SECTION – A

1. From a group of 7 women and 6 men, 5 persons are required to form a selection committee in which at least 3 women should be there. How many are the possibilities?
   (a) 765
   (b) 657
   (c) 567
   (d) 756

2. Two trains, one from Delhi to Pune and the other from Pune to Delhi, start at the same time from their respective stations. After they meet, the trains reach their appropriate destinations after 4 hours and 9 hours respectively. The ratio of their speeds is:
   (a) 9:4
   (b) 3:2
   (c) 4:3
   (d) 5:4

3. A container has a mixture of kerosene and water in a ratio of 7 : 5. When 9 litres of mixture are taken off and the container is filled with 9 litres of water, the ratio between kerosene and water becomes 7 : 9. How many litres of kerosene were initially in the container?
   (a) 11
   (b) 16
   (c) 21
   (d) 4. 26

4. The missing number in the series 40, 120, 60, 180, 90,_____, 135 is:
   (a) 110
   (b) 270
   (c) 105
   (d) 210

5. If a rectangle was called a circle, a circle a point, a point a triangle and a triangle a square, the shape of a wheel would be a:
   (a) Rectangle
   (b) Circle
   (c) Point
   (d) Triangle

6. Six persons A, B, C, D, E and F are standing in a circle facing the centre of the circle. B is between F and C, A is between E and D, F is to the left of D. Who is between A and F?
   (a) B
   (b) C
   (c) D
   (d) E

7. The molecular weight of a protein is 30 kDa. The minimal length of mRNA encoding this polypeptide will be close to:
   (a) 800
   (b) 900
   (c) 1000
   (d) 4. 300

8. What is the amount of protein required to prepare 5 ml of 1μM solution (Mol. Wt. Of protein is 25 kDa)?
   (a) 125 μg
   (b) 2. 125 ng
   (c) 3. 250 μg
   (d) 4. 12.5 μg

9. Calculate the concentration of NADH solution, whose A340nm = 0.8 O.D. (optical path length is 10 mm, NADH molar extinction coefficient is ℾ340 = 6220):
   (a) 128.6 μM
   (b) 12.86 nM
   (c) 1.286 μM
   (d) 1.28 nM

10. Identify the pair that best expresses the relationship similar to that expressed in: MENTOR: GUIDANCE:
(a) Philanthropist: Arguments
(b) Philosopher: Donation
(c) Physician: Treatment
(d) Physicist: Succour

11. If counting was done in base 5 (instead of 10) so that 5 (in base 10) would be written as 10 (in base 5), 6 (in base 10) would be written as 11 (in base 5), then 89 (in base 10) will be written as which of the following numbers in base 5?
(a) 234
(b) 324
(c) 423
(d) 432

12. If there are 3 children in a family, then the probability that there is only one girl child in the family is:
(a) 2/3
(b) 1/3
(c) 3/25
(d) 3/8

13. A students average marks (arithmetic mean) on three tests is 80. Which of thefollowing **CANNOT** be the number of tests on which (s)he earned exactly 80 marks?
(a) 0
(b) 1
(c) 2
(d) 3

14. If 0<a<b<1, which of the following is **INCORRECT**?
(a) a-b < 0
(b) $\frac{1}{ab} > 1$
(c) $\frac{1}{b} - \frac{1}{a} > 0$
(d) $ab < \frac{a^{2+}b^2}{2}$

15. If 25% of 260 equals 6.5% of 10^a, what is a?
(a) 0
(b) 1
(c) 2
(d) 3

16. Complete the following sentence from the options provided. Few other plants can grow beneath the canopy of a tree, whose leaves and pods produce a natural herbicide that leaches into the surrounding soil, other plants that might compete for water and nutrients:

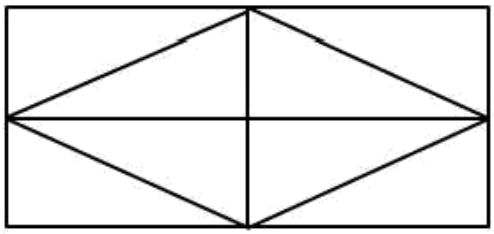
(a) Inhibiting
(b) Distinguishing
(c) Nourishing
(d) Refreshing

17. The data below are from a Meselson-Stahl type of experiment. Which model of DNA replication is supported by the results shown in the table below?

Generation	% Heavy DNA	% Hybrid DNA	% light DNA
1	100	0	0
2	50	0	50
3	25	0	75
4	12.5	0	87.5

(a) DNA replication is semi-conservative
(b) DNA replication is conservative
(c) DNA replication is dispersive
(d) DNA replication is random

18. How many triangles are present in this figure?



(a) 8
(b) 10
(c) 12
(d) 14

19. A man goes to the house of Sita, who is the neighbor of Geeta, who has a daughter named Meera. Ashu is Aman's father and is married to Anjali, who is sister of Geeta. How is Meera related to Anjali?
(a) Niece
(b) Cousin
(c) Sister
(d) Aunt

20. What will come in place of (*) in the following number series? 19, 26, 40, 68, 124 (*)?
(a) 256
(b) 238
(c) 246
(d) 236

21. Fifty-three percent of a number is 358 less than the square of 26.What is the value of three-fourth of 23 per cent of that number?
(a) 109.5
(b) 113.5
(c) 101.5
(d) 103.5

22. A cube is painted on all sides using yellow and black color such that opposite faces are painted in different color. This cube is cut into 27 smaller cubes of equal sizes. How many smaller cubes will have only one face colored?
(a) 3
(b) 2. 6
(c) 8
(d) 12

23. A man fills a basket with eggs in such a way that the number of eggs added on each successive day is the same as the number already present in the basket. This way the basket gets completely filled in 24 days. After how many days the basket was 1 / 4th full?
(a) 6
(b) 12
(c) 17
(d) 22

24. Seema goes 30 km towards North from a fixed point, then after turning to her right she goes 15 km. After this she turns right again and goes another 30 km. How far and in what direction is she from her starting point?
(a) 45 km East
(b) 15 km East
(c) 45 km West
(d) 15 km West

25. Find the odd one out:
(a) 77
(b) 36
(c) 65
(d) 3

26. Th1 response is characterized by the secretion of which of the following combinations of cytokines?

(a) IL4 and IL17
(b) IFN – γ and IL 12
(c) IL1 – β AND IL12
(d) IFN – γ

27. In hybridoma production, aminopterin is added after fusion to:
(a) Ensure monoclonality of the cultures that survive .
(b) Cause the death of non -antibody secreting hybrids.
(c) Cause the death of unfused myeloma cells.
(d) Cause the death of unfused splenic cells.

28. An alpha-helical conformation of a globular protein can be determined by:
(a) Atomic force microscopy.
(b) Electron microscopy.
(c) Ultraviolet-visible absorbance spectroscopy.
(d) Circular dichroism.

29. The athymic nude (nu/nu) mice are difficult to breed and maintain because the homozygous (nu/nu) females are sterile. How will you propagate it to get maximum nude (nu/nu) mice progeny?
(a) By mating of normal males to heterozygous (nu/+) females.
(b) By mating homozygous (nu/nu) males to heterozygous (nu/+) females.
(c) By mating of heterozygous (nu/+) males to heterozygous (nu/+) females.
(d) By mating of heterozygous (nu/+) males to normal females.

30. The base sequence of a short piece of DNA is AGCTTACG. During replication, a transition mutation occurs in the complementary strand synthesized on this piece of DNA. Which of the following is mutated complementary strand?
(a) T C G A A T C G
(b) T C G A A T G C
(c) C G C G A G C T
(d) U C G A A G U C

31. Uncoupling of LDL receptors with their ligands occur at which of the following compartments?
(a) Late endosome
(b) Recycling endosome
(c) Early endosome
(d) Lysosome

32. Transport of cargo from nucleus to cytoplasm through nuclear pore is regulated by:
(a) Ras GTPase
(b) Rab GTPase
(c) Rho GTPase
(d) Ran GTPase

33. Which one of the following is a cobalt containing vitamin?
(a) Vitamin B2
(b) Vitamin B4
(c) Vitamin B6
(d) Vitamin B12

34. Brefeldin A inhibits protein transport from:
(a) ER to Golgi apparatus
(b) Golgi apparatus to ER
(c) Golgi apparatus to nucleus
(d) Golgi apparatus to mitochondria

35. Which one of the following diseases is caused by a bacteria?
(a) Measles
(b) Tetanus
(c) Marek's disease
(d) Mumps

36. Which one of the following antibiotics is used to demonstrate the new/fresh protein synthesis in response to an inducer/ upon induction in a microbial system?
(a) Chloramphenicol
(b) Carbenicillin
(c) Ampicillin

(d) Tetracyclin

37. Both somatic hypermutation and isotype switching depend upon a highly specific enzyme of adaptive immunity that is made only by B cells proliferating in response to antigen. The name of the enzyme is:
(a) Rag1 recombinase
(b) Activation induced cytidine deaminase
(c) Terminal deoxynucleotidyl transferase
(d) Cre recombinase

38. AGO proteins are associated with:
(a) Histone complex
(b) RNAi effector complex
(c) SOS mechanisms
(d) Tryptophan operon

39. The fusion between protoplasts can be enhanced by subjecting them to:
(a) High temperature
(b) Low temperature
(c) High electric current
(d) High light intensity

40. If a nucleotide sequence encoding a protein is known and a homologous protein to be identified, which of the following will be the best analysis tool?
(a) BLASTp
(b) BLASTn
(c) BLASTx
(d) tBLASTn

41. The concentration of which of the following plays an important role in somatic embryogenesis?
(a) NH4
(b) NO^-
(c) K^+
(d) PO^{3-}

42. Simple sequence repeats (SSRs) markers are derived from:
(a) Non-coding sequences only.
(b) Coding sequences only.
(c) Both coding and non-coding sequences.
(d) Only from promoter sequences.

43. Which of the following enzymes are required for making plant protoplasts?
(a) Cellulase and proteinase
(b) Cellulase and pectinase
(c) Cellulase and amylase
(d) Amylase and pectinase

44. The floral dip method is commonly used for:
(a) Proteomics
(b) Genetic transformation
(c) Crossing
(d) DNA isolation

45. Impeller Reynolds number is given by:
(a) DVp/μ
(b) D^2Np/μ
(c) D^2Vp/μ
(d) DNp/μ

46. Continuous cultivation is carried out in 10 L working volume. If 0.2 h^{-1} dilution rate has to be maintained, then the feed rate will be:
(a) 2L/h
(b) 400 mL/h
(c) 400 mL/min
(d) 5 L/h

47. If the doubling time of an organism is 0.693 h, the specific growth rate will be:

(a) 1 h-1
(b) 1 min^{-1}
(c) 0.1 h^{-1}
(d) 10 min^{-1}

48. Aeration in a fermentor is expressed as VVM. What will be the VVM if air is sparged at 2000 L/min with a working volume 10 m3?
(a) 0.2
(b) 0.5
(c) 1
(d) 1.2

49. Rate of centrifugation of a particle in a centrifuge is increased by:
(a) Decreasing the particle diameter.
(b) Increasing the centrifuge speed.
(c) Decreasing the density difference between the particle and liquid.
(d) Increasing the viscosity of suspended fluid.

50. In a batch process of solvent-solvent extraction, higher percentage of extraction is ensured when the whole solvent for extraction is added:
(a) Once at a time
(b) Twice in equal volume
(c) Thrice in equal volume
(d) Four times in equal volume

51. Which one of the following is TRUE during the separation of biomolecules by reversed phase chromatography ?
(a) Stationary phase is less polar than the mobile phase.
(b) Stationary phase is more polar than the mobile phase.
(c) Both the stationary and the mobile phase are having the same polarity.
(d) Polarity of the mobile phase does not play any role.

52. In ultrafiltration, identify which one of the following relationships between transmembrane pressure (TMP) and flux (F) is CORRECT
(a) For water, initially F increases with TMP and remains constant.
(b) For water, F always increases with TMP.
(c) For water, F always decreases with TMP.
(d) For water, initially F decreases with TMP and remains constant.

53. Identify the **INCORRECT** match:
(a) Koch-Germ theory.
(b) Pasteur-blood clotting theory.
(c) Halsted-modern surgical principles.
(d) Lavoisier-oxygen theory of combustion.

54. The first smallpox vaccine is an example of:
(a) Heat killed vaccine
(b) Chemically attenuated vaccine
(c) Live vaccine
(d) Vaccine with adjuvant

55. ELISPOT assay is traditionally used for measuring:
(a) Frequency of T cell responses
(b) Frequency of B cell responses
(c) Cytokine concentration in serum
(d) Antibody titre in serum

56. Fertility factor' is related to 'conjugation' in the same way as 'bacteriophage P1' to:
(a) Transformation
(b) Transduction
(c) Efflux
(d) Transposition

57. Hemorrhage in the brain tissue with loss of consciousness is known as:
(a) Hematoma
(b) Hemoptysis

(c) Hematemesis
(d) Apoplexy

58. Which one of the following methods is frequently used to create transgenic animals?
(a) Particle bombardment
(b) Nuclear micro-injection
(c) Nuclear fusion
(d) Nucleo-cytoplasmic transplantation

59. Which of the following is an atypical signaling receptor?
(a) Cytokine receptor
(b) Chemokine receptor
(c) T-cell receptor
(d) Mannose receptor

60. The critical regulatory site in the circuit of emotions is:
(a) Hippocampus
(b) Cingulate gyrus
(c) Amygdala
(d) Fornix

61. Which glial cells participate in the re-uptake mechanism of neurotransmitter from the synaptic cleft?
(a) Microglia
(b) Oligodendroglia
(c) Radial Glia
(d) Astroglia

62. Red data book contains data of ….
(a) All plant species
(b) All animal species
(c) Economically important species
(d) Threatened species

63. Conservation within the natural habitat is ……
(a) In situ conservation
(b) Ex situ conservation
(c) In vivo conservation
(d) Ex vivo conservation

64. MAB program stands for…
(a) Man and biotechnology
(b) Material and biology
(c) Man and biology
(d) Man and biosphere

65. Marine organisms that require oxygen levels typically in the range of 2-10 % for growth would be classed under:
(a) Facultative anaerobes
(b) Aerotolerant anaerobes
(c) Obligate aerobes
(d) Microaerophiles

66. Along which plate boundaries do the majority of the world's earthquakes occur?
(a) Divergent
(b) Transform
(c) Convergent
(d) Divergent as well as transform

67. Which of the following will increase the salinity of a particular area of coastal water?
(a) Thawing of ice
(b) Precipitation
(c) River input
(d) Freezing of water

68. An individual has the genotype AaBbccddEe. Assuming independent assortment what frequency of gametes will have the genotype abcde?
(a) 1/4
(b) 1/8
(c) 1/16
(d) 1/32

69. If the DNA content of a cell in G1 phase of cell cycle is 'C', what will be its content after meiosis is completed?
(a) ¼ C
(b) ½ C
(c) C
(d) 2C

70. Which type of chemical mutagen is incorporated into the genome by DNA polymerase during replication?
(a) Alkylating agents
(b) Base analogs
(c) Deaminating agents
(d) Intercalating agents

71. Which of the following constitutes a necessary and sufficient condition for two proteins to be considered homologous?
(a) The sequences of the proteins must show greater than 50% identity in a Global alignment.
(b) The sequences of the proteins must show greater than 50% identity in a local alignment.
(c) The proteins should have diverged from a common ancestor.
(d) The proteins should have very similar structure and function.

72. Boiling a mixture of butter, water and eggs, results in a homogenous suspension; However if the eggs are omitted, then the butter and the water separate out. Which component, present in the egg, is responsible for this behaviour?
(a) Albumin
(b) DNA
(c) Various salts of sodium and magnesium that are present in eggs
(d) Lecithin

73. Cooking meat in presence of cut pieces of Papaya fruit results in unusually tender meat. What enzyme, present in the Papaya fruit is responsible for this?
(a) Pepsin
(b) Papain
(c) Papase
(d) Papaverine

74. Which of the following peptide sequences will match the sequence motif GXX[SVP]XXG?
(a) PGQRVGGGR
(b) GPQRVGGGR
(c) PGQRQYGGGG
(d) PGQRFYGGPR

75. In Mass Spectroscopy, a qudrupole mass filter does which of the following?
(a) It makes possible the detection of four times larger ions than normal.
(b) It specifically filters out those complex ions that have two positive and two negative charges.
(c) It specifically allows ions with two positive and two negative charges and blocks the rest.
(d) It allows only those ions which have a specific m/z ratio to pass through.

SECTION – B

76. If maltose and monosodium flutamate (MSG) are added to a vinegar and palmitic acid and shaken, the mixture will eventually separate into two phases of different density and polarity. Where will most of the sucrose and the MSG be located following phase separation?
(a) Both will concentrate in the vinegar.
(b) Both will concentrate in the oil.
(c) Maltose will concentrate in the oil and MSG will concentrate in the vinegar.
(d) Maltose will concentrate in the vinegar and MSG will concentrate in the oil.

77. A slide of macrophage was stained by immunofluorescence using a monoclonal antibody for TAP1/TAP2 complex. Which of the following intracellular compartments would exhibit positive staining with this antibody?
(a) Cell surface

(b) Endoplasmic reticulum
(c) Golgi apparatus
(d) Mitochondria

78. Which of the following disorder is **NOT** X-linked?
(a) Color blindness
(b) Rett syndrome
(c) Hutchinson muscular dystrophy
(d) Swyers syndrome

79. a-amanitin inhibits
(a) RNA polymerase I
(b) RNA polymerase II
(c) DNA polymerase I
(d) DNA polymerase II

80. Nullisomy is the term used for the condition when an organism has
(a) One additional chromosome than normal
(b) One less chromosome than normal
(c) Loss of one homologous pair of chromosome
(d) Loss of two heterologous chromosomes

81. Tunicamycin blocks
(a) N-linked glycosylation
(b) O-linked glycosylation
(c) Phosphorylation
(d) Methylation

82. Which of the following cannot be used in finding the interaction between miRNA and mRNA?
(a) TargetScan
(b) StarBase
(c) PAR-CLIP
(d) miranda

83. H1N1, H1N2, H2N1, H3N1 and H3N2 are subtypes of which influenza virus?
(a) Influenza A
(b) Influenza B
(c) Influenza C
(d) Influenza D

84. A mother and a father, both CF (crystic Fibrosis) carriers, have two children that do not suffer from CF. The probability of a third pregnancy producing a child with the disease is:
(a) None
(b) 1:4
(c) 1:3
(d) 1:1

85. The overall reaction catalyzed by the electron transport chain is:
(a) Glucose + ATP -> Glucose – 6 - phosphate + ADP.
(b) ATP + GDP -> ADP + GTP.
(c) NADH + H^+ +1/2 O2 -> NADP + H2O.
(d) ATP + H2O - ➔ ADP + H2PO4.

86. DNA polymerase III of E. coli is:
(a) Required for de nono synthesis of new stands of DNA.
(b) Involved in the repair of damaged DNA.
(c) Required to restart a replication fork.
(d) Involved DNA recombination.

87. The protection against smallpox afforded by prior infection with complex represents:
(a) Antigenic specificity
(b) Antigenic cross-reactivity

(c) Innate immunity
(d) Passive protection

88. Internalized antigens are targeted to which of the following compartments for peptide for presentation on the cell surface along with MHC molecule:
(a) Lysosomes
(b) Endosome
(c) Endoplasmic reticulum
(d) Golgi

89. In which receptor system, both receptor and ligand are recycled back to membrane?
(a) LDL receptor
(b) Mannose receptor
(c) Transferrin receptor
(d) Insulin receptor

90. GTP binding proteins are active in GTP bound form. Which of the following protein bound form to GDP bound form?
(a) Guanine nuncletotide exchange factor.
(b) GTPase activating protein.
(c) Guanine nucleotide dissociation inhibitor.
(d) Guanine nucleotide dissociation factor.

91. Which enzyme is used to remove the phosphate group from 5' end of the DNA?
(a) Polynucleotide kinase
(b) Terminal phosphoryl transferase
(c) Alkaline phosphatase
(d) Lyases

92. Which one of the following techniques is suitable for the large scale purification of isozymes (A and B) that are differing from each other by a single positive charged amino acid?
(a) Chromatofocusing
(b) Gel filtration chromatography
(c) Native PAGE
(d) Analytical isoelctric focusing

93. Glycogen and cellulose are
(a) Helical and beta-sheet structure, respectively.
(b) Helical structures but with different degree of helicity.
(c) Beta-sheet structures.
(d) Helical but glycogen is extensively branched molecule.

94. Which one of the following factors influences the binding of oxygen to hemoglobin?
(a) Concentration of HC0 3
(b) Partial pressure of oxygen
(c) Concentration of hemoglobin
(d) Concentration of 2,3-bisphosphoglycerate

95. Which one of the following DNA viruses has part of its life cycle involving Reverse which is a hallmark of Retroviruses?
(a) Epstein-Barr Virus
(b) Herpes Simplex Virus
(c) Hepatitis B Virus
(d) Hepatitis C Virus

96. Cells are broken to release the contents by using various enzymes. Which of the FALSE?
(a) Lysozyme-bacteria
(b) Cellulase - plant cell
(c) Chitinase - fungus
(d) Cellulase – bacteria

97. Which of the following enzymes is required to release the tension imposed by uncoiling of strands?
(a) Endonuclease
(b) DNA ligase
(c) DNA grase
(d) DNA helicase

98. DNA fingerprinting is based on:
(a) Occurrence of VNTR's
(b) Knowledge of human karyotype
(c) Cloned DNA
(d) Recombinant DNA

99. The DNA sequence is ATG. What would be the sequence of bases in anticodon of tRNA:
(a) CAU
(b) AUG
(c) UAC
(d) TAC

100. All except one of the following are TRUE about the protein kinase A (PKA) pathway:
(a) PKA phosphorylates proteins at serine or threonine residues.
(b) PKA phosphorylates proteins at tyrosine residues.
(c) PKA is activated by CAMP.
(d) PKA is activated by binding of epinephrine to a transmembrane receptor without enzyme activity.

101. A T-cytotoxic cell can be induced to mount a cytotoxic attack on a virus-infected cell if it binds to a cell displaying:
(a) Insufficient MHCI
(b) Insufficient MHCII
(c) MHC I bearing foreign antigen.
(d) MHC II bearing foreign antigen.

102. Testosterone hormone, necessary for spermatogenesis, is secreted by:
(a) Sertoli cells
(b) Leydig cells
(c) Spermatozoa
(d) Cowpers gland

103. Which of the following processes occurs in the formation of disulfide bridge between two cystiene residues?
(a) Reduction of sulfhydral group
(b) Electrostatic interaction
(c) Oxidation of sulfhydral group
(d) Hydrogen bond

104. In Ramchandran plot the values of dihedral angel (psi) is based on rotation around:
(a) N-C bond
(b) C-C' bond
(c) C'-N bond
(d) N-H bond

105. Which one of the following antibiotics attaches to 50S ribosome and inhibits peptidyl- transferase activity?
(a) Penicillin
(b) Chloramphenicol
(c) Trimethoprim
(d) Amphotericin

106. The cytological representation of Klinefelter syndrome is:
(a) 44A + XO
(b) 44A + XXO
(c) 44A +XXY
(d) 43A + XYY

107. A chromosome on which T-cell receptor alpha chain gene rearrangement has occurred following gene segments?
(a) Joining
(b) Diversity
(c) Variable
(d) Constant

108. Which one of the following molecule yields higher amount of free energy?
(a) Phosphoenolpyruvate
(b) Glycerate-1,3-bisphosphate
(c) Acetyl phosphate
(d) Phosohocreatine

109. Which region of mRNA contains Shine-Dalgarno sequence?
(a) 5'unstranslated region
(b) Protein coding region
(c) 3' unstranslated region
(d) Promoter region

110. $\alpha - D$ glucose and E – D glucose are:
(a) Epimers
(b) Keto - aldose isomers
(c) Anomers
(d) Optical isomers

111. Which of the following statements is **NOT TRUE** for eukaryotic DNA replication?
(a) It has multiple origins.
(b) It is synchronized to phases of cell cycle.
(c) It does not involve Okazaki fragment.
(d) It require licencing of pre-replicative complex.

112. In vitro characteristics of E. Coli DNA polymerase shows an error rate of $10^{-6} - 10^{-7}$ per base pair. However, in vivo the observed mutation rate is $10^{-9} - 10^{-10}$ per base. Such discrepancy is because?
(a) In vitro assays for DNA polymerase is less precise than in vivo assays.
(b) E. Coli has a mechanism of removing such erroneous incorporation of bases.
(c) The mechanism by which DNA polymerase amplifiers linear DNA used in vitro is different from that of circular DNA in vivo.
(d) The reason for such discrepancy is not known yet.

113. The molecular formulae of deoxyribose sugar and ribose sugar, respectively, are:
(a) C5 H10 O4 and C5 H10 O6.
(b) C5 H10 O4 and C5 H10 O5.
(c) C5 H10 O5 and C5 H10 O4.
(d) C5 H10 O5 and C6 H10 O4.

114. Usually intracellular pathogens avoid their transport to lysosome for their survival in which of the following intracellular pathogens survives in the lysosomes?
(a) Legionella
(b) Salmonella
(c) Mycobacterium
(d) Leishmania

115. When Hfr strain of E. coli is crossed with F^- strain, recombinant obtained are:
(a) Always F^+
(b) Always HFr^+
(c) Rarely F^+
(d) Rarely HFr^+

116. Archea is considered as a separate group from bacteria and eukaryotes, based on:
(a) Genome sequence.
(b) 16S rRNA gene sequence.
(c) 23S rRNA gene sequence.
(d) EFTu sequence.

117. How many grams of NaCl will be required to make 10 ml of 10 millimolar solution (MW of NaCl = 58.5):
(a) 0.5858
(b) 0.0585 g
(c) 0.00585 g
(d) 0.000585 g

118. Keratin intermediate filaments are synthesized in the cytoplasm of cells. Disulfide bonds **CANNOT** be formed in the cytoplasm. However, the keratin fibers in the skin are cross-linked by disulfide bonds. This is because?
(a) Keratin fibers get transported via endoplasmic reticulum and Golgi to the skin surface.
(b) Keratinocytes have an oxidizing cytosol.
(c) Keratin crosslinking happens in dead cells whose contents are oxidized.
(d) Secreted enzymes of the skin cells form the disulfide bonds after secretion of keratin.

119. Which of the following plays a role in changing the antigen binding site of a B cell after antigenic

stimulation?
(a) Junctional diversity
(b) Combinatorial diversity
(c) Germline diversity
(d) Somatic hypermutation

120. What region of an mRNA is most commonly associated with transcript destabilization?
(a) The 5' untranslated region
(b) The 3' untranslated region
(c) The exonic coding regions
(d) The intronic regions

121. Which type of replication requires a break in the nucleotide strand to get started?
(a) Theta replication
(b) Rolling circle replication
(c) Linear eukaryotic replication
(d) Theta and linear replication

122. Mismatch repair in bacteria distinguishes between old and new strands of DNA on the basis of:
(a) Differences in base composition of the two strands
(b) Modification of histone proteins
(c) Base analogs on the new strand
(d) Methyl groups on the old strand

123. Why does the Environmental Protection Agency closely monitors the release of transgenic bacteria used? for agricultural purposes?
(a) They want to monitor the destruction of crops by the GMOs.
(b) They want to observe the effect the GMOs have on crops.
(c) They want to ensure the GMOs do not proliferate in the environment and pose a threat to humans.
(d) They want to ensure that people are aware that GMOs may have played a role in the production of a. particular food product

124. Which of the following events occurs first in the differentiation sequence of human B cells in the bone marrow?
(a) Immunoglobulin light chain rearrangement.
(b) Immunoglobulin heavy chain rearrangement.
(c) Surface IgD and IgM present on the B cell.
(d) Surface IgM present on the B cell.

125. A zoo blot helps to detect DNA sequences that:
(a) Are mutation at a fast rate
(b) Are conserved between species
(c) Are lost due to species extinction
(d) Are processed pseudogenes.

126. Addition of which of the following can prevent the precious germination of the embryos during embryo culture?
(a) Cytokinin
(b) Sucrose
(c) Ammonium chloride
(d) Calcium chloride

127. Which of the following techniques can be used to create diploid homozygous plants in months to a year)?
(a) Cloning
(b) Anther culture
(c) Selfing
(d) Grafting

128. In plant tissue culture experiments, "conditioned medium" refers to a medium in which?
(a) All the nutrients are added in optimum concentration.
(b) All the nutrients are added in high concentration for luxuriant growth.
(c) Media in which the plant cells have been grown for about 48 hrs and cells are filtered out.
(d) Plant cells have been grown for about 48 hrs and new cell cultures are added to it.

129. An intron containing a-glucuronidase (gus-intron) is used as a reporter gene to assess plant transformation. The intron is introduced to:

(a) Prevent any expression in the bacterial cells.
(b) Stabilize the gus transcript.
(c) Allow for alternate splicing.
(d) Use it as a target for in situ hybridization for spatial localization of the transcript.

130. Which one of the following is TRUE about epigenetic changes?
(a) Changes are caused by deletion and are heritable.
(b) Changes are caused by mutation and are heritable.
(c) Changes are caused by mutation but are not heritable.
(d) Changes are caused by DNA methylation and are heritable.

131. A cross between two True breeding lines, one with dark blue flowers and the other flowers produces F1 offspring that are light blue. When the F1: blue to light blue to white flowers is results?
(a) Epistasis
(b) Incomplete dominance
(c) Co-dominance
(d) Inbreeding depression

132. In a tissue culture experiment, a student desires to have more differentiation of shoots. Which of the following plant growth hormone ratios should be used?
(a) High cytokinin to auxin
(b) High auxin to cytokinin
(c) High gibberellin to cytokinin
(d) High gibberellin to auxin

133. A yeast mutant shows decreased expression of 5.8S rRNA, 5S rRNA and cdc2 mRNA. In which of the following might mutation lie?
(a) TATA binding protein (TBP)
(b) Upstream binding factor (UBF)
(c) RNA polymerase III
(d) RNA polymerase I

134. Photosynthesis is a:
(a) Reductive, endergonic, catabolic process.
(b) Reductive, endergonic, anabolic process.
(c) Reductive, exergonic, catabolic process.
(d) Reductive, exergonic, anabolic process.

135. Which of the following statements about a genomic library is **INCORRECT**?
(a) The genomic library will be representative if they contain all the genes in an organism.
(b) The genomic library must be prepared from cDNA.
(c) The DNA must be fragmented to an appropriate size to be cloned in suitable vector.
(d) Genomic libraries should contain a minimum number of recombinant clones if they are to genes in an organism.

136. Which one of the following statements CORRECTLY describes the sequential steps in CDNA cloning?
(a) Reverse transcription of mRNA, second strand synthesis, cDNA end modification, ligation to vector synthesis, ligation.
(b) mRNA preparation, cDNA synthesis using reverse transcriptase, second strand synthesis using terminal transferase, ligation to vector.
(c) mRNA synthesis using RNA polymerase, reverse transcription of mRNA, second strand synthesis, ligation to vector.
(d) Double stranded DNA synthesis, restriction enzyme digestion, addition of linkers, ligation to vector.

137. Hygromycin B, generally used as a selection marker in plant transformation protocols is:
(a) An aminocyclitol antibiotic produced by Streptomyces hygroscopicus.
(b) An aminoglycoside bacteriocidal antibiotic isolated from the bacterium Streptomyces kanamyceticus.
(c) A beta-lactam antibiotic that is part of the amino-penicillin family and is roughly equivalent to amoxicillin in terms of activity.
(d) An ammonium butanoate antibody produced by Streptomyces hygroscopicus.

138. Which of the following statements about transcription in E. coli is CORRECT?
(a) The-10 sequence is always exactly 10 bp upstream from the transcription start site.
(b) The initiating nucleotide is always a G.
(c) The intervening sequence between -35 and -10 sequences is highly conserved.
(d) The distance between the -35 and -10 sequences is critical for transcription efficiency.

139. In an in vitro culture experiment the colour of explants turned brown just after 24 hours of sub-culturing This is due to the:
(a) Release of antioxidant from explants. contain all the
(b) Release of Phenolic compounds from explants.
(c) Deficiency of nutrients.
(d) Deficiency of hormones in the medium.

140. To avoid the somaclonal variation in the development of transgenic plants which one of the following is preferred?
(a) Direct regeneration.
(b) Regeneration through somatic embryos.
(c) Regeneration through calli.
(d) Regeneration through immature embryos.

141. The transplastomic lines have no risk of gene escape through pollens since the:
(a) Pollens degenerate before fertilization.
(b) Transformed mitochondrial DNA is lost during pollen maturation.
(c) Transformed chloroplast DNA is lost during pollen maturation..
(d) Transformed genomic DNA is maternally inherited

142. Among the following, which one is **NOT** a common method of haploid plant production?
(a) Embryo rescue of inter-specific crosses
(b) Anther culture
(c) Ovule culture
(d) Colchicine treatment

143. Which one of the following statements about the M13 bacteriophage is **INCORRECT**?
(a) It mediates transduction.
(b) It is a single-stranded DNA phage.
(c) It produces progeny without lysing the host cell.
(d) It is useful in sequencing strategies.

144. Which of the following are flowering hormones?
(a) Ethylene and florigen
(b) Florigen and vernalin
(c) Vernalin and Auxin
(d) Ethylene and Auxin

145. Which of the following genes are constitutively expressed and control the plant induced activation of other vir genes?
(a) vir A and vir G
(b) vir C and vir D
(c) vir A and vir B
(d) vir B and vir E

146. In case of gametophytic incompatibility system, the self incompatibility phenotype of the pollen is determined by:
(a) Haploid genotype of the pollen.
(b) Haploid genotype of the anther.
(c) Diploid genotype of the pollen.
(d) Diploid genotype of the anther.

147. High frequency heterokaryon formation is observed during protoplast fusion by the addition of:
(a) Glycerol
(b) PEG
(c) $NaNO_3$
(d) DMSO

148. Somatic embryo induction generally occurs in presence of the two growth regulators namely:
(a) Auxin & Cytokinin
(b) Auxin & Abscissic acid
(c) Cytokinin & Ethylene
(d) Cytokinin & Gibberellins

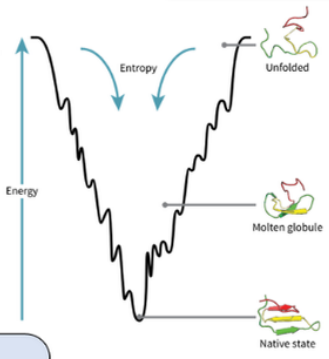
149. A molecular biology student genetically engineered Arabidopsis thaliana to harbour bar gene. The resulting transgenic plant is expected to be resistant to:
(a) DL-Phosphinothricin

VEDEMY'S CAPSULE (VEDEMY'S SPECIAL NOTES)

Amino acid Classes

Essential	**M**y **V**ery **T**alented **F**riend **I**s **W**aiting **F**or **K**ajo**L**
Semi-essential	**R**ahu**L**
Non-Polar	**GAV** के लोग **PILW** लेकर **FM** सुन रहे थे
Polar Uncharged	**CN**(कार्टून नेटवर्क) pe **STY**(सत्य) **Q**ues पूछते है
Negative charged	Ye **DE**kh
Positive charged	**R**a**H**u**L** bola
Gluco-ketogenic	**I**tni **T**alented **WYF** (wife)
Ketogenic	**K**ajo**L**

Protein Folding Curve



Energy profile-
High
- **U**- Unstructured
- **M**- molten globule
- **D**- discrete structure
- **N**- native
- **A**- amorphous
- **A**- amyloid

Low

Urmila Matoldkar ka DNA Achha hai

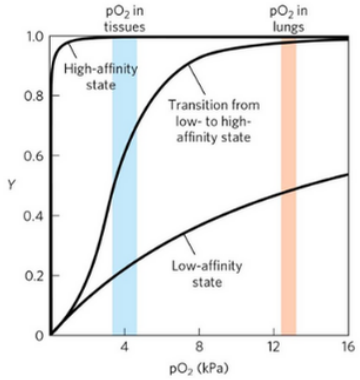
Hemoglobin

State of Hb – MOLD

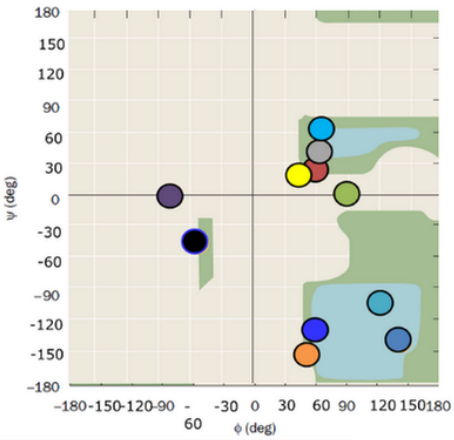
- **M**ore acidic (Relaxed state)
- **O**xy Hb
- **L**ess acidic (Tensed state)
- **D**eoxy Hb

Affinity of Curve – DRIL

- **H+, Temp. BPG, CO_2**
- **D**ecrease
- **R**ight shift
- **I**ncrease
- **L**eft shift

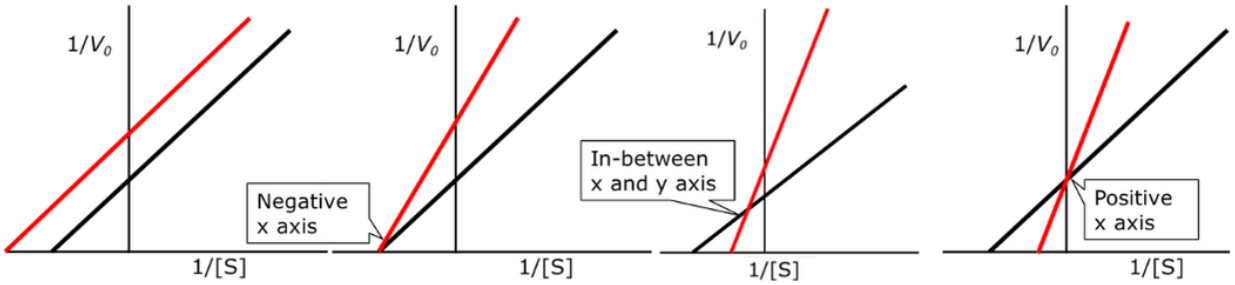


Ramachandran plot



Secondary Structure	Phi	Psi
AP β Sheet	+140⁰	-135⁰
P β Sheet	+120⁰	-115⁰
CTH	+50⁰	-150⁰
L-α-H	-60⁰	-50⁰
R-α-H	+60⁰	+50⁰
Type-I i+1	+60⁰	+30⁰
Type-I i+2	+90⁰	0⁰
Type-II i+1	+60⁰	-120⁰
Type-II i+2	-80⁰	0⁰

Enzyme Inhibition Curve



Uncompetitive Inhibition
Decrease K_m = increased $1/K_m$
Decreased V_{max}= increased $1/V_{max}$

Noncompetitive Inhibition
Decreased V_{max}= increased $1/V_{max}$

Mixed Inhibition
K_m increase
V_{max} decrease

Competitive Inhibition
Increase K_m = decreased $1/K_m$

UP ke **NaNa** patekar **MI** ka **PC** lekar aaye

- **UP**: Parallel, Uncompetitive
- **NaNa**: Negative x axis, Non-competitive
- **MI**: In-between x and y axis, Mixed
- **PC**: Positive x axis, Competitive

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(a) Changes in osmotic pressure
(b) Barium stress
(c) Imidazolinone

150. Which one of the following statements about haploids is **INCORRECT**?
(a) They help in shortening of breeding cycle
(b) Using haploids, it is possible to obtain exclusively male plants in dioecious species
(c) Haploids are useful in isolation and detection of mutants.
(d) Haploid plants cannot be used for gene transfer

151. Refugia approach in cultivation of Bt cotton is used to minimize:
(a) Contamination of Bt gene in non-Bt cotton.
(b) Bt gene flow in other crops.
(c) Damage by pest.
(d) Emergence of virulent biotypes.

152. In which method of plant transformation would multicopy integration be a common feature?
(a) Particle bombardment
(b) Protoplast fusion
(c) Agrobacerium mediated
(d) In planta

153. Which one of the following techniques will help to overcome a pre fertilization barrierbetween the two species?
(a) Embryo rescue
(b) Protoplast fusion
(c) Ovary culture
(d) Embryo implantation

154. Genes located in which one of the following **DO NOT** follow Mendel's laws?
(i) Nucleus
(ii) Choloroplast
(iii) Mitochondria
(iv) Cytoplasm
(a) Both (i) and (ii)
(b) Both(i) and (iii)
(c) Both (ii) and (iii)
(d) Both (iv) and (i)

155. Seedless fruits may arise as a result of
(a) Parthenocarpy
(b) Sexual reproduction
(c) Autogamy
(d) Allogamy

156. An aluminium pot contains water that is kept steadily boiling (100°C). The bottom surface of the pot, which is 0.012 m thick and 1.5 x 10^4 mm^2 in area, is maintained at a temperature of 102°C by an electric heating unit. Find the rate at which heat is transferred through the bottom surface. Given kAl = 235 $W.m^{-1}.K^{-1}$:
(a) 480.3 W
(b) 587.5 W
(c) 640.2 W
(d) 820.1 W

157. What happens to the viscosity of non-Newtonian fermentation broth upon scale-up?
(a) Viscosity increases
(b) Viscosity decreases
(c) Viscosity does not change
(d) Initially viscosity decreases and then increases

158. Estimate the theoretical growth yield coefficient (YX/s) for ethanol fermentation by $S.\ cerevisiae$ described by the following overall reaction: $C6H12O6 \rightarrow 2C2H5OH + 2CO2$ Given (YX/ATP $=10.\ 5$gdw/mol ATP and glycolysis yields 2ATP/mol of glucose in Yeast:
(a) 0.224 gdw/g glucose
(b) 0.117 gdw/g glucose

(c) 0.334 gdw/g glucose
(d) 0.45 gdw/g glucose

159. Which one of the following is TRUE in the scale-up of medium sterilization?
(a) It is an independent process in terms of quality of medium.
(b) It is an independent process in terms of both quality of medium and number ofcontaminants.
(c) It is a dependent process in terms of both quality of medium and number of contaminants.
(d) It is a dependent process in terms of quality of medium and independent process in terms of number ofmicroorganisms.

160. In order to extract Penicillin G from fermentation broth, the pH of the broth is adjustedto pH 2.5. This is done because:
(a) Most of the Penicillin is in neutral uncharged form at this pH and hence extraction isbetter.
(b) Most of the Penicillin is in ionic form and hence extraction is better.
(c) Penicillin is highly stable at this pH.
(d) Most of the enzymes are precipitated at this pH, which increases the extractionefficiency of Penicillin.

161. Dynamic kinetic resolution of a racemic mixture of alcohol ensures it's _____ percentconversion to one enantiomer:
(a) 100
(b) 50
(c) 75
(d) 25

162. Very low values of Km may cause:
(a) Product inhibition
(b) Substrate inhibition
(c) Enzyme denaturation
(d) Substrate induction

163. In the stoichiometric equation given below identify which one of the followingcorresponds to oxygen balance: $\boldsymbol{CwHxOyN2 + aO2 + bHgOhNi \rightarrow c\ CHaO\beta N\delta + dCO2 + eH2O}$:
(a) w = c + d
(b) x + bg = cα + 2e
(c) y +2a + bh = cβ + 2d + e
(d) z + bi = c δ

164. If the ΔG of the reaction A → B is–40 kJ/mol, under standard conditions the reaction:
(a) Is at equilibrium.
(b) Will never reach equilibrium.
(c) Will not occur spontaneously.
(d) Will proceed spontaneously from left to right.

165. Salting out of proteins results in:
(a) large increase in enthalpy
(b) ΔG being positive
(c) small decrease in entropy
(d) ΔG being negative

166. The specific productivity (qp) of an enzyme production is fitted linearly with specific growthrate (μ) of a fungal organism according to the equation p = α.μ + β. The estimated values ofconstants α and β are 0.0006 and 25 respectively. The enzyme production kinetics is:
(a) Growth associated
(b) Non-growth associated
(c) Dependent on specific growth rate
(d) Partially growth associated

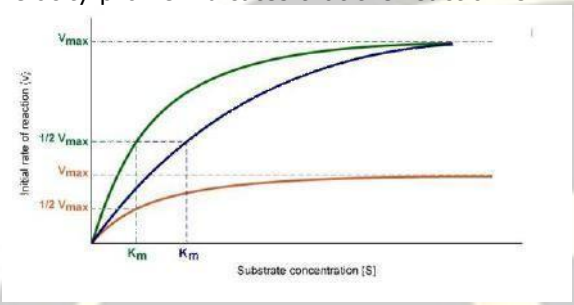
167. The partition coefficient of a solute between the stationary phase and the mobilephase is denoted by the:
(a) Capacity factor
(b) Efficiency
(c) Height of an equivalent theoretical plate (HETP).
(d) Zone spreading.

168. A fermentor with volume V is vigorously agitated with an impeller of diameter Di,rotating at an rpm of n. Mixing time tm in the reactor maximally decreases with

(a) Increase in Di alone.
(b) Increase in both Di and rpm.
(c) Increase in both Di and rpm and decrease in volume of the reactor.
(d) Decrease in both Di and rpm and increase in volume of the reactor.

169. Identify which one of the following is TRUE of a typical drying curve:
(a) The moisture content would remain constant throughout the drying period.
(b) The rate of drying would remain constant throughout the drying period.
(c) The product temperature will remain constant with time and then decrease.
(d) The falling rate period is followed by constant rate period.

170. Upon addition of reversible inhibitors to an enzymatic reaction following MM kinetics, the following velocity profiles are generated as shown in the figure below (indicated in Red, green and blue line). The red line velocity profile indicates that the reaction is:



(a) Un-competitively inhibited
(b) Non-competitively inhibited
(c) Competitively inhibited
(d) Enzyme is not inhibited

171. Common name for Hexadecanoic acid is:
(a) Myristic acid
(b) Palmitic acid
(c) Stearic acid
(d) Oleic acid

172. The interaction between a solute and a solvent is determined by the balance of forcesbetween solvent molecules, between solute molecules and between solute and solvent molecules. If the sum of two self-interactions balance the cross-interactions, the solvent is referred to as a(n)
(a) Eta solvent
(b) Beta solvent
(c) Theta solvent
(d) Zeta solvent

173. Given in the table is the list of compounds being produced by the organisms. With appropriate matching indicate which one of the following combinations is most appropriate:

	PRODUCT		ORGANISM
A	Propionic acid	i	Clostridium acetobutylicum
B	Butanol	ii	Clostridium propionicum
C	Citric acid	iii	Gluconobacteroxydans
D	Gluconic acid	iv	Aspergillus niger

A- iv, B-iii, C-ii, D-i
A- iv, B-i, C-ii, D-iii
A-iii, B-iv, C-i, D-ii
A-ii, B-i, C-iv, D-iii

174. One advantage of using Pichia pastoris as a protein expression platform overSaccharomyces cerevisiae is that the former:
(a) Has a faster growth rate.
(b) Cannot grow over a wide pH range.
(c) Produces very high levels of ethanol.
(d) Secretes very low level of endogenous proteins.

175. The synthesis of aspartame may be carried out in organic solvents using:
(a) Phenylalanine ammonia lyase

(b) Argininosuccinatesynthetase
(c) Thermolysin
(d) Candida antarctica lipase B

176. The water content in solid state fermentation is:
(a) Between 40-60%
(b) Between 20-40%
(c) Between 10-20%
(d) Between 5-10%

177. When considering submerged fermentation system oxygen transfer is considered to bea more important factor than the supply of other nutrients. Which one of the following statements is CORRECT?
(a) Oxygen has a much lower solubility in water than sugars and nutrients.
(b) Oxygen has a much higher solubility in water than sugars and nutrients.
(c) Oxygen has similar solubility in water like sugar and other nutrients.
(d) Oxygen diffuses more slowly compared to other nutrients.

178. Which one of the following sugars is **NOT** only non-reducing sugar but also does notexhibit muta-rotation
(a) Glucose
(b) Maltose
(c) Sucrose
(d) Lactose

179. Calculate the overall order of a reaction which has rate expression: Rate = k $[A]^{1/2}$ $[B]^{3/2}$:
(a) First order
(b) Second order
(c) Half order
(d) Zero order

180. Match the microbial enzymes from Group A with appropriate application processes from Group B Group A

Group A	Group B
A. Pectinase	i. Meat tenderizing
B. Glucose isomerase	ii. Bread making
C. Amylase	iii. high fructose corn syrup
D. Protease	iv. Fruit juice clarification

(a) A-iii, B-iv, C-i, D-ii
(b) A-iv, B-iii, C-ii, D-i
(c) A-iv, B-ii, C-iii, D-i
(d) A-ii, B-i, C-iii, D-iv

181. Which one of the following statements is **FALSE**. Microbial secondary metabolites are?
(a) Not essential for growth.
(b) Produced in higher amount as compared to primary metabolites.
(c) Always produced in the exponential phase of the growth.
(d) Biodegradable.

182. Rate of centrifugal sedimentation is a:
(a) Square function with respect to rpm.
(b) Linear function with respect to rpm.
(c) Square function with respect to rotor diameter.
(d) Cubic function with respect to rotor diameter.

183. The advantage of chemostat with cell recycle system over a simple chemostat is that it can be:
(a) Operated at lower dilution rate.
(b) Used for achieving higher cell mass.
(c) Adapted for achieving higher specific productivity.
(d) Adapted for achieving higher specific oxygen uptake rate.

184. Which one of the following amino acids is the most effective contributor of protein buffer?
(a) Alanine
(b) Glycine
(c) Histidine
(d) Arginine

185. Fluorescence microscopy is based on the ability of certain molecules to:
(a) Absorb light of a constant wavelength.
(b) Absorb light of many different wavelengths.

(c) Absorb light at a given wavelength and then emit light of a longer wavelength.
(d) Absorb light at a given wavelength and then emit light at shorter wavelength.

186. Hemorrhagic lymphadenitis is seen in:
(a) Tuberculosis
(b) Actinomycosis
(c) Glanders
(d) Anthrax

187. In equine infectious anemia, central nervous system shows:
(a) Cytoplasmic vacuolation in neurons
(b) Intranuclear inclusions
(c) Non-purulent encephalomyelitis
(d) Infiltration of neutrophils

188. Hjarre's disease in poultry is caused by:
(a) Mycoplasma gallisepticium
(b) Mucoid strain of E. coli
(c) Newcastle disease virus
(d) Mycobacterium avium

189. After infection of cattle, Dictyocaulusviviparus larvae reach the lungs via:
(a) Intestine, portal vein, liver, heart, lung.
(b) Intestine, abdominal cavity, liver, heart, lung.
(c) Intestine, lymphatics, mesenteric lymph nodes, thoracic duct, heart, lungs.
(d) Intestine, abdominal cavity, thoracic duct, heart, lungs.

190. Which one of the following is found in overloaded rumen?
(a) High rumen pH and high plasma phosphorus.
(b) Low plasma phosphorus and low packed cell volume.
(c) Low rumen pH and high plasma sodium.
(d) Low rumen pH and high plasma lactate.

191. Pressing of head against wall by cow is the clinical symptom of:
(a) Babesiosis
(b) Theileriosis
(c) Trypanosomiasis
(d) Toxoplasmosis

192. Which one of the following factors released from damaged tissue initiate a chain of clotting events?
(a) Thrombin
(b) Prothrombin
(c) Tissue thromboplastin
(d) Fibrin

193. Which one of the following breeds of cattle is known as a milch breed?
(a) Hariana
(b) Gir
(c) Kankrej
(d) Amritmahal

194. Tarry color blood from natural orifice is a symptom of:
(a) Anthrax
(b) Strangle
(c) Hemorrhagic septicemia
(d) Tuberculosis

195. Which one of following cartilages lacks a distinct perichondrium in horse?
(a) Hyaline cartilage
(b) Elastic cartilage
(c) Fibrocartilage
(d) Cartilage of the appendicular skeleton

196. Creutzfeldt-Jakob disease is caused by:
(a) PrP^{C}
(b) PrP^{SC}
(c) West Nile virus
(d) Varicella-Zoster virus

197. The natural reservoir of Ebola virus is:
(a) Fruit bat
(b) Dog
(c) Sheep
(d) Pig

198. A disease diagnostic assay with high specificity should yield:
(a) More false positives
(b) Fewer false negatives
(c) Fewer false positives
(d) More false negatives

199. Which one of the following statements is **INCORRECT** for cystic fibrosis?
(a) It results in the reduced secretion of sodium chloride in sweat.
(b) It results in the increased secretion of sodium chloride in sweat.
(c) It is an autosomal recessive disease.
(d) It results in buildup of mucus.

200. Drug resistance among bacteria involved in hospital infections is commonly due to:
(a) Multi drug therapy
(b) Probiotic bacteria
(c) Transfer of resistance genes
(d) Mutation in target genes

201. Vaccine is available for all except one of the following pathogens:
(a) Bordetella pertussis
(b) Haemophilusinfluenzae type b
(c) Clostridium tetani
(d) Helicobacter pylori

202. Toxic shock syndrome is caused by:
(a) TNF- α
(b) TGF- β
(c) Interferon- ¥
(d) Interleukin-1

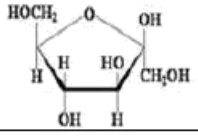
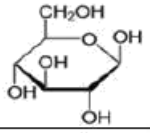
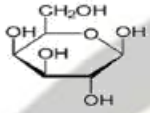
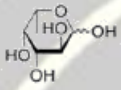
203. BCG vaccine _____
(a) Is an attenuated M. tuberculosis strain.
(b) Reduces the incidence of tubercular meningitis.
(c) Induces protective CMI response against atypical mycobacteria.
(d) Protects against pulmonary tuberculosis.

204. Which one of the following is commonly used to prevent microbial growth in polyclonal sera?
(a) DMSO
(b) Polyethylene glycol
(c) Sodium azide
(d) Glycerol

205. The prescribed treatment for swine flu is:
(a) Azacytidine
(b) Oseltamivir
(c) Lamivudine
(d) Acyclovir

206. A chimeric therapeutic monoclonal antibody consists of:
(a) Human constant region and mouse variable region.
(b) Mouse constant region and human variable region.
(c) Human constant and variable regions with CDR loops of mouse origin.
(d) One side mouse variable region and other side human variable region.

207. In individuals with galactosemia, the enzymes needed for further metabolism of which one of the following sugars is severely diminished or missing entirely? (answer 3)

1	
2	
3	
4	

208. Which one of the following is **INCORRECT** about Fragile X syndrome?
(a) Father to son transmission
(b) Presence of CGG repeats
(c) Presence of CAG repeats
(d) Symptoms of Mental retardation

209. Which one of the following statements is TRUE about superantigens?
(a) They are processed in the cytosol.
(b) They are processed in endosomes.
(c) They do not require processing.
(d) They are processed in the lysosome.

210. Retrograde transport may be used for:
(a) Nerve path tracing
(b) Determining nerve fiber diameter
(c) Determining soma size
(d) Estimating number of dendrites

211. The conscious state of an individual may be best understood by studying ones:
(a) Electromyogram
(b) Electrocardiogram
(c) Electroretinogram
(d) Electroencephalogram

212. Acetylcholine is released by exocytosis of synaptic vesicles; this release is triggered by:
(a) Na^+
(b) Ca^{2+}
(c) K^+
(d) Cl^-

213. Resting membrane potential of a neuron range between:
(a) 60 mv to 70 mv
(b) -60 mv to -70 mv
(c) 100 mv to 110 mv
(d) 0 mv

214. The pathological hallmark of Huntington's disease is:
(a) The degeneration of the substantia nigra
(b) The degeneration of globus pallidus
(c) The degeneration of striatum
(d) The degeneration of sub-thalamic nucleus

215. The patterning of the nervous system along the anterior-posterior axis in embryo iscontrolled by:
(a) Pax genes
(b) Hox genes
(c) SHH signaling

(d) BMP signaling

216. Approximately, 50% of total world plant species are present in…
(a) Tropical rain forest
(b) Temperate rain forest
(c) Temperate deciduous forest
(d) Coral reefs

217. The process of mineralization of environmental pollutants by wild microbes is referredas …
(a) Biotransformation
(b) BBioremediation
(c) Bioadsorption
(d) Bioaugmentation

218. Which one of the following is readily available source of nitrogen to plant?
(a) Amide fertilizers
(b) Ammonia fertilizers
(c) Nitrate fertilizers
(d) Ammonium phosphate fertilizer

219. Root nodules are pink due to ….
(a) Haemoglobin
(b) Leghaemoglobin
(c) Myoglobin
(d) Phytocyanin

220. Which of the following is a GM phytoremediator plant?
(a) Populus
(b) Portulaca
(c) Brasicca
(d) Helianthus

221. Which one of the following terms represents the recycling of settled decomposerbacteria in sewage treatment plant?
(a) Cyclic treatment
(b) Primary treatment
(c) Activated sludge treatment
(d) Tertiary treatment

222. The relationship between species A and species B is described as commensalism. Thismeans that…..
(a) Both species suffer.
(b) Both species benefit.
(c) One species benefits and the other species suffers.
(d) One species benefits and the other species is unaffected.

223. Which one of the following is the best indicator of SO2 pollution?
(a) Bryophyte
(b) Pteridophyte
(c) Lichen
(d) Algae

224. Which one of the following groups of enzymes is primarily involved in microbialbioremediation?
(a) Hydrolases
(b) Transferases
(c) Oxidoreductases
(d) Mutase

225. Why catalase is induced in microbes during exposure to the pollutants?
(a) Because it involve in biotransformation of that pollutant.
(b) Because of oxidative stress produced due to exposure of pollutant.
(c) Pollutants are general inducers of catalase.
(d) Because catalase in involved in the metabolism of metabolite generated from pollutants.

226. The solute concentration of the body fluids of some marine organisms are maintained the same as that of the external medium in which the organism lives. Such organisms are referred to as:
(a) Stenohaline

(b) Osmoconformers
(c) Euryhaline
(d) Osmoregulators

227. Remote sensing is done in the microwave channels by virtue of:
(a) Emission.
(b) Reflection.
(c) Scattering.
(d) Diffraction

228. Which of the following drugs was **NOT** isolated from a natural source?
(a) Artemisinin
(b) Isoniazid
(c) Quinine
(d) Morphine

229. Antifreeze molecules that prevent intracellular ice formation in marine organisms are generally:
(a) Calcium salts
(b) Glycoproteins
(c) Membrane phospholipids
(d) Long chain alcohols

230. Which term refers to the distance that the wind travels across open water?
(a) Fetch
(b) Current
(c) Throw or Reach
(d) Drift

231. The typical residence time of water in the oceans is of the order of:
(a) 3,500 years
(b) 1,000 years
(c) 10,000 years
(d) 350 years

232. The spring bloom of phytoplankton in the surface waters of high latitude oceans occurs when?
(a) Zooplankton grazing declines as large copepods go into diapause.
(b) The mixed layer depth becomes shallower than the critical depth.
(c) Increased wind mixing injects nutrients into the surface waters.
(d) Nutrients are regenerated rapidly by zooplankton grazers.

233. The vertical movement of lithosphere to accommodate additional weight or removal of weight is called:
(a) Isometric rebounding.
(b) Interval submersion.
(c) Isostatic adjustment.
(d) Isotonic positioning.

234. Which family of motile bacteria with polar flagella is predominant in coastal and marine environments?
(a) Enterococcaceae
(b) Vibrionaceae
(c) Lactobacillales
(d) Staphylococcaceae

235. Which is the oceanic zone that extends from the low tide line to the edge of the continental shelf?
(a) Intertidal zone
(b) Open ocean zone
(c) Neritic zone
(d) Abyssal zone

236. Evidence of past climate conditions is best revealed by studying:
(a) Metal sulphide deposits.
(b) Lagoon features.
(c) Deep sea sediments.
(d) Rock formations.

237. The gases making highest relative contribution to "green house gases" are:
(a) NO_2 and CO_2

(b) CFC and NO_2
(c) CO_2 and CH_4
(d) NO_2 and CH_4

238. Which of the following types of coral reefs (given below as 1-3) are found in India?
A. Atoll
B. Fringing
C. Barrier
(a) A & B only
(b) A, B & C
(c) B & C only
(d) A & C only

239. What part of a tidal cycle has minimal current?
(a) Ebb tide
(b) Slack tide
(c) Flood tide
(d) Lunar tide

240. What is the function of nucleators in freeze-tolerant animals?
(a) To prohibit the formation of ice crystals within cells.
(b) Act as hormones that induce changes in the expression of enzyme proteins that are more tolerant of cold temperatures.
(c) To control the location and kinetics of ice crystal growth.
(d) To increase the metabolic rate of the animal to keep it from freezing.

241. The most effective Foul release coatings presently used in the marine environment are:
(a) Biocides such as lead, arsenic and mercury.
(b) Tributyltin compounds.
(c) Fluoropolymer and silicone based polymer coatings.
(d) Spray coatings.

242. The first marine derived cancer drug, "Cytosar-U" used for the treatment of leukemia and lymphoma was isolated from:
(a) Indian sea hare.
(b) A Caribbean sea sponge.
(c) Southeast asian corals.
(d) Australian waters.

243. Altemicidin isolated from Streptomyces sioyaensis SA 1758 has antitumor activity and has been widely used in aquaculture:
(a) For the control of Alteromonas sp.
(b) As an iron chelator.
(c) Due to its toxicity to Artemia salina.
(d) To clear up organic carbon.

244. A marine bryozoan, normally causing a problem as a biofouler on boats, harbors this bacterium that has shown promise in cancer treatment and also as a memory enhancer for patients with Alzheimer's disease:
(a) Bugula neritina
(b) Bugula dentate
(c) Cephalosporium acremonium
(d) Ectoprocta sp

245. A system incorporating unilateral eye stalk ablation, high salinity, good water quality and optimum temperature can:
(a) Induce maturation in male crustaceans in captivity.
(b) Induce maturation in female crustaceans in captivity.
(c) Maintain viability in juveniles in captivity.
(d) Facilitate mortality in mature adults.

246. Which of the following can help determine if two mutations are allelic?
(a) Lack of recombination between the two mutations
(b) The two mutants do not complement each other
(c) Suppression of one mutation by the other
(d) Co-segregation of the two mutations

247. An individual has the genotype AaBb. The two genes are linked in cis and is 5cM apart. What percentage of gametes will have the genotype ab?
(a) 2.5
(b) 5.0
(c) 47.5
(d) 90.0

248. An E. coli mating between Hfr trp+ his+ strS and FtrphisstrR was allowed to proceed for 30 minutes. The mixture was plated on medium containing either (i) streptomycin +histidine or (ii) streptomycin + tryptophan. Replica plating revealed that in the first case 'i' 48 out of 104 colonies were hiswhile in the second case 'ii' 10 out 70 colonies were trp-. Which of the following is the best representation of the location of the trp and his genes relative to the origin of transfer (>) of the Hfr chromosome?
(a) …..his.....>.....trp.....
(b) ....trp.....his.....
(c) .....trp.....his.....>.....
(d) .....his.....trp.....>.....

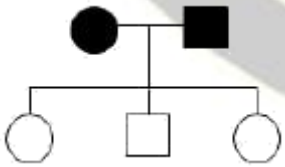
249. Color blindness is an X- linked recessive character. A color blind man and his wife with normal vision have a colour-blind daughter. What is the probability that their new born son would be colour blind?
(a) 0
(b) 1/4
(c) 1/2
(d) 1

250. Alkaptonuria is a metabolic disorder controlled by a recessive autosomal allele. The frequency of Alkaptonuria in an ethnic population is about 1 in million persons. What is the proportion of heterozygous 'carriers' in the population?
(a) 1 in 1000
(b) 1 in 500
(c) 1 in 10000
(d) 1 in 100

251. Of a population of cells undergoing meiosis, 1% of the cells undergo recombination between genes A and B. What is the distance between the two genes?
(a) 0.5Kb
(b) 1.0kb
(c) 0.5cM
(d) 1.0cM

252. Variation in which types of repeat sequence commonly arise by replication slippage?
(a) Microsatellites
(b) Minisatellites
(c) Retrotransposons
(d) DNA transposon

253. One from of congential deafness in human is inherited as a recessive condition and controlled by two independent genes (A and B) In the pedigree depicted below two deaf individuals have children with normal hearing ability



(a) AaBb and AaBb
(b) aaBB and AABB
(c) aaBB and AAbb
(d) Aabb and aABB

254. Genetic relatedness between mothers and daughters in haplodiploid organisms is:
(a) 1
(b) 0.75
(c) 0.5
(d) 0.25

255. In a family, among the siblings, there is a heterozygous girl for haemophilia, a normal boy, a haemophilic girl and a haemophilic boy. Which of the following genotypes would be attributed to the parents?

(a) XX and ^{n}Xy
(b) ^{n}XX and XY
(c) ^{n}X^{n}X and ^{n}XY
(d) ^{n}XX and ^{n}XY

256. Which among the following is a proper definition of a SMILES string?
(a) A SMILES string is a 1-dimensional representation of the 2-dimensional structure of a molecule.
(b) A SMILES string is a 2-dimensional representation of the 3-dimensional structure of a molecule.
(c) A SMILES string is a 1-dimensional representation of the 3-dimensional structure of a molecule.
(d) A SMILES string is a 2-dimensional representation of the 3-dimensional structure of a molecule

257. Which of the following is a CORRECT statement regarding sensitivity and specificity of a search algorithm?
(a) Sensitivity is the ability to detect true positives and specificity is the ability to reject false positives.
(b) Sensitivity is the ability to reject false positives and specificity is the ability to detect true positives.
(c) Sensitivity is ability to simultaneously detect true positives and reject false positives, while specificity the ability to simultaneously reject true negatives as well as false negatives.
(d) Sensitivity is the ability to reject true negatives and specificity is the ability to reject false negatives.

258. Which of the following statements is TRUE for the BLAST algorithm for sequence comparison?
(a) It is a heuristic algorithm.
(b) BLAST alignments are guaranteed to be the best possible alignment subject to the correctness of the scoring function.
(c) The size of the sequence alphabet has no effect on the efficiency of the BLAST algorithm.
(d) The algorithmic complexity is given by Onlog(n) where n is the number of sequences in the database.

259. A mixture containing L-Aspartate, D-Aspartate and L-Lysine was set up for crystallization and produced a single crystal belonging to space group P2/m (Primitive cell with a 2-fold rotation axis and a mirror plane perpendicular to the rotation axis). Which of the following is the most likely composition of the crystal?
(a) L-Aspartate and D-Aspartate in equal proportions without any L-Lysine.
(b) All three components in equal proportions.
(c) L-Aspartate, D-Aspartate and L-Lysine in the ratio 1:1:2.
(d) It is not possible to predict the composition of the crystal from the information given.

260. Which of the following statements best describe the significance of the Temperature factor (B-factor) column in a PDB file?
(a) The B-factor signifies the positional uncertainty of a particular atom in a crystal structure due to the inherent dynamics of the atom.
(b) The B-factor signifies the positional uncertainty of a particular atom in the crystal structure, which may be due to refinement errors besides the inherent dynamics of the atom.
(c) The B-factor specifies the average of the two temperatures in which the molecule was crystallized and the temperature in which X-ray diffraction data was collected from the crystal.
(d) The B-factor is an inherent property of the atom and is not related to any other parameter like temperature or dynamics.

261. Peaks in ^{1}H-NMR spectra are often split into multiplets due to spin-spin coupling with neighbouring protons. Surprisingly, peaks in ^{13}C-NMR spectra appear much simpler with very little evidence of ^{13}C-^{13}C coupling. Which one of the following statements offers the best explanation for the above observation?
(a) The value of the Magnetogyric ratio (g) for ^{13}C is much smaller than the corresponding value for ^{1}H. As a result ^{13}C-^{13}C couplings have an extremely small magnitude and are not detectable.
(b) The natural abundance of the ^{13}C nucleus is very small (~1.1%) hence the chance of finding a neighbouring ^{13}C nucleus for spin-spin coupling is very small.
(c) The presence of ^{12}C nuclei in the vicinity, inhibit spin-spin coupling between ^{13}C-^{13}C neighbours.
(d) ^{13}C-^{13}C coupling constants are so large that the multiplets appear as separate single peaks.

262. For any molecule with N atoms (N x 3), the minimum number of internal coordinates (bond lengths, bond angles and dihedral angles) sufficient to describe the structure of the molecule is given by:
(a) $3N - 6$
(b) $3N - 5$
(c) $3N - 4$
(d) $3N$

263. A scientist screening for monoclonal antibodies against a protein antigen isolates two antibodies, the first of which recognizes a conformational epitope in the form of an D- helix in the protein, and a second one that also recognizes a conformational epitope, but in the form of just one strand in a multi-stranded E-sheet. The scientist then synthesizes small peptides with the same sequences corresponding to the two epitopes and tests for binding with antibodies. Which of the following is the most likely outcome of her experiments?
(a) The first antibody recognizes the a-helical epitope but the second antibody fails to recognize the E-

strand epitope.
(b) The first antibody fails to recognize the D-helical epitope but the second antibody successfully recognizes its E-strand epitope.
(c) Both antibodies successfully recognize their respective epitopes.
(d) Both antibodies fail to recognize their respective epitopes.

264. Which of the following cases will most likely lead to sequence specific recognition of DNA by a protein?
(a) When the protein binds through the minor groove of DNA.
(b) When the protein binds through the major groove of DNA.
(c) When the protein binds with the phosphate groups avoiding both the minor and major grooves.
(d) Sequence specific DNA binding by proteins has no relationship with groove preference.

265. Which of the following algorithms is most likely to be used as an optimizer for Docking calculations?
(a) 4^{th} - order Runge-Kutta algorithm
(b) Maximum Parsimony algorithm
(c) Genetic Algorithm
(d) Biochemical Algorithm

266. A certain chemical carcinogen causes a lethal chemical modification in DNA bases with a probability of 10^{-7}. It was found that if cultured human cells are treated with this compound then approximately 1% of the amount added makes its way to the nucleus and attacks the chromosomes. What is the approximate probability of obtaining at least one base modification event per cell, if cultured human cells are treated with the compound at a concentration of 1mmol/cell:
(a) 0
(b) 0.1
(c) 0.5
(d) 1

267. When p and q are lengths of sequences, the computational complexity of the Smith- Waterman algorithm is:
(a) O(p q)
(b) O(p + q)
(c) O(q log p)
(d) O (pq)

268. Which among the following is a measure of similarity between two chemical structures of small molecules?
(a) RMSD
(b) Tanimoto coefficient
(c) E-value
(d) P-value

269. A closed circular DNA molecule is treated with saturating concentrations of an intercalator followed by treatment with topoisomerase until it is completely relaxed. If the intercalator is now removed by dialysis, the DNA molecule will become:
(a) Positively supercoiled.
(b) It will become negatively supercoiled.
(c) It will remain relaxed without any change in supercoiling.
(d) Exactly half the molecules will become positively supercoiled and the other half will become negatively supercoiled, so that there is no net change in supercoiling.

270. Which among the following amino acids has at least ONE asymmetric carbon atom in its side chain?
(a) Valine
(b) Isoleucine
(c) Tryptophan
(d) Histidine

271. A right handed D-helix made up of L-amino acids has I,\ angles of -60 and -40 degrees respectively. Which of the following will be the I,\ angles of a left handed D-helix made up of D-amino acids only?
(a) +60 and +40 degrees
(b) -60 and +40 degrees
(c) +60 and -40 degrees
(d) cannot be predicted

272. The membrane permeability of Dimethyl urea is:
(a) Less than that of urea
(b) More than that of urea
(c) Comparable to that of urea

(d) Depends on the properties of the membrane

273. Which of the following statements is TRUE with respect to the formation of disulfide bonds in a protein produced by eukaryotic cells?
(a) Disulfide bonds are formed inside the endoplasmic reticulum (ER) or outside the cell in contact with the atmosphere.
(b) Disulfide bonds are formed outside the ER but within the cytosol.
(c) Disulfide bonds are formed within the ER but the process continues within the Golgi complex.
(d) Disulfide bonds are formed only within the nucleus.

274. Circular dichroic spectra of some proteins show a strong negative ellipticity band at 200 nm. Which of the following secondary structures is characterized by the presence of this band?
(a) S-helix structure
(b) intrinsically disordered structure
(c) D-helical structure
(d) ß-sheet structure

275. Water has a high dielectric constant of 80 in contrast with many non-polar solvents having very low dielectric constants. Due to this property the electrostatic interactions between various side-chains of amino acids in proteins after their transfer from non- polar solvent to water would:
(a) Decrease
(b) Increase
(c) Remain unaffected
(d) Attain a value of zero

DBT-BET-JRF 2015 ANSWER KEY

DBT-BET-JRF 2015 ANSWER KEY																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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a	c	a	b	c	a	b	a	c	b	c	a	a	b	c	d	c	a	a	b
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c	b	c	b	b	c	b	a	a	c	c	b	b	d	c	b	c	c	d	b
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b	d	c	b	b	b	b	c	a	d	b	a	a	b	b	a	a	d	b	a
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c	d	a	b	a	a	b	b	a	d	d	a	b	c	b	b	a	b	a	a
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d	a	b	c	b	a	c	c	c	a	d	b	b	c	b	a	b	c	b	a
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c	d	c	c	b	b	a	b	b	a	a	b	c	b	b	c	c	b	b	c
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
c	b	c	a	b	b	c	d	c	b	c	a	c	c	d	a	a	a	a	b
261	262	263	264	265	266	267	268	269	270	271	272	273	274	275					
b	a	a	b	c	d	a	b	a	b	a	b	a	b	a					