Biotechnology Eligibility Test (BET) for DBT-JRF Award (2011-12)

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

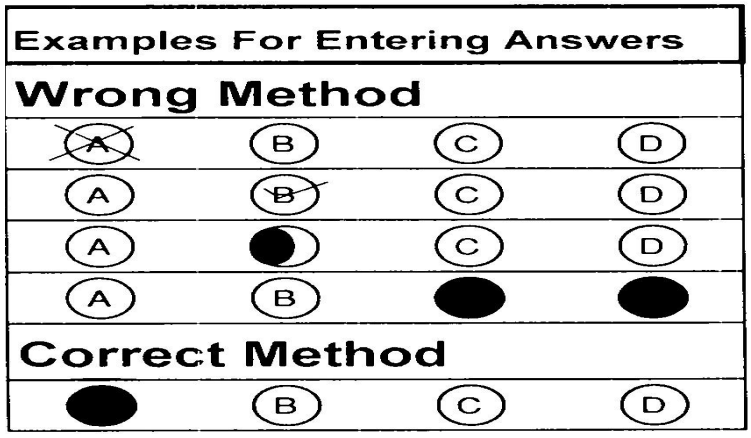
(Coordinated by University of Pune)

April 17, 2011 **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. Morphogenetic competence in callus tissue is obtained by
   (A) Vitrification
   (B) Somaclonal variation
   (C) Habituation
   (D) Dedifferentiation

2. Which of the following is not relevant to recombinant DNA safety guidelines in India ?
   (A) IBSC
   (B) RCGM
   (C) GEAC
   (D) NBPGR

3. Which of the following statements correctly indicates the relative position of two genes in higher plants?
   (A) The closer two genes are to each other on a chromosome, the higher the frequency of recombination between them.
   (B) The more distant two genes are to each other on a chromosome, the higher the frequency of recombination between them
   (C) If two genes are located on different chromosomes then there will be high frequency of recombination between them.
   (D) If two genes are located on different chromosomes then there will be low frequency of recombination between them.

4. Which of the following is the best method for localization of a protein during transition from vegetative to flowering stage?
   (A) Place a reporter gene next to the promoter of the gene encoding the protein, and identify the cellular location of the reporter gene
   (B) Use an antibody against the specific protein
   (C) Separate the cellular compartments by centrifugation followed by screening with antibodies
   (D) Tag the protein with fluorescent amino acids and identify the cellular location by fluorescent microscopy.

5. An agreement about regulating both tariff rates and quantitative restrictions on global imports and exports is
   (A) GATT
   (B) TRIP
   (C) WIPO
   (D) PBR

6. Gold extraction from mine wastes is carried out by which of the following microbes?
   (A) Pseudomonas
   (B) Nitrifying bacteria
   (C) Acidophils
   (D) Acidothiobacillus

7. Library screening based on the biological activity of a gene in plants is referred as
   (A) Expression cloning
   (B) Functional cloning
   (C) Positional cloning
   (D) Hybridization based screening

8. The fluid used as solvent in super critical fluid extraction is a
   (A) gas
   (B) mixture of gas and liquid
   (C) highly compressed gas
   (D) highly compressed liquid

9. Gaucher's disease is caused due to deficiency of
   (A) glucocerebrosidase
   (B) streptokinase
   (C) uricase
   (D) serratiopeptidase

10. During the penicillin extraction process, pH is adjusted to acidic value to
    (A) enhance the extraction of penicillin
    (B) increase stability of penicillin
    (C) decrease the partition coefficient
    (D) reduce the viscosity of the broth

11. Marine bacteria change their morphology in response to the nutrients in their surrounding environment and the phenomenon is referred as
    (A) Oligotrophism
    (B) Pleomorphism
    (C) Heterotrophism
    (D) Syntrophism

12. Marine sediments derived from erosion of rocks are
    (A) Biogenous sediments
    (B) Lithogenous sediments
    (C) Limnologic sediments
    (D) Magnetic sediments

13. Inanimate habitats colonized by organisms are called
    (A) Seston
    (B) Pelagic
    (C) Neuston
    (D) Epibiotic

14. Probionts in aquaculture are regularly used to
    (A) increase the size and weight of fish.
    (B) improve the fecundity of fish.
    (C) improve the water quality of the pond.
    (D) for vaccinating the fish against general bacterial infection.

15. A lithoautotroph
    (A) derives energy from reduced compounds of mineral origin.
    (B) can be bacterial or eukaryotic cell.
    (C) is always an extremophile.
    (D) requires light for producing

16. Higher version of BLOSUM can be used to detect
    (A) Closely related sequences
    (B) Distantly related sequences
    (C) Unrelated sequences
    (D) Partially related sequences

17. TBLASTX matches a DNA query sequence, translated into all six reading frames, against a DNA database with
    (A) No gaps allowed
    (B) Gaps allowed
    (C) Gaps depending on the input sequence
    (D) Gaps depending on the database

18. Changing which of the following BLAST parameters would tend to yield fewer search results?
    (A) Turning off the low complexity filter
    (B) Changing the expected value from 1 to 10
    (C) Raising the threshold value
    (D) Changing the scoring matrix from PAM30 to PAM70

19. The Ramachandran map of a protein representation allows you to identify
    (A) The most stable structure
    (B) The tertiary allowed structure
    (C) The sterically disallowed conformations
    (D) the secondary structure elements

20. Which information among the following provides the maximum information to do structure based drug design?
    (A) 3D-structure of a set of active compounds
    (B) 3D-structure of the target
    (C) Crystal structure of target-ligand complex
    (D) Primary structure of the target

21. To display a ligand molecule, one cannot use the rendering style of
    (A) Stick
    (B) Ball and stick
    (C) Ribbon
    (D) CPK/space filling

22. The angle between the two long helical arms of tRNA is about
    (A) 180°
    (B) 0°
    (C) 45°
    (D) 90°

23. The cytokine that down regulates T-cell mediated immune responses is
    (A) IL-8.
    (B) TGF-beta.
    (C) TNF-alpha.
    (D) GM-CSF.

24. The antibody present in the breast milk is
    (A) IgA.
    (B) IgD.
    (C) IgM.
    (D) IgE.

25. Toxin conjugated antibody molecules are known as
    (A) toxoid.
    (B) immunotoxin.
    (C) reaginic antibody.
    (D) lymphotoxin.

26. Which of the following receptors is not a signalling receptor?
    (A) Cytokine receptor
    (B) Chemokine receptor
    (C) T-cell receptor
    (D) Mannose receptor

27. A patient of Grave's disease produces antibody against
    (A) thyroid stimulating hormone.
    (B) basement membrane of thyroid gland.
    (C) acetylcholine receptor.
    (D) Insulin receptor.

28. Survival of mice exhibiting autoimmune lupus-like symptom may be prolonged by treatment with monoclonal antibody specific for
    (A) CD16.
    (B) CD69.
    (C) CD4.
    (D) CD8.

29. The 5th human malarial parasite is
    (A) *Plasmodium yoellii*.
    (B) *Plasmodium fragile*.
    (C) *Plasmodium cynomolgi*.
    (D) *Plasmodium knowlesi*.

30. Osteognesis imperfecta is caused by a defect in the
    (A) removal of propeptide from collagen α chain during protein synthesis.
    (B) collagen cross-link formation.
    (C) glycosylation of hydroxlysine residues in collagen.
    (D) hydroxylation of proline to hydroxyproline.

31. The most common mode of transmission for diphtheria, pneumonia and tuberculosis is through
    (A) direct contact.
    (B) aerosols.
    (C) contaminated water.
    (D) insect vectors.

32. Which of the following bacteria causes Rheumatic fever?
    (A) *Staphylococcus aureus*
    (B) *Staphylococcus pyogenes*
    (C) Campylobacter jejuni
    (D) *Shigella flexneri*

33. The purpose of adding phytohemagglutinin to peripheral blood cultures for chromosomal analysis is to facilitate
    (A) chromosome condensation
    (B) to synchronize large number of cells at metaphase
    (C) swelling of cells to permit chromosome visualization
    (D) stimulation of lymphocyte cell division

34. In human, pointed eyebrows are dominant to smooth
    eyebrows and ‘‘widow’s peak” frontal hairline is dominant to continuous hairline. What phenotypic ratio would you expect in the offspring from a marriage between an individual heterozygous for both the genes and an individual homozygous recessive for both the genes ?
    (A) 9 : 3: 3: 1
    (B) 9: 7
    (C) 1: 1
    (D) 1: 1: 1: 1

35. If a man of blood group AB marries a woman of blood group A whose father was of blood group O, to what different blood groups can this man and woman expect their children to belong?
    (A) A, AB, B
    (B) A, AB
    (C) AB, O
    (D) A, O, B

36. Cytotoxic T cells generally recognise antigen in association with
    (A) class II MHC determinants
    (B) class I MHC determinants
    (C) class III MHC determinants
    (D) HLA-DR determinants

37. Which one of the following amino acids interrupts α helices, and also disrupts β sheets?
    (A) Phe
    (B) Cys
    (C) His
    (D) Pro

38. Which of the following statements concerning the Edman degradation method is incorrect?
    (A) Phenyl isothiocyanate is coupled to the amino-terminal residue
    (B) Under mildly acidic conditions, the modified peptide is cleaved into a cyclic derivative of the terminal amino acids and a shortened peptide (minus the first amino acid)
    (C) Once the PTH amino acid is separated from the original peptide, a new cycle of sequential degradation can begin
    (D) Phenyl isothiocyanate is coupled to the carboxy-terminal residue

39. The non-oxidative branch of the pentose phosphate pathway does NOT include which of the following reactions?
    (A) Ribulose 5-P → ribose 5-P
    (B) Xylulose5-P + ribose 5-P →sedoheptulose 7-P →glyceraldehydes 3-P
    (C) Ribulose 5-P + glyceraldehydes 3-P→ sedoheptulose 7-P
    (D) Sedoheptulose 7-P + glyceraldehyde 3-P → fructose 6-P + erythrose 4-P

40. Silk fibroin displays
    (A) alpha helix
    (B) loop structure
    (C) Antiparallel- β pleated sheets
    (D) parallel β sheet

41. Carnitine is required for
    (A) Renal function
    (B) fatty acid synthesis
    (C) fatty acid oxidation
    (D) sterol synthesis

42. How many milliliters of 0.05 N HCl are required to neutralize eight grams of NaOH?
(A) 5000
(B) 4000
(C) 4500
(D) 5050

43. What is the pH of 10^{-8} M solution of HCl?
(A) 8.99
(B) 6.99
(C) 7.99
(D) 7.00

44. Z DNA helix
(A) is the primary form in any living organism
(B) is favoured by an alternating GC sequence
(C) tends to be formed at 3' end of genes
(D) formation is inhibited by methylation of bases

45. In H-DNA bases of the third strand pairs with
(A) Pyrimidines of the double helix
(B) Purines of the double helix
(C) Both Purines and Pyrimidines of the duplex
(D) Remains unpaired

46. Deletion of which of the following genes will result in permanent lysogenic stage of bacteriophage λ?
(A) N
(B) CII
(C) CI
(D) Cro

47. Which of the following is a segmented single stranded RNA virus with ambisense genome?
(A) Rotavirus
(B) Influenza virus
(C) Colorado tick fever virus
(D) Arena virus

48. Which of the following antibiotics inhibits bacterial protein synthesis by interfering with peptidyl transferase activity?
(A) Streptomycin
(B) Erythromycin
(C) Puromycin
(D) Cycloheximide

49. Disulphide bonds in proteins could be formed by cysteines using
(A) Iodoacetamide
(B) oxidized glutathione
(C) reduced glutathione
(D) β-mercaptoethanol

50. During DNA replication in *E.coli*, RNA primers are synthesized by
(A) dna B
(B) dna G
(C) dna C
(D) dna A

Section B

51. Hydrogen bonds in α-helices are
(A) more numerous than van der waals interactions
(B) not present at phenylalanine residues
(C) analogous to the steps in a spiral staircase
(D) roughly parallel to the helix axis

52. Which one of the following is the correct statement for an active sodium-potassium ATPase?
(A) it pumps out 3 Na-ions and pumps in 2 K-ions
(B) it pumps out 3 Na-ions and pumps in 3 K-ions
(C) it pumps out 3 Ca-ions and pumps in 2 K-ions
(D) it pumps out 3 Na-ions and pumps in 2 Ca-ions

53. Under which circumstances T cell develops anergy?
(A) When the number of TCR on the T cell surface is low
(B) When the CD4/ CD8 molecules present on T cell surfaces do not recognize self MHC II/MHC I molecules
(C) When the MHCII molecules present on antigen presenting cells bind to the peptides with less avidity
(D) When co-stimulatory molecules present on the antigen presenting cells fail to interact with T cells

54. Which one of the statements is most appropriate for the ability of an antigen for the induction of TH1 or TH2 response ?
(A) The nature of naïve T cell it encounters
(B) The nature of epitopes present in it
(C) The cytokine milieu at the time of activation of T cells
(D) The nature of antigen presenting cell which presents the peptides derived from the antigen.

55. Allotypic determinants are
(A) constant region determinants that distinguish each Ig class and subclass within a species.

(B) generated by the conformation of antigen-specific VH and VL sequences.
(C) Not immunogenic in individuals who do not have that allotype.
(D) amino acid differences encoded by different alleles for the same H or L chain locus.

56. Junctional diversity affects primarily the amino acid sequence in
(A) all CDR equally.
(B) CDR1.
(C) CDR2.
(D) CDR3.

57. Which of the following techniques is used to locate disulfide bonds in a protein?
(A) The protein is first reduced and carboxymethylated
(B) The protein is cleaved by acid hydrolysis
(C) The peptides are separated by SDS-polyacrylamide gel electrophoresis
(D) The peptides are separated by two-dimensional electrophoresis with an intervening performic acid treatment

58. Diphtheria toxin
(A) is cleaved on the surface of susceptible eukaryotic cells into two fragments, one of which enters the cytosol
(B) binds to peptidyl transferase and inhibits protein synthesis
(C) reacts with ATP to phosphorylate eIF2 and prevent the insertion of the Met-$tRNA_i$ into the P site
(D) reacts with NAD^+ to add ADP-ribose to eEF2 and prevents movement of the peptidyl-tRNA from A to P site in the ribosome

59. The rate limiting reaction in cholesterol biosynthesis is catalyzed by
(A) HMG-CoA reductase
(B) HMG-CoA synthase
(C) acetoacetate synthase
(D) squalene synthase

60. The potent allosteric activator of animal Phosphofructo kinase is
(A) Fructose
(B) Fructose 2,6 Phosphate
(C) Fructose 1,6 Phosphate
(D) Pyruvate

61. Antimycins block the respiratory chain by
(A) inhibiting cytochrome oxygenase
(B) blocking NADH hydrogenase
(C) blocking ADP-ATP transport
(D) blocking electron flow between cytochrome b and c_1

62. Which of the following conditions would tend to promote cell cycle progression?
(A) A cell with a mutant E2F that cannot bind to DNA
(B) A cell with a mutant p16 protein that cannot bind to cdk4
(C) A cell with a mutant cdk4 that cannot bind to cyclin D
(D) Expression of a mutant pRB that cannot be phosphorylated by cyclin D/cdk4

63. What are the concentrations of HOAc and OAc^- in 0.2 M "acetate buffer", pH 5.00? The Ka for HOAc is 1.70×10^{-5}
(A) OAc^- = 0.126 M, HOAc = 0.074 M
(B) OAc^- = 0.150 M, HOAc = 0.084 M
(C) OAc^- = 0.200 M, HOAc = 0.184 M
(D) OAc^- = 0.250 M, HOAc = 0.284 M

64. Calculate the instantaneous buffering capacity in both directions of 0.05 M Tricine buffer , pH 7.5. Tricine is an N-tris- (hydroxymethyl)-methyl glycine. pKa = 8.15 ($Ka = 7.08 \times 10^{-9}$)
(A) 0.017 M
(B) 0.217 M
(C) 0.257 M
(D) 0.175 M

65. Hydrolysis of ATP over ADP and AMP generates highest energy because
(A) ATP on hydrolysis generates thermodynamically stable structure
(B) ATP is highly unstable
(C) Hydrolysis of ATP is pH dependent
(D) Hydrolysis of ADP and AMP do not generate thermodynamically stable structure

66. The equilibrium constant ((Keq) for the reaction S↔ P is 5. Suppose we have a mixture of [S] = 2×10^{-4} M and [P] = 3×10^{-4} M. In which direction will the reaction proceed on addition of appropriate enzyme?
(A) Proceeds in a forward direction
(B) Proceeds in a reverse direction
(C) Proceeds in both the directions
(D) Proceeds sometimes in forward and sometimes in reverse direction

67. In the ds-break recombination model, which of the following steps is the first one that happens after formation of the Holliday junction?
(A) DNA cleavage catalyzed by RuvC
(B) Coating ssDNA with RecA

(C) C Branch migration catalyzed by RuvAB
(D) D Dissociation of RecD from RecBCD at a chi site

68. For attachment of sister chromatids to the spindle, which of the following is required?
(A) Inhibition of M-Cdk
(B) Association of lamina to nuclear membrane
(C) Breakdown of nuclear envelope
(D) Rapid synthesis of cyclin B

69. At 12 hours of post seeding suspension cell culture, the cell density was determined to be 3.6 $X10^8$cells/ml. For viral infections, an aliquot of 4 ml culture was withdrawn at that time and centrifuged. What is the cell concentration if pellet is re-suspended in 9 ml medium?
(A) $16X10^8$ cells/ml
(B) $2X10^8$ cells/ml
(C) $1.6X10^8$ cell/ml
(D) $4X10^8$ cell/ml

70. Information for which of the following functions is not encoded in the genome of virus?
(A) Replication of the genome
(B) Modulation of host defense
(C) Envelope membrane biosynthesis
(D) Assembly and packaging of the genome

71. Order glucose, urea, H_2O, CO_2 and steroid hormones according to their ability to diffuse through the lipid bilayer, beginning with the one that crosses the bilayer most readily
(A) CO_2, steroid hormone, H_2O, urea, glucose
(B) CO_2, H_2O, urea, glucose, steroid hormone
(C) H_2O, CO_2, glucose, urea, steroid hormone
(D) steroid hormone, CO_2, H_2O, urea, glucose

72. The therapeutic index of sulphonamides is high because
(A) Bacteria manufacture their own folate and humans do not synthesize folate
(B) Humans synthesize folic acid at a very high rate
(C) Dihydrofolate reductase is not active in bacteria
(D) Pteridine synthetase is more efficient in humans

73. One of the major causes of *Plasmodium falciparum* resistance to chloroquine is amplification of the gene for
(A) MsbA transporter
(B) LacY permease
(C) AqpZ porin
(D) ABC transporter

74. Polyproline II structure found in some proteins and having helical orientation is known to have
(A) 3 residues per turn
(B) 3.3 residues per turn
(C) 3.6 residues per turn
(D) 4 residues per turn

75. Concentration of a protein solution determined using its extinction coefficient resulted in a value of 1 mg/ml. Given that its molecular weight is 100 kDa, its concentration in molar units will be
(A) 10 μM
(B) 100 μM
(C) 1 mM
(D) d) 10 mM

76. If the pK_a of the ε-amino group of lysine is 10.5, the side chain at pH 7 is likely to be
(A) neutral
(B) half dissociated
(C) negatively charged
(D) positively charged

77. The dihedral angle ψ for a peptide used in the Ramachandran plot is given a value based on rotation around
(A) N-C^{α} bond
(B) C^{α}-C' bond
(C) C'-N bond
(D) C^{α}-C^{β} bond

78. Urea and guanidine hydrochloride are potent protein denaturants. They work by
(A) binding to the hydrophobic groups in proteins
(B) breaking of disulphide bonds
(C) enhancing the hydrogen bonded network of water
(D) binding to the peptide bonds of proteins

79. Water has a high dielectric constant value of 80. Because of its presence in biological systems compared with low dielectric solvents like hydrocarbons, it should
(A) strengthen electrostatic interaction but weaken hydrophobic interactions
(B) weaken electrostatic interaction but strengthen hydrophobic interactions
(C) strengthen both electrostatic as well as hydrophobic interactions
(D) weaken both electrostatic as well as hydrophobic interactions

80. RNAi methodology uses double-stranded pieces of RNA to trigger a breakdown or blocking of mRNA. This is often used

(A) to increase the rate of production of an enzyme of pharmacological significance
(B) to decrease the production from a harmful gain-of-function of mutated gene
(C) to mutate an unwanted allele in a homozygous individual
(D) to form a knockout organism that will not pass the deleted sequence to its progeny

81. In a lac operon, a mutation is created so that lactose cannot bind. Now, if lactose is provided, what would happen?
(A) the β-galactosidase will be over-expressed
(B) lac I repressor will remain inactivated.
(C) expression of lac operon will remain unaffected
(D) lac I repressor would remain bound to operon preventing expression

82. In 1997, Dolly the sheep was cloned. Which of the following processes was used?
(A) use of mitochondrial DNA from adult female cells of another ewe
(B) replication and dedifferentiation of adult stem cells from sheep bone marrow
(C) separation of an early stage sheep blastula into separate cells, one of which was incubated in a surrogate ewe
(D) fusion of an adult cell's nucleus with an enucleated sheep egg, followed by incubation in a surrogate ewe.

83. Alkaptonuria resulting from the homozygous expression of a recessive autosomal gene, occurs in about 1 in 1 million persons. Assuming Hardy-Weinberg equilibrium for this trait, what is the approximate proportion of heterozygous "carriers" in the population?
(A) 1 in 1000
(B) 1 in 500
(C) 1 in 20,000
(D) 1 in 2000

84. A woman who is heterozygous for both phenylketonuria mutation and for X-linked hemophilia mutation has a child with a phenotypically normal man who is also heterozygous for a phenylketonuria mutation. What is the probability that the child will be affected by both ?
(A) 1 /8
(B) 1 /4
(C) 1/16
(D) 3/8

85. In a family a female child is diagnosed with a known genetic disorder. She has four unaffected brothers and sisters. Neither parent nor any of the four biological grandparents of the affected child had the disease. The most likely genetic explanation is that the disease is inherited as
(A) autosomal dominant
(B) autosomal recessive
(C) X-linked recessive
(D) X-linked dominant

86. The genotypes of a husband and wife are I^AI^A X I^AI^O. Among the blood types of their children,how many different genotypes and phenotypes are possible ?
(A) 2 genotypes , 3 phenotypes
(B) 3 genotypes, 4 phenotypes
(C) 4 genotypes, 4 phenotypes
(D) 4 genotypes, 3 phenotypes

87. In animal kingdom, the group amniota includes
(A) birds and reptiles
(B) birds and mammals
(C) reptiles and mammals
(D) reptiles, birds and mammals

88. In evolutionary biology, 'biological species' concept is based on
(A) geographical isolation and karyotypic difference
(B) morphological differentiation only
(C) ecological differentiation coupled with morphological differentiation
(D) primarily reproductive isolation

89. Conjugated bilirubin is
(A) transported in blood bound to serum albumin
(B) reduced in a deficiency of a UDP-glucoronosyl transferase
(C) less soluble in aqueous solution than in conjugated form
(D) reduced in serum in biliary tract obstruction

90. The typical length of an integral membrane protein domain (glycophorin fold) is
(A) 20-25 amino acids
(B) 10-15 amino acids
(C) 30-40 amino acids
(D) 5-10 amino acids

91. Fluid mosaic nature of a biological membrane can be proved by
(A) Patch clamp technology
(B) FRAP technique
(C) Electron spin resonance technique
(D) Cell-cell fusion technique

92. A bottle contains 1 mCi of L-Phenylalanine ^{14}C (uniformly labelled) in 2.0 ml of solution. Specific activity of the labelled amino acid is given as 150 mCi/m mole. The concentration of L-Phenylalanine in the solution can be calculated as
(A) 2.335×10^{-3} M
(B) 3.335×10^{-3} M
(C) 3.535×10^{-3} M
(D) 2.535×10^{-3} M

93. Complete fusion of two cells takes place only when
(A) Two outer bilayers of the plasma membrane are fused
(B) Two inner bilayers of the plasma membrane are fused
(C) Both outer and inner bilayers of the plasma membrane are fused
(D) Both outer and inner bilayers of the plasma membrane are fused and aqueous connection is established

94. Which one of the following is the ideal molecular marker of a mature lysosome?
(A) Glucose -6-phosphate receptor
(B) Endoprotease
(C) Mannose-6-Phosphate receptor
(D) Endoglycosidase

95. Which of the following has the highest affinity of ligand-receptor interaction?
(A) Insulin-insulin receptor
(B) Lectin-sugar receptor
(C) Biotin-avidin
(D) Cytokine-cytokine receptor

96. Lateral diffusion rate of an individual membrane protein in a biological membrane generally depends on
(A) The extent of glycosylation
(B) The extent of phosphorylation
(C) The number of integral membrane domains
(D) The extent of its association with cholesterol

97. Maturation of endosome in a living cell is strictly dependent on
(A) Appearance of specific glycolipids on its membrane
(B) Appearance of specific phospholipids on its membrane
(C) Acidification of its aqueous compartment
(D) Kinetics of ligand receptor interaction on cell surface

98. Asymmetry of biological membranes is regulated by
(A) Phospholipase A
(B) Flippase
(C) Phospholipase C
(D) N-glycosidase

99. Which of the following statements concerning biological membrane is correct?
(A) Lipid rafts are fixed in position in membrane
(B) Lipid composition of two layers of the membrane equilibrate
(C) The membrane is most fluid at the surfaces
(D) Lipid transporters catalyze unidirectional movement of specific lipids from one layer to other

100. Signal recognition particle consists of
(A) A single large RNA
(B) Multiprotein complex
(C) A complex of single RNA and multiple proteins
(D) A complex of multiple RNA and multiple proteins

101. Which of the following amino acids of a membrane protein are most likely to be buried in the interior of protein structure?
(A) Aspartic acid and phenylalanine
(B) Isoleucine and glutamic acid
(C) Aspartic acid and glutamic acid
(D) Methionine and Tyrosine

102. A grafting of a dorsal lip of the blastopore from an early xenopus gastrula onto the ventral side of an early embryo will result in
(A) The formation of two separate and independent embryos
(B) The formation of two complete embryos joined along the ventral axis
(C) The formation of two sets of anterior structures joined along the ventral axis: a two headed embryo
(D) The formation of two sets of posterior structures joined along the ventral axis: a two headed embryo

103. In which of the following processes eukaryotic mitochondria is known to be least involved?
(A) ATP production
(B) Apoptosis
(C) Tricarboxylic acid cycle
(D) Fatty acid biosynthesis

104. Which one of the following statements is not correct?
(A) PCR is more sensitive than branched DNA assays
(B) Branched DNA is more sensitive than Ligase chain reaction

(C) Linear amplification occurs in branched DNA
(D) PCR is extremely liable to contamination

105. Chemokine receptor used by HIV for attachment during infection of T cells
(A) CXCR 4
(B) CXCR 3
(C) CCR5
(D) CXCR 1

106. The colloidal pressure of vertebrate blood is mainly due to
(A) Neutrophil
(B) Albumin
(C) Fibrinogen
(D) Globulin

107. In a conjugation experiment, the order in which the markers from Hfr donor appeared in F- recipient was : *mal* (10 min) *thi* (22 min)*met* (17 min) *trp* (57 min)*thr* (33 min).What will be the order of markers on the chromosome?
(A) *mal-thi-met-trp-thr*
(B) *trp-thr-thi-met-mal*
(C) *mal-met-thi-thr-trp*
(D) *thr-trp-mal-met-thi*

108. Which method is used to generate clonally amplified DNA fragments to be used as templates in Pyrosequencing?
(A) Ligation PCR
(B) Shot gun cloning
(C) BAC cloning
(D) Emulsion PCR

109. Twin membrane proteins vSNARE and tSNARE act as anchors when two vesicles fuse into one during molecular transport in the cell. These snare proteins are found in membranes of all except
(A) Mitochondria
(B) Golgi complex
(C) Early endosome
(D) Endoplasmic reticulum

110. In a ligation reaction, what amount of insert DNA of 750 bp is required to clone into 5000 bp vector with a concentration of 80 ng/ µl at a molar ratio of vector to insert 1:3?
(A) 12 ng
(B) 36 ng
(C) 40 ng
(D) 24 ng

111. Addition of activated charcoal to plant tissue culture medium is done in order to
(A) Reduce phenolic leachates
(B) Increase osmolarity of medium
(C) Supplement vitamins
(D) Resist pH changes

112. Which of the following chemicals prevents precocious germination, promotes embryo maturation and increases dessication tolerance of somatic embryos?
(A) Abscisic acid
(B) Silver nitrate
(C) 2,4-Dichloro phenoxy acetic acid
(D) Sodium chloride

113. Wild type *Agrobacterium tumefaciens* does not contain one of the following classes of genes in the T-DNA region. These are
(A) Auxin biosynthesis genes
(B) Opine synthesis genes
(C) Opine catabolism genes
(D) Cytokinin biosynthesis genes

114. One way of overcoming homologous gene silencing by a transgene is
(A) Using CaMV35S promoter to drive transgene expression
(B) Inserting transgene into plastid genome instead of nuclear genome
(C) Removing the antibiotic resistance-conferring genes from transformed plants
(D) Placing an intron between the promoter and coding sequence of the transgene

115. Which of the following genes is a non-antibiotic, non-herbicidal marker that is used for positive selection in plant genetic transformation?
(A) Neomycin phosphotransferase II
(B) Dihydrofolate reductase
(C) Glyphosate oxidoreductase
(D) Mannose 6-phosphate isomerase

116. Which of the following is formed without fertilization in diplosporic apomicts?
(A) Embryo
(B) Seed
(C) Endosperm
(D) Embryo sac

117. NCED (9-cis epoxycarotenoid dioxygenase) is involved in
(A) ABA biosynthesis
(B) GA biosynthesis
(C) Auxin biosynthesis
(D) Ethylene biosynthesis

118. The single-stranded nick in DNA during T-DNA transfer is initiated by
(A) Vir C
(B) Vir B
(C) Vir D
(D) Vir E

119. Target protein for Glyphosate (Roundup®) is
(A) acetolactate synthase
(B) Glutamine synthase
(C) 5-Enolpyruvyl shikimate 3-phosphate synthase
(D) Glutamate dehydrogenase

120. Application of molecular biological technique for commercial production of recombinant products in plants is referred as
(A) Transgenic technology
(B) Biotech crops technology
(C) Molecular Farming
(D) Recombinant DNA technology

121. Which of the following is not a function of molecular chaperon in protein folding?
(A) Molecular chaperones assist in protein folding into their correct structure
(B) Molecular chaperones specify the tertiary structure of a protein
(C) Molecular chaperones can stabilize partially folded proteins and prevent them aggregating with other proteins
(D) Molecular chaperones can shield an protect exposed hydrophobic regions of proteins

122. Transgenic for terminator seed is due to a lethal gene along with two other genes. Which of the following is the product of the lethal gene?
(A) Recombinase
(B) Ribosomal inhibiting protein
(C) Repressor protein
(D) Protein for late embryogenesis

123. The haploid chromosome number of rice is 12. Which tissue will have 36 chromosomes?
(A) Coleoptile
(B) Scutellum
(C) Endosperm
(D) Nucellus

124. Which one of the following phytohormones is produced under water-deficit and plays an important role in tolerance against drought?
(A) Abscisic acid
(B) Cytokinin
(C) Ethylene
(D) Gibberellin

125. Phytoalexins are chemical compounds that are produced by plants. The following statements refer to these compounds:
1. These compounds are stress related factors produced in plants due to physical chemical or microbial stress
2. A large number of secondary metabolites belong to this class.
3. Some genes are derepressed because of these factors.

Of the statements given above
(A) Only 1 is true
(B) Only 1 and 2 are true
(C) Only 1 and 3 are true
(D) All are true

126. Barley RIP gene was demonstrated to provide protection in tobacco plant against
(A) Rhizoctonia solani
(B) Alternaria blight
(C) Phytophthora infestans
(D) Tobacco Mosaic Virus

127. CO_2 acceptor in C_3 plants is
(A) Phosphoglyceric acid
(B) Ribulose monophosphate
(C) Ribulose 1,5- bisphosphate
(D) Phosphoenol pyruvate

128. Why haploids are preferred for plant breeding experiments?
(A) Dominant characters are expressed
(B) Recessive characters are expressed
(C) Induction of mutation is easy
(D) Incomplete dominance is expressed

129. C4 rice has been developed by transforming rice with
(A) PEPC and PPDK
(B) PEPC and RUBISCO
(C) PEPC and MDH
(D) PEPC and Carbonic anhydrase

130. Active form of Gibberellin in plants is
(A) GA1
(B) GA3
(C) GA15
(D) GA9

131. Which of the following is the seed specific promoter used in plant genetic engineering?

(A) CaMV35S promoter
(B) Ubiquitin promoter
(C) ABRE promoter
(D) Glutelin promoter

132. Which of the following requires back crossing?
(A) Generation of RILs
(B) Generation of DH population
(C) Generation of NILs
(D) Generation of F_2s

133. AAO gene family in plants is involved in
(A) ABA biosynthesis
(B) GA biosynthesis
(C) Auxin biosynthesis
(D) Ethylene biosynthesis

134. Oilseed mustard overexpressing 18:1 delta 12 desaturase will show increased levels of the following fatty acid in the seed oil
(A) Oleic acid
(B) Linoleic acid
(C) Stearic acid
(D) Erucic acid

135. A signal sequence KDEL is removed from a ER resident protein. Assuming that there is no change in tertiary structure of such plant protein and no other signal sequences present in protein, the changed protein will now have following fate
(A) It will remain in ER and be degraded
(B) It will be targeted to Golgi apparatus
(C) It will be secreted outside the cell
(D) It will be targeted to lysosome for degradation

136. Which of the following objectives cannot be achieved by using cybrids?
(A) Transfer of cytoplasmic male sterility
(B) Recombination of cytoplasmic genes with nuclear gene of another species.
(C) Introgression of Chromosome segment
(D) Development of true hybrid line

137. Amylase inhibitor gene is transferred to plants for providing resistance against
(A) Fungi
(B) Viruses
(C) Insects
(D) Bacteria

138. PHB biosynthetic pathway for bioplastic production involves manipulation of *pha*A, *pha*B and *pha*C genes of
(A) *Escherichia coli*
(B) *Aspergillus nidulans*
(C) *Alcaligenes eutrophus*
(D) *Bacillus megaterium*

139. Sodium alginate is used in
(A) Protoplast culture
(B) Artificial seed formation
(C) Cryopreservation
(D) Media as gelling agent

140. Heating coils inside a fermentor serve additional roles as
(A) Shaft of the agitator
(B) Blades of the agitator
(C) Baffle of the fermentor
(D) Heating surface of the fermentor

141. A stirrer has a power number (Np) 10. If the stirrer speed (N) is 1 s^{-1} , its diameter D= 1 m and the density of the medium is 1000 kg/m^3, the ungassed power input (P) in watts is
(A) 100
(B) 1000
(C) 10,000
(D) 10

142. Producing biodiesel from algae is a process which is
(A) carbon negative
(B) carbon positive
(C) carbon and nitrogen positive
(D) carbon neutral

143. A pitched-blade turbine draws ……a straight blade turbine of same the diameter.
(A) more power than
(B) less power than
(C) same power as
(D) very high power as

144. In SI system, the unit of thermal conductivity is
(A) W/ m^2. K
(B) W/ m. K
(C) W/K
(D) W/ m^2

145. For efficient heat transfer in a jacketed reactor, the reactor configuration should have
(A) low surface-to-volume ratio
(B) high surface-to-volume ratio
(C) intermediate surface-to-volume ratio
(D) low height to diameter ratio

146. Filtration involving incompressible cake, the specific cake resistance
(A) increases with time
(B) decreases with time
(C) remains constant
(D) depends on the filter design

147. Which of the following characteristics refers to an ideal plug flow reactor?

(A) Less back mixing of the reactants and products
(B) Complete back mixing of the reactants and products
(C) Uniform temperature, pressure and composition across any section normal to the fluid motion
(D) Uniform temperature, pressure and composition across any section parallel to the fluid motion

148. If V_s = Volume of solvent, V_r= Volume of raffinate and α = Distribution factor, then Separation factor S in liquid-liquid extraction is given by
(A) $S= V_s/ V_r$
(B) $S= \alpha (V_s/ V_r)$
(C) $S= V_r/V_s$
(D) $S= 1/ \alpha (V_s/V_r)$

149. Most important factor that affects the cell disruption in a Dyno-mill is
(A) osmotic pressure difference
(B) temperature of disruption
(C) dimension of beads
(D) flow of cells through the chamber

150. The decrease in apparent viscosity of a liquid with increasing shear rate, is known as
(A) dilatant
(B) pseudoplastic
(C) casson body
(D) bingham plastic

151. In heat transfer through a heat exchanger in co-current or counter-current flow, which of the assumptions is not correct ?
(A) The overall heat transfer coefficient (U) is constant
(B) Temperature difference between hot and cold fluid should not be high
(C) Heat losses from the system is negligible
(D) The system is at steady state

152. Growth yield coefficient of microbes is defined as
(A) amount of substrate consumed/amount of cell mass formed
(B) specific growth rate/specific rate of substrate utilization
(C) specific growth rate/specific rate of product formation
(D) specific rate of substrate utilization/ specific rate product formation.

153. If the separation factor of two different centrifuges for a particular solid suspension is same, which of the following will be true?
(A) The applied centrifugal force for the two centrifuges are same
(B) The relative centrifugal force for the two centrifuges are same
(C) The relative centrifugal force for the two centrifuges are not same
(D) The applied centrifugal force for the two centrifuges are not same

154. Which of the following strategies is not adopted to minimize secretion of acetate in a recombinant protein producing *E. coli* ?
(A) Converting acetyl CoA to acetoin
(B) Altering the rate of glucose transport inside the cell
(C) Blocking the acetate synthesis pathway
(D) Increasing the flux in pentose phosphate pathway

155. In general, the critical dilution rate (D_c) in a chemostat is
(A) higher than μ_m
(B) less than μ_m
(C) equal to μ_m
(D) not related to μ_m

156. In microbial cultivation, the expression for product synthesis $r_p = \alpha\mu X + \beta X$ denotes
(A) Growth associated
(B) Non growth associated
(C) Impaired growth associated
(D) Mixed growth associated

157. In autocatalytic reactions,
(A) one of the reactants acts as a catalyst
(B) one of the products acts as a catalyst
(C) catalysts have very high selectivity
(D) both reactants and products act as catalyst

158. Rate of absorption of a sparingly soluble gas in a liquid can be increased by
(A) increasing the gas side mass transfer coefficient
(B) decreasing the gas side mass transfer coefficient
(C) increasing the liquid side mass transfer coefficient
(D) decreasing the liquid side mass transfer coefficient

159. Concentration of limiting substrate can be maintained at a very low level in
(A) fed batch culture
(B) batch culture
(C) both batch and fed batch culture
(D) plug flow culture

160. In microbial fermentation, factor which does not affect cellular oxygen demand is
(A) type of microorganism
(B) culture growth phase
(C) nature of carbon source
(D) fermenter design

161. Aqueous two phase extraction system has a combination of
(A) two water soluble polymers or a polymer and salts in water below critical concentration
(B) two water soluble polymers or a polymer and salt in water above critical concentration
(C) two water insoluble polymers or a polymer and salt in water above critical concentration
(D) two water soluble polymers or a polymer and salt in two immiscible liquid

162. Which one of the following systems should be adopted to resolve a mixture of antibiotic and an impurity with partition coefficient 6 and 2, respectively,
(A) cocurrent extraction system with polar solvent
(B) counter current extraction system with polar solvent
(C) cocurrent extraction system with nonpolar solvent
(D) counter current extraction system with nonpolar solvent

163. Which type of filtration equipment, especially with precoat is classically used for the removal of mycelial cell?
(A) Micro filtration
(B) Centrifugal filtration
(C) Ultra filtration
(D) Rotary vacuum filtration

164. BOD of distillery waste water (mg/l) is approximately
(A) 15,000-20,000
(B) 350
(C) 550
(D) 4000-7000

165. The dissolved oxygen concentration during the measurement of K_La by sodium sulphite method is
(A) zero
(B) maximum
(C) 10 mg/ml
(D) minimum

166. In reactions with immobilized enzymes/whole cells, one generally measures
(A) True reaction rate
(B) Observed reaction rate
(C) Both true and observed reaction rates
(D) True reaction rate in the beginning and then observed reaction rate

167. Use of eutomer is always desirable for drug synthesis as it
(A) is more soluble in body fluids
(B) is less expensive compared to distomer
(C) has direct access to cell receptors
(D) slowly recognizes the drug target

168. Biogenerics or follow-on protein drugs are defined as any
(A) natural protein or nucleic acid drugs
(B) genetically engineered protein or nucleic acid drugs
(C) protein or nucleic acid or carbohydrate drugs
(D) active pharmaceutical ingredients (API)

169. Which statement is correct in the biotransformation of prochiral ketones to the desired enantiomeric alcohol?
(A) The enantiomeric excess should be maximum
(B) The conversion should be maximum
(C) Both the conversion and the enantiomeric excess should be maximum
(D) The conversion should be maximum with lowest enantiomeric excess

170. Which order of reaction it follows when one measures the activity of an enzyme using a standard protocol?
(A) Zero order reaction
(B) First order reaction
(C) Second order reaction
(D) Mixed order reaction

171. One cannot estimate the volumetric oxygen transfer coefficient (K_La) by dynamic gassing method if the organism is
(A) micro aerophilic
(B) obligate aerobe
(C) chemolithotrophic
(D) highly aerobic

172. Sterilization of oil using steam is a process involving
(A) wet heat
(B) moist heat
(C) dry heat
(D) both dry heat and wet heat

173. The byssus threads produced by the mussel, *Mytilus edulis*, is composed of
(A) A complex biopolymer made of polysaccharides resembling chitinaceous and gelatin like material with extensive substitution.

(B) A bundle of water resistant threads made of cellulose containing substituted ester, ether and alkoxyl groups.
(C) A mixture of different types of adhesive proteins with a high proportion of DOPA (3,4-dihydroxyphenyl-L-alanine).
(D) A bundle of threads made of fucoidin that is water resistant

174. *Riftia pachyptila*, a vestimentiferan, present only near the hydrothermal vent systems obtain their primary nutrition
(A) from the decomposing detritus on which the tubeworm grows
(B) from the organic molecules synthesized by the chemosynthetic bacteria that oxidize hydrogen sulfide, using dissolved oxygen from water.
(C) from the planktons that are ingested with the help of plume.
(D) by trapping marine snow that descend from photic zone using plume.

175. The role of oceanic Dimethyl sulfide (DMS) emitted by phytoplankton in influencing earth's climate may be attributed to the fact that
(A) DMS produces sulfate aerosols that act as cloud condensation nuclei which in turn reflect incoming solar radiation.
(B) excessive DMS traps heat contributing partly to global warming.
(C) DMS reacts with atmospheric CO_2 to form organosulfur compounds such as DMSO and sulpholane which has the characteristic smell of decaying organic matter (carbon sink).
(D) The acidification of sea water due to production of sulfuric acid as a by-product due to oxidation of DMS in seawater acts as carbon sink.

176. The most abundant photopicoplankton that has the capability to grow in oligotrophic niches of oceans under low-light or high light conditions is
(A) *Synechococcus* sp.
(B) *Prochlorococcus* sp.
(C) *Nodularia* sp.
(D) *Oscillatoria* sp.

177. One of the following statements is false with regard to the DsRed and GFP.
(A) GFP was isolated from *Aquorea* jelly fish whereas DsRed was isolated from *Dicosoma* coral.
(B) DsRed has higher extinction coefficient and greater resistance to pH extremes in comparison to GFP.
(C) Unlike DsRed, GFP forms oligomers *in vivo* leading to drop in fluorescence signal.
(D) Both proteins have beta-can structure that confer stability to protein

178. Electro-mineral accretion is a process of
(A) applying a low voltage current to a metallic structure in ocean leading to crystallization of limestone on which coral planulae can attach and grow.
(B) *in vitro* method of isolating trace minerals from seawater by applying suitable potential difference across the electrodes.
(C) Dissolution of minerals from sea bed rocks by applying high electrical current (instead of blast in deep sea that damages marine life) promoting easier drilling activity for oil extraction.
(D) Depositing a layer of mineral on ocean floor for promoting spawning of some marine fishes.

179. The neurotoxin that is produced by marine dianoflagellates and is responsible for paralytic shell fish poisoning in humans by acting on voltage-gated sodium channels of nerve cell is
(A) Shigatoxin
(B) Saxitoxin
(C) Amatoxin
(D) Gliotoxin

180. The SAR11 clade is
(A) A lineage of bacteria belonging to alpha-proteobacteria that is extremely common in ocean around the world.
(B) A clade consisting of 11 sulfate assimilating *rhodobacter* species observed in deep sea environment.
(C) A marine *Roseobacter* clade comprising several genera of marine bacteria
(D) Name of a south Asian research vessel for conducting studies in Indian ocean.

181. Which of the following factors is not responsible for coral bleaching?
(A) 1-2°C rise in ocean temperature for 5-6 weeks.
(B) 3-5 °C decline in ocean temperature for 5-10 days.
(C) Increase level of CO_2 in seawater.
(D) Overgrazing by manta ray and snapper fish.

182. The true source of tetradotoxin production reported in puffer fish, porcupine fish and polyclad flat worm is attributed to
(A) Small cone snails attached to puffer fish.

(B) Presence of *Microbulbifer elongatus* in digestive tract.
(C) Presence of *Vibrio alginolyticus*.
(D) *Stachybotrys chartarum* a known pathogen infecting above organisms.

183. Cameleons are
(A) Coral reef associated fish that change colour depending on the color of corals.
(B) Chimeric protein consisting of calmodulin and mutant GFP.
(C) Fluorescent proteins isolated from *Demospongiae* that depict different color fluorescence depending on the presence of metal ions.
(D) Deep sea spotted Rat fish which puffs up mimicking a puffer fish to ward off predators.

184. Scombrotoxic fish poisoning is due to
(A) histamine and histamine-like products generated in fin-fishes due to contamination by members of *Enterobacteriaceae* family.
(B) toxins produced by *Noctiluca* that resides commonly in fishes.
(C) toxin generated by *Shigella flexneri*
(D) toxin generated by *Clostridium botulinum*

185. Beta-glucan, a structural element in fungal cell walls has been used in fish aquaculture
(A) as an immunostimulant
(B) to stimulate natural bacterial flora for bioremediation of waste matter.
(C) for inhibiting bacterial cell wall synthesis and thus preventing their growth.
(D) as a bioflocculant for precipitaton of waste in aquaculture ponds.

186. "Crabyon" an anti-smell, non-allergic soft fibre used in sports- wear is a blend of
(A) Crab shells and rayon.
(B) Modified chitosans.
(C) Crustacean shells and calcium.
(D) Chitin and Cellulose

187. Giant bacteria are normally associated with sulphur compounds however the only species so far reported to store calcite in their cells is
(A) *Thiomargarita* sp.
(B) *Epulopiscium* sp.
(C) *Achromatium* sp.
(D) *Thioploca* sp.

188. Halocins isolated from halophilic archae can be exploited as
(A) Sunscreen agent
(B) Protein antibiotics
(C) Enzyme stabilizers
(D) Skin moisturisers.

189. A psychrophilic organism which confers pink color to snow and is referred as snow algae
(A) *Ulva latuca*
(B) *Polaromonas* sp.
(C) *Chlamydomonas nivalis*
(D) *Achromobacter* sp.

190. The model marine organism that is widely used in assay system for the detection of antifouling substance is
(A) *Mytilus edulis*
(B) *Crassostrea* sp.
(C) *Peneaus monodon.*
(D) *Sardinella longiceps*.

191. A novel group of archaea isolated from the hydrothermal vent and responsible for setting the upper temperature threshold for known life to 113°C is
(A) *Thermus thermophilus*
(B) Pyrolobus fumarii.
(C) *Pyrococcus furiosus*
(D) *Spirochaeta americana*

192. Which one of the following property is not associated with *Halomonas salaria*, a piezophile?
(A) Require a pressure of 1000 atm.
(B) Grows at temperature of 3^{o}C.
(C) They require complete darkness for growth.
(D) They have an efficient DNA repair mechanism that function at high pressure.

193. Thraustochytrids
(A) have been shown to contribute to red tide formation
(B) have been recently isolated from deep sea hydrothermal vents and are a potential marine bacterial source of bioactive compounds
(C) are a class of marine osmoheterotrophic protists
(D) comprise of a newly identified group of filamentous algae known to uniquely produce polyunsaturated fatty acids.

194. The technique of estimation of chlorophyll in water bodies through remote sensing satellites uses electromagnetic radiations in the approximate wavelength range
(A) 1 to 100 cm
(B) 10^{-5} to 10^{-4} cm
(C) 10^{-9} to 10^{-12} cm
(D) 1 to 10 nm

195. The high concentration of myoglobin in marine mammals allows them to
(A) respire at a lower rate
(B) remain underwater for longer periods of time
(C) reduce the effects of osmotic pressure due to extra oxygen load in their body
(D) with stand large changes in CO2 concentration in muscle.

196. Which of the following mixture of organisms could be cultured to demonstrate integrated multi-trophic aquaculture for treatment of effluent rich in nitrogen and phosphorous?
(A) Phytoplankton-*Porphyra yezoensis*-*Phythium porphyrae*
(B) Phytoplankton-shell fish (oyster and clams)-Marine fishes.
(C) *Gracilaria corticata*-star fish-clams.
(D) Phytoplanktons-starfish-catfish.

197. Which of the following statements is false with regards to zooanthids.
(A) they feed by photosynthesis as well as by capturing planktons and particular matter from ocean.
(B) Some of them produce palytoxin which is the most toxic organic compound in world.
(C) Some zooanthids often grow on other invertebrates.
(D) All zooanthids harbor phytoplankton *coccolithophore* for photosynthesis.

198. Carbon sequestration in ocean relates to
(A) technique of iron fertilization to encourage phytoplankton growth which would remove carbon from atmosphere over a period of time.
(B) mechanism by which the carbon from bacteria and phytoplankton is recycled by lytic marine bacteriophage.
(C) formation of marine snow that is transported from photic zone to deep sea by ocean upwelling.
(D) study of the intricate food web chain in the marine ocean.

199. Which of the following statements is true regarding Shigella dysentery?
(A) Shigella infection is an invasive disease
(B) Shigella bacterial invasion lead to dissemination of bacteria to different organs
(C) Large number of bacteria is required to cause the disease
(D) Infection with Shigella bacilli will always cause symptomatic infection

200. Which of the following conditions promotes tumour growth?
(A) increased expression of MHC
(B) increased expression of Th2 cytokines
(C) increased expression of co-stimulatory molecules
(D) decreased expression of CTLA-4

201. Ciprofloxacin specifically cleaves
(A) nuclear DNA
(B) apicoplast DNA
(C) both nuclear and apicoplast DNA
(D) mitochondrial DNA

202. The aggregating peptides/proteins in the diseased conditions contain extensive
(A) Alpha-helical segments
(B) beta-sheet conformation
(C) random structures
(D) beta-helices

203. First successful vaccine against cancer has been prepared for
(A) Oral cancer
(B) Cervical cancer
(C) Breast cancer
(D) Colon Cancer

204. Recently gene therapy for mutated gene has been experimentally proven in mouse utilizing
(A) Winged P elements
(B) Cre-Lox system
(C) Non-homologous recombination
(D) Ac-Ds element

205. Leukemia inhibiting factor has been utilized in animal cell culture for
(A) Stimulating growth of cells
(B) Differentiation
(C) Mophogenesis
(D) Arrest cells at mitosis

206. Which is least likely to occur for removal of cancer cells?
(A) T-cell based cytotoxicity
(B) Complement fixation
(C) Autophagy
(D) Phagocytosis

207. The virus inserted in genome can be recognized by
(A) FISH
(B) Northern blot
(C) Microarray
(D) Southern blot

208. Unsynchronized signals in EEG are generated during
(A) Deep Sleep
(B) Active and non-quite
(C) Slow wave but quite sleep
(D) REM sleep

209. The vector responsible for JEV is
(A) *Culex tritaeniorhynchus*
(B) *C. pusillus*
(C) *C. pipiens*
(D) *C. jenseni*

210. Which of the following types of necrosis is found in granulomatous lesions of pulmonary tuberculosis
(A) Coagulative
(B) Liquifactive
(C) Caseous
(D) Fat

211. The accumulation of pus in thoracic cavity is called as
(A) Hydrothorax
(B) Haemothorax
(C) Pyothorax
(D) Patchythorax

212. In which of the following conditions testes do not descend and are retained in the abdominal cavity?
(A) Cryptorchidism
(B) Hypochondrism
(C) Orchitis
(D) Prostate cancer

213. Which of the following cells form multinucleated giant cells in chronic inflammations?
(A) Neutrophils
(B) Macrophages
(C) Eosinophils
(D) Lymphocytes

214. Which of the following is not true about Macrophages?
(A) Macrophages have longer lifespan than neutrophils.
(B) Macrophages at inflammatory sites are responsible for phagocytosis of cellular debris and help in keeping the tissue clean.
(C) Macrophages contain many lysosomes and have cytoplasmic extensions called "pseudopodia".
(D) Macrophages appear at the site of inflammation earlier than neutrophils.

215. Which of the following conditions do not have exudates?
(A) Pus
(B) Catarrhal inflammation
(C) Serous inflammation
(D) Granulomatous inflammation

216. Viral infections in the central nervous system are usually associated with
(A) Suppurative exudation
(B) Serous exudation
(C) Fibrinous exudation
(D) Lymphocytic exudation

217. Which of the following is not used as anti-coagulant?
(A) Trisodium citrate
(B) Tripotassium ethylenediamine tetraacetic acid
(C) Trisodium chloride
(D) Heparin

218. The anemia with increase in size of RBC with reduced haemoblobin concentration is termed as
(A) Microcytic hypochromic anemia
(B) Normocytic hypochromic anemia
(C) Microcytic normochromic anemia
(D) Piglet anemia

219. The highly pathogenic Avian Influenza in chickens is caused by
(A) Avian Paramyxovirus
(B) (B)Avian Morbilivirus
(C) Avian Orthomyxovirus
(D) (D)Avian Pestivirus

220. Hump sore in cattle is caused by
(A) Parafilaria bovicola
(B) Dirofilaria immitis
(C) Stephanofilaria assamensis
(D) Stephanurus dentatus

221. *Bunostomum trigonocephalum* is the hookworm of
(A) Cattle
(B) Dog
(C) Cat
(D) Sheep and goat

222. Dick test is used to detect susceptibility for
(A) Tetanus
(B) Diphtheria
(C) Sore throat
(D) Scarlet fever

223. Which artery is commonly involved in MI?
(A) Right coronary artery
(B) Anterior interventricular branch of left coronary artery
(C) Posterior interventricular branch of left coronary artery
(D) Circumventricular artery

224. Sub acute combined degeneration is a manifestation of
(A) Vitamin B12 deficiency
(B) Folic acid deficiency
(C) Iron deficiency Anemic
(D) Biotin deficiency

225. An egg cell in a plant has 12 chromosomes. In the seed of the same plant, cells of embryo and endosperm will show the following number of chromosomes, respectively
(A) 12 and 24
(B) 24 and 36
(C) 36 and 24
(D) 24 and 48

226. A human male (XY) carrying an allele for a trait on the X chromosome is
(A) hemizygous
(B) homozygous
(C) heterozygous
(D) monozygous

227. "Living fossils" are the
(A) organisms which have become fossilized in recent geological era.
(B) organisma that have become fossilized recently and all the structural proteins are not yet completely denatured.
(C) ancient organisms persisting to modern times without further morphological evolution.
(D) ancient organisms persisting to modern times with further morphological evolution.

228. In animal kingdom, the group amniota includes
(A) birds and reptiles
(B) birds and mammals
(C) reptiles and mammals
(D) reptiles, birds and mammals

229. A female rat homozygous for a recessive X-linked mutation is mated to a male with wild type phenotype. The phenotypes of the F1 progeny will be
(A) all wild type
(B) 50% mutant irrespective of sex
(C) all females wild type and all males mutant
(D) all males wild type and all females mutant

230. Red green colour blindness is X-linked in human. If a male is red green colour blind and both parents have normal colour vision, which of the male's grandparents is most likely to be red green colour blind ?
(A) maternal grandmother
(B) maternal grandfather
(C) paternal grandmother
(D) paternal grandfather

231. If an individual was producing dicentric chromosome you would suspect
(A) a deletion
(B) a duplication
(C) an inversion
(D) a translocation

232. What is the difference between RefSeq and GenBank?
(A) RefSeq includes publicly available DNA sequences
(B) GenBank includes nonredundant curated data
(C) GenBank sequences are derived from RefSeq
(D) RefSeq sequences are derived from GenBank

233. Hemoglobin, myoglobin and globin v protein sequences will be stored in PIR-PSD database as a
(A) Sub-family
(B) Superfamily
(C) Group
(D) GenPept

234. The method of maximum parsimony is also known as
(A) Maximum evolution method
(B) Minimum evolution method
(C) Zero evolution method
(D) Moderate evolution method

235. The pI calculated from the sequence may differ from the experimentally determined value because
(A) pI is not accurately determined experimentally
(B) pKa of the amino acid side chains depend on the micro structural environment
(C) pI calculation from the sequence does not take the N and C termini into account
(D) pH is not known theoretically

236. Which of these sets of amino acids are not capable of forming hydrogen bonds through their side chains
(A) Val, Ile, Phe
(B) Trp, Tyr, His
(C) Ser, Thr, Asn
(D) Arg, Lys, Asp

237. Hydrogen bonds in anti parallel β-sheets
(A) occur in more number than van der Waals interactions
(B) are not present at Phe residues
(C) occur roughly perpendicular to the polypeptide chain direction
(D) are about five Angstroms in length

238. The hydrophobic moment is
(A) Zero for amphiphilic secondary structures
(B) Negative for amphiphilic secondary structures
(C) Positive for amphiphilic secondary structures
(D) Indeterminate for amphiphilic secondary structures

239. Generally ---- puckered sugar residues are found in A-DNA structures.
   (A) C3'-Exo
   (B) C3'-Endo
   (C) O4'-Exo
   (D) C4'-Endo

240. Arrange the three residues, glycine, phenylalanine and proline, in the decreasing order of backbone flexibility
   (A) Gly > Phe > Pro
   (B) Pro > Gly > Phe
   (C) Phe > Pro > Gly
   (D) It is not possible to comment

241. The number of different isomers of a pentose sugar (saccharide) are
   (A) 4
   (B) 8
   (C) 16
   (D) 32

242. The term k in the following energy expression $E = ½ k (b-b_o)^2$ represents
   (A) van der Waals radius
   (B) Stretching constant for bond length variation
   (C) Torsional potential
   (D) Kinetic energy of an atom

243. Energy minimization can be employed as a technique for
   (A) Studying receptor binding kinetics
   (B) Optimizing molecular geometry
   (C) Converting a straight chain of a polypeptide to its tertiary structure
   (D) Decreasing the size of a molecule

244. The term 'N50' in the area of genome assembly refers to
   (A) The largest value of *n* for which 50% of the basepairs in the bin is in supercontigs with length *n* basepairs or longer
   (B) The smallest value of *n* for which 50% of the basepairs in the bin is in supercontigs with length *n*10* basepairs or longer
   (C) 50% of bases in the whole genome
   (D) 50% of correct bases in the whole genome

245. Methotrexate, an analogue of dihydrofolate, is an inhibitor of dihydrofolate reductase. Methotrexate would be expected to
   (A) Decrease the Vm of the enzyme
   (B) Increase the Km of the enzyme for the substrate
   (C) Decrease both the Km and Vm of the enzyme
   (D) Increase the affinity of the enzyme for the substrate

246. Principal components analysis (PCA)
   (A) Minimizes entropy to visualize the relationships among genes and proteins
   (B) Can be applied to test the hypothesis of gene expression data from microarrays
   (C) Can be performed by agglomerative or divisive strategies
   (D) Reduces highly dimensional data to show the relationships among genes or among samples

247. The biggest problem in predicting protein coding genes from genome sequencing algorithm is that
   (A) The software is difficult to use
   (B) The false negative rate is high; many exons are missed
   (C) The false-positive rate is high; many exons are falsely assigned
   (D) The false-positive rate is low; many exons have unknown function.

248. Artificial intelligence technique is used to predict secondary structure of globular protein. Which of the following methods uses this technique to predict secondary structures of globular proteins?
   (A) Chou and Fasman
   (B) GOR
   (C) PHD
   (D) Ab-initio

249. The bacterial genome of size 2MB is being sequenced with a read size of 650 bases and coverage of 99%. What is the minimum number of times random reads need to be generated?
   (A) 8 x 2MB
   (B) 4 x 2MB
   (C) 2 x 2MB
   (D) 16 x 2MB

250. Large RNA molecules show greater backbone conformational variation than DNA double helices because of
   (A) Presence of unusual modified bases
   (B) The occurrence of single stranded regions
   (C) The presence of ribose sugar
   (D) Presence of triplex regions