1. A closed cylinder has volume 2156 cm^3. What will be the radius of its base so that its total surface area is minimum?
   (A) 7cm
   (B) 2cm
   (C) 1cm
   (D) 9cm

2. Find the dimensions of the rectangle of perimeter 36cm which will sweep out a volume as large as possible when revolved about one of its sides
   (A) 6 cm , 4cm
   (B) 12 cm , 6 cm
   (C) 6 cm , 8 cm
   (D) None

3. Differentiate the following with respect to x sin (3x +5)
   (A) 4 tan (2x + 6)
   (B) 3 cos (3x +5)
   (C) tan x
   (D) cosec x (2x + 5)

4. The minimum value of $f(x) = x^4 - x^2 - 2x + 6$ is
   (A) 6
   (B) 4
   (C) 8
   (D) None

5. If a cone of maximum volume is inscribed in a given sphere then the ratio of height of the cone to the diameter of the sphere is
   (A) 3/4
   (B) 1/3
   (C) 1/4
   (D) 2/3

6. The sum of two non zero number is 8. The minimum value of the sum of their reciprocals is
   (A) 1/4
   (B) 1/2
   (C) 1/8
   (D) None

7. Find the largest possible area of a right angled triangle whose hypotenuse is 5cm long
   (A) 2/7 cm^2
   (B) 1/6 cm^2
   (C) 25/4 cm^2
   (D) 18/3 cm^2

8. A wire of length 25m is to be cut into two pieces. One of the pieces is to be made into square and other into a circle. What should be lengths of the two pieces so that the combined area of square and the circle is minimum.
   (A) 22 π, $\pi/4$
   (B) $\pi + 2, \pi + 6$
   (C) $\frac{100}{\pi+4}, \frac{25}{\pi+4}$
   (D) 25 π, $22 + \pi$

9. The number of all possible matrices of order 3x 3 with each entry 0 or 1 is
   (A) 27
   (B) 18
   (C) 81
   (D) 512

10. $\cos^{-1}(\cos 7\pi / 6)$ is equals to
   (A) $7\pi/6$
   (B) $5\pi/6$
   (C) $\pi/3$
   (D) $\pi/6$

11. A satellite orbits at a height h above the Earth's surface. Let R be the Earth's radius. If V_e is the escape velocity and V_o is the orbital velocity of the satellite orbiting at a height $h << R$, then
   (A) $V_0^2 = 2Ve^2$
   (B) $Ve = V_0$
   (C) $Ve^2 = 2V_0^2$
   (D) $Ve = 2V0$

12. The work done by the centripetal force is always?
   (A) Zero
   (B) Positive
   (C) Negative
   (D) Constant

13. Value of k in coulomb's law depends upon
   (A) magnitude of charges
   (B) distance between charges
   (C) both A and B
   (D) medium between two charges

$F = \frac{K q_1 q_2}{r^2}$

14. Light can travel in
   (A) air only
   (B) vacuum only
   (C) both air and vacuum
   (D) none of mediums

15. Which of the following is a true statement?
   (A) The power of a lens is always positive
   (B) The power of a lens is always negative
   (C) The power of a convex lens is positive
   (D) The power of a concave lens is positive

16. At 'yield point' of a copper wire
   (A) load hasn't exceeded elastic limit yet; so, Hooke's law applies
   (B) load has already exceeded elastic limit and material has become plastic
   (C) even plastic stage has passed and wire has snapped already
   (D) Like Brass and Bronze, Copper has no yield point

17. If T is surface tension of soap solution, the amount of work done in blowing a soap bubble from diameter D to a diameter 2D is
(A) $2\pi D^2 T$
(B) $4\pi D^2 T$
(C) $6\pi D2 T$
(D) $8\pi D2 T$

18. Resistance of a wire is r ohms. The wire is stretched to double its length, and then its resistance in ohms is
(A) r / 2
(B) 4 r
(C) 2 r
(D) r / 4

19. In a magnetic field of 2.50×10^{-3}T such that magnetic force is equal to its weight then proton moves with speed of
(A) $3.09 \times 10^{-5} ms^{-1}$
(B) $4.09 \times 10^{-5} ms^{-1}$
(C) $2.09 \times 10^{-5} ms^{-1}$
(D) $0.09 \times 10^{-5} ms^{-1}$

20. The shape of l - T graph of simple pendulum is
(A) Curve
(B) Parabola
(C) Straight line
(D) Hyperbola

21. F-centres in an ionic crystal are
(A) lattice sites containing electrons
(B) interstitial sites containing electrons
(C) lattice sites that are vacant
(D) interstitial sites containing cations

22. 1.00 g of non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is 5.12 K kg mol^{-1}. What is the molar mass of solute?
(A) 265 g mol^{-1}
(B) 215 g mol^{-1}
(C) 165 g mol^{-1}
(D) 256 g mol^{-1}

23. Given $E^0_{Cr^{3+}/Cr} = -0.75V$, $E^0_{Fe^{3+}/Fe} = -0.45$ V, the EMF of the cell
$Cr \mid Cr^{3+}(0.1M) \mid\mid Fe^{2+}(0.01M) \mid Fe$ will be
(A) 0.2409V
(B) 0.3394V
(C) 0.30V
(D) 0.2606V

24. 99% of the first order reaction was completed in 32 min. When will 99.9% of the reaction complete?
(A) 50 min.
(B) 46 min.
(C) 49 min.
(D) 48 min.

25. Which of the following is not a metal refining process?
(A) Baeyer's process
(B) Bessemer process
(C) Van Arkel process
(D) Liquation process

26. The molecule having smallest bond angle is
(A) $AsCl_3$
(B) $SbCl_3$
(C) PCl_3
(D) NCl_3

27. Amongst the following, the most stable complex is
(A) $[Fe(H_2O)_6]^{3+}$
(B) $[Fe(NH_3)_6]^{3+}$
(C) $[Fe(C_2O_4)_3]^{3-}$
(D) $[FeCl_6]^{3-}$

28. Which of the following substances does not give iodoform test?
(A) acetaldehyde
(B) ethyl alcohol
(C) methyl alcohol
(D) acetone

29. Acetone reacts with HCN to form a cyanohydrin. It is an example of
(A) electronphilic addition
(B) electrophilic substitution
(C) nucleophilic addition
(D) nucleophilic substitution

30. The addition of Br_2 to ***trnas***-2-butene gives
(A) (R, R)-2, 3- dibromobutane
(B) (S, S)-2, 3-dibromobutane
(C) (S, R)- 2, 3-dibromobutane
(D) (R, S)- bromobutane

31. What does a protein lose when it denatures?
(A) Its primary structure
(B) Its peptide bonds
(C) Its sequence of amino acids
(D) Its three dimensional shape

32. Enormous diversity of protein molecules is due to
(A) sequence of amino acids
(B) R-group of amino acids
(C) peptide bonds
(D) amino group of amino acids

33. Most abundant protein in the human body is
(A) haemoglobin
(B) keratin
(C) collagen
(D) immunoglobulin

34. Proteins may be separated according to size by
(A) reverse phase chromatography
(B) ion exchange chromatography
(C) molecular exculision chromatography
(D) isoelectric focusing

35. Binding of oxygen to haemoglobin occurs when Fe is in the following oxidation state
(A) +1
(B) +2
(C) +3
(D) +4

36. Guanidino group present in side chain of
(A) Tyrosine
(B) Arginine
(C) Histidine
(D) Cysteine

37. Melting of DNA results in
(A) decrease in optical density
(B) increase in optical density
(C) no change in optical density
(D) none of these

38. The Z DNA helix:
(A) has fewer base pairs per turn than the B DNA
(B) is favoured by an alternating GC sequence
(C) tends to be found at the 3' –end of genes
(D) is inhibited by methylation of the bases

39. A double stranded DNA has 30% Thymine. The percentage of cytosine is
(A) 30%
(B) 20%
(C) 70%
(D) 15%

40. DNA
(A) is more susceptible than RNA to degradation at high pH
(B) has catalytic activity
(C) can hybridize with other DNA molecules but not with RNA
(D) has fewer hydroxyl group than RNA

41. Rosalind Franklin's picture of the DNA double helix were taken using the technique known as
(A) differaction
(B) fluorescence
(C) transmission electron microscopy
(D) X-ray crystallography

42. Glucose and galactose are two isomeric monosaccharide known as
(A) anomer
(B) epimer
(C) enantiomers
(D) conformers

43. Which carbohydrate is used in silvering of mirrors?
(A) sucrose
(B) fructose
(C) glucose
(D) cellulose

44. What are bile salts?
(A) charged phospholipids
(B) amphipathic cholesterol analogs with detergent propertiese
(C) esterfied cholesterol
(D) hydrolyzed forms of triacylglycerol

45. All of the following vitamins act as antioxidant except
(A) vitamin D
(B) vitamin A
(C) vitamin E
(D) vitamin C

46. Golgi complex plays a major role in
(A) protein synthesis
(B) glycosylation of lipid and protein
(C) removal of sulphate from glycolipid
(D) formation of secondary lysosomes

47. Organization of a cell has not been achieved in
(A) bacteria
(B) diatom
(C) bacteriophage
(D) amoeba

48. Contraction of skeletal muscle is initiated by the binding of Ca^{2+} to
(A) tropomyosin
(B) tropnin
(C) actin
(D) myosin

49. Carbohydrates presents on the plasma membrane
(A) have structural role
(B) forms channel
(C) acts as carrier
(D) helps in molecular recognization

50. In chloroplast, photosynthetic reactions occur in
(A) thylakoid membrane
(B) thylakid lumen
(C) stroma
(D) inner chloroplast membrane

51. Vacuoles present in plant cells are analogous to
(A) golgi bodies
(B) spherosome
(C) lysosome
(D) hydrogenosome

52. All of the following processes occur in the mitochondria of mammalian cells except
(A) fatty acid biosynthesis
(B) protein synthesis
(C) DNA synthesis
(D) beta oxidation of fatty acids

53. Radially symmetrical phylum are
(A) Platyhelminthes and Nematoda
(B) Cnidaria and Porifera
(C) Echinodermata and Arthopoda
(D) Cnidaria and Annelida

54. The water vascular system present in
(A) Coelentrates
(B) Porifers
(C) Echinoderms
(D) Protozoans

55. Round worms are
(A) Acelomate
(B) Pseudocoelomate
(C) Eucoelomate
(D) Haemocoelomate

56. Trichoderma belongs to
(A) Basidiomycetes
(B) Deuteromycetes
(C) Ascomycetes
(D) Phycomycetes

57. Fermentation
(A) in some organisms can produce ethanol
(B) allows ATP to continue to be synthesized in the absence of oxygen
(C) recycles NADPH to NAD^+ so that glycolysis can continue
(D) All of the above are correct

58. During photosynthesis, the final product of the Calvin cycle
(A) ribulose bisphosphate
(B) phosphoglycerate
(C) pyruvate
(D) glyceraldehydes-3-phosphate

59. In CAM plants, CO_2 acceptor is
(A) RUBP
(B) PEP
(C) OAA
(D) PGA

60. Vector for transmission of Dengue virus is
(A) Ades
(B) Anopheles
(C) Culex
(D) Phlebotomus

61. Root pressure is due to the
(A) passive absorption
(B) increase in transpiration
(C) low osmotic potential in soil
(D) active absorption

62. A flaccid cell placed in pure water
(A) DPD= OP
(B) DPD= TP
(C) DPD= OP - TP
(D) None of these

63. The accumulation of one of the following cause seed dormancy
(A) cytokinin
(B) auxin
(C) abscisic acid
(D) giberellin

64. The action potential of a neuron
(A) is initated by efflux of Na^+
(B) is terminated by efflux of K^+
(C) declines in amplitude as it moves along the axon
(D) results in a transient reversal of the concentration gradient

65. The stress response is controlled primarily by the
(A) kidney
(B) adrenal gland
(C) hypothalamus
(D) thyroid glands

66. A Graafian follicle is
(A) an immature developing follicle
(B) a mature follicle ready to ovulate
(C) a follicle undergoing apoptosis
(D) ovulated follicle

67. During which stage in embryonic development do cells differentiate into three germ layers?
(A) blastula
(B) morula
(C) gastrula
(D) neurula

68. The Down's syndrome is due to
(A) X- chromosome
(B) Y- chromosome
(C) Loss of an autosome
(D) Gain of an autosome

69. A sperm with two Y- chromosomes can be formed when there is non-disjunction in
(A) Meiosis I
(B) Meiosis II
(C) Neither meiosis I nor meiosis II
(D) Oogenesis

70. In ABO blood groups how many phenotypes are found?
(A) 1
(B) 4
(C) 6
(D) 8

71. How many types of gametes will be produced by individuals having genotypes AaBbCc?
(A) 8
(B) 2
(C) 6
(D) 4

72. In man, the blue eye color is recessive to brown eye color. If a boy has brown eyes and his mother is blue eyed, what would be the phenotype of his father?
(A) Blue eyed
(B) Black eyed
(C) Red eyed
(D) Brown eyed

73. The rudimentary seed habits has been attained in
(A) *Psilotum*
(B) *Lycopodium*
(C) *Selaginella*
(D) *Equisetum*

74. Stony fruit is
(A) Berry
(B) Drupe
(C) Nut
(D) Samara

75. Polyembryony is more frequent in
(A) Angiosperm
(B) Gymnosperm
(C) Pteridophytes
(D) None of the above

76. When phloem and cambium are present on both side of xylem, the vascular bundle is called
(A) Bicollateral
(B) Radial
(C) Concentric
(D) Collateral

77. In-vitro fertilization is a technique that involves transfer of which one of the following into fallopian tube?
(A) Zygote only
(B) Embryo only up to 8 cell stage
(C) Early zygote or early embryo up to 8 cell stage
(D) Embryo up to 32 cell stage

78. Biomass of producers within specified area will be maximum in
(A) Grassland ecosystem
(B) Forest ecosystem
(C) Pond ecosystem
(D) Lake ecosystem

79. An antibody has
(A) two Fab regions and an Fc region
(B) an Fab regions and an Fc region
(C) two Fab regions and two Fc regions
(D) an Fab regions and three Fc regions

80. Cancer cells are
(A) BHK
(B) Vero
(C) HL-8
(D) Hela cells

81. The yellowish fluid colostrums secreted by mother during initial days of lactation has abundant antibodies
(A) IgM
(B) IgA
(C) IgD
(D) IgE

82. Substrate used by micro-organisms to produce single cell proteins include
(A) methane gas
(B) industrial waste
(C) agricultural waste
(D) all of above

83. A biofertilizer which involves a pteridophyte host is
(A) Rhizobium
(B) Anabaena
(C) Clostridium
(D) Azotobacter

84. First discovered restriction endonuclease enzyme is
(A) *Hind II*
(B) *Hind III*
(C) *EcoRI*
(D) *EcoRII*

85. Crystals of Bt toxin produced by some bacteria do not kill the bacteria themselves because
(A) bacteria are resistant to the toxin
(B) toxin is immature
(C) toxin is inactive
(D) bacteria encloses toxin in a special sac

86. The first transgenic cow is
(A) Dolly
(B) Dolion
(C) Enviro
(D) Rosie

87. pBR 322 has/have which of the following selection marker(s)?
(A) Amp^r
(B) Tet^r
(C) Both (a) and (b)
(D) Kan^r

88. Both DNA gel electrophoresis and SDS-PAGE of proteins are similar because
(A) in both cases molecules migrate to the anode
(B) both techniques rely on a constant charge to mass ratio
(C) both techniques utilize the sieving properties of gels
(D) all of the above

89. Which of the following can be diagnosed by amniocentesis?
(A) Down's syndrome
(B) Cystic Fibrosis
(C) Sickle cell anemia
(D) All of these

90. Trophozoites, Schizonts and gametocytes of all the malarial parasites are seen in the peripheral blood smear except
(A) *P. falciparum*
(B) *P. malariae*
(C) *P. ovale*
(D) *P. vivax*

91. The secretory phase in the human menstrual cycle is also called
(A) luteal phase lasts for about 6 days
(B) follicular phase lasting for 6 days
(C) luteal phase lasts for about 13 days
(D) follicular phase lasts for about 13 days

92. The earliest fossil of prehistoric man is
(A) Dryopithacus
(B) Ramapithacus
(C) Shivapithacus
(D) Autralopithacus

93. Chirality of DNA is due to
(A) the bases
(B) base stacking
(C) hydrogen bonds between bases
(D) deoxyribose

94. The 5' cap of RNA is required for the
(A) stability of RNA only
(B) stability and transport of RNA
(C) transport of RNA only
(D) methylation of RNA

95. Origin of replication usually contains
(A) GC rich sequences
(B) both AT and GC rich sequences
(C) no specific sequences
(D) AT rich sequences

96. E. coli proliferate faster on glucose than it does on lactose because lactose is
(A) taken up slowly than glucose
(B) not hydrolysed by E. coli
(C) taken up faster than glucose
(D) toxic to the cells

97. Which one of the following is a type of intercellular junction in animal cells?
(A) Anomastellae
(B) Plasmodesmata
(C) Desmosomes
(D) Glycocalyx

98. Major stimulus for spore formation in bacteria is
(A) nutrition limitation
(B) heat stress
(C) cold stress
(D) pH stress

99. The dye used in Gram staining is
(A) Rhodamine
(B) Methylene blue
(C) Giemsa
(D) Crystal violet

100. All are in-situ conservation efforts except
(A) National parks
(B) Sanctuaries
(C) Zoo
(D) biosphere reserves