with no structural information
 (C) *ab initio* structure prediction
 (D) no input of sequence information
209. Which of the following cases are commonly used in sequence alignment?
 (A) gap opening penalty = -2, gap extension penalty = -0.5
 (B) gap opening penalty = -0.5, gap extension penalty = -2
 (C) gap opening penalty = -100, gap extension penalty = 0
 (D) gap opening penalty = -100, gap extension penalty = -100
210. CATH database classifies protein domains. CATH stands for
 (A) Classsified, Advanced, Technology and Homology
 (B) Automatic Classification of Turns and Helices
 (C) Class, Architecture, Topology and Homologous superfamily
 (D) Classification of Alpha Trans-membrane Helices
211. *Ab initio* approaches for prediction of protein structure utilize
 (A) sequence similarity
 (B) structural similarity
 (C) both sequence and structural similarity
 (D) basic physicochemical principles

212. To know the structural similarity between two proteins, the server to use is
 (A) PRODOM
 (B) PROSITE
 (C) TREMBLE
 (D) DALI
213. Quantitative Structure Activity Relationship (QSAR) is used for
 (A) Drug design
 (B) Protein modeling
 (C) Aligning two sequences
 (D) Molecular Dynamics simulation
214. In protein modeling, molecular mechanics force field is used, because
 (A) it takes less time as compared to others
 (B) it is more accurate
 (C) it guarantees global minimum
 (D) it explicitly represents the electrons in a calculation
215. The potential energy for the interaction of two atoms is given by $U = A/r^{12} - B/r^6$. The bottom of the potential well corresponds to
 (A) the sum of van der Waals radii of the atoms
 (B) the existence of the maximum electrostatic interaction
 (C) the situation when the first term vanishes
 (D) the situation when the atoms get bonded covalently
216. A protein with mostly hydrophobic residues in the surface is likely to be a
 (A) fibrous protein
 (B) globular protein
 (C) membrane protein
 (D) glycosylated protein
217. The overall cost of production of recombinant DNA products for human use, in general increases due to complications in
 (A) Upstream processing
 (B) Fermentation process
 (C) Downstream processing
 (D) Formulation process
218. Which of the following does not represent a valid amino acid sequence?
 (A) EINSTEIN
 (B) CRICK
 (C) FARADAY
 (D) WATSON
219. Quaternary structure of a protein consists of
 (A) arrangement of one protein chain in a protein with a single subunit
 (B) arrangement of separate protein chains in a protein molecule with more than one subunit
 (C) arrangement of only parallel and antiparallel β -sheets in a protein chain
 (D) occurrence of an alpha-helix bundle in a protein chain
220. Among the following, which one is another anti-angiogenic factor than Squalamine extracted from Shark?
 (A) Neovastat
 (B) Chlorampenciol
 (C) Streptomycin
 (D) Histamine
221. Which of the following marine sources acts as a Na^+ channel blocker?
 (A) Tetrodotoxin
 (B) Conotoxin
 (C) Carageneen
 (D) Acetyl choline
222. Which of the following proteins was used to create the first transgenic fish?
 (A) Green Fluorescent protein
 (B) Anti freezing protein
 (C) Horseshoe peroxidase
 (D) Myosin protein
223. Which of the following provides the best source of prostaglandins?
 (A) Ctenophores
 (B) Echinoderms
 (C) Coral reefs
 (D) Molluscs
224. The DNA replication inhibitor yielded by sponge is
 (A) Clathesine
 (B) Spongosides
 (C) Spongin
 (D) Sclerorin
225. Calyculins are natural products originally isolated from the marine
 (A) Mollusk
 (B) Sea weeds
 (C) Sponges
 (D) Mangrove
226. Curacin A is a potent anti-tumor agent obtained from a marine
 (A) Actinomyces
 (B) Cyanobacterium
 (C) Aspergillus

- (D) Coral reef
227. In sea urchins _____ nerve fibers are involved in spawning.
 (A) Cholinergic
 (B) Peptidergic
 (C) Dopaminergic
 (D) Serotonergic
228. Which of the following is a pollution tolerant species?
 (A) Shrimp
 (B) Cuttle fish
 (C) Isopods
 (D) Polychaetes
229. Sponge cells are capable of constitutively expressing ----- and thus resemble tumor cells
 (A) DNase
 (B) Polymerase
 (C) Helicase
 (D) Telomerase
230. Which of the following trend is not the treatment used for the induction of triploidy in gastropods ?
 (A) Pressure shock
 (B) Thermal shock
 (C) 6-dimethylamino purine
 (D) Osmotic shock
231. UV-A absorbing compound present in marine cyanobacteria is
 (A) α -glucoside
 (B) α -galactoside
 (C) Biopterin glucoside
 (D) Biopterin galactoside
232. Members of luminous *Vibrio* sp. communicate with each other by
 (A) Conjugation
 (B) Recombination
 (C) Quorum sensing
 (D) Secreting Pheromones
233. The only naturally transformable marine cyanobacteria is
 (A) *Agmenellum* sp.
 (B) *Spirulina* sp.
 (C) *Oscillatoria* sp.
 (D) *Nostoc* sp.
234. Most of the cyanobacterial plasmids are
 (A) Relaxed
 (B) R plasmids
 (C) Stringent
 (D) Cryptic
235. Which of the following is not an epibiont?
 (A) Barnacles
 (B) Bryozoans
 (C) Sea anemone
 (D) Mussels
236. Which of the following peptides showing anti-tumor activity is isolated from marine organism?
 (A) Saxitoxin
 (B) Tetradoxin
 (C) Ecteinascidin
 (D) Dolostatin
237. The clown fish shows mutualism with
 (A) Sea urchin
 (B) Sea cucumber
 (C) Sea anemone
 (D) Hermit crab
238. Which of the following cell cycle regulatory proteins was first identified in marine invertebrates?
 (A) p53
 (B) Cyclins
 (C) P27
 (D) Cyclin dependent kinase
239. Gene coding for luminescence in marine luminescent bacteria is
 (A) luxR
 (B) toxR
 (C) recA
 (D) Luciferase
240. Red fluorescent protein used in the development of transgenic ornamental fish was isolated from
 (A) Star fish
 (B) Sponges
 (C) Red algae
 (D) Corals
241. Leydig's organ in cartilaginous fishes is for
 (A) Sensation
 (B) Respiration
 (C) Immunity
 (D) Reproduction
242. Melanosis in shrimps occurs due to the activity of
 (A) Phenol oxidase
 (B) alpha-glucosidase
 (C) Prophenol oxidase
 (D) All the above
243. The best source for salt tolerant gene is
 (A) Fishes
 (B) Mangroves

- (C) Seaweeds
 - (D) Bacteria
244. Water resistant bioadhesives are produced by
- (A) Seaweeds
 - (B) Mangroves
 - (C) Mussels
 - (D) Sea anemones
245. What kind of proteins are synthesized in marine algae in response to metal stress?
- (A) Metalloprotease
 - (B) Phytochelatins
 - (C) Metallothioneins
 - (D) Phycobilins
246. The commercially available marine-derived anticancer drug is
- (A) Vincristine
 - (B) Carboplastin
 - (C) Vinblastin
 - (D) Ara C
247. Which of the following is a marine pollution monitoring programme?
- (A) Bird watch programme
 - (B) Mussel watch programme
 - (C) Fish watch programme
 - (D) Bay of Bengal programme
248. The viral infection in shrimp is caused by
- (A) HSV
 - (B) WSSV
 - (C) HIV
 - (D) HPV
249. Alginate is obtained from
- (A) Brown algae
 - (B) Green algae
 - (C) Red algae
 - (D) Blue green algae
250. General Economic Zone distance is
- (A) 500 nautical miles
 - (B) 200 nautical miles
 - (C) 300 nautical miles
 - (D) 100 nautical miles