104 MSC INTEGRATED BIOLOGICAL SCIENCES

SHIFT III

PHYSICS

1. A certain screw gauge has a pitch of 0.5 mm. If there are 50 divisions on the head scale, the dimension of the object can then be determined to an accuracy of

   (A) 0.05 cm
   (B) 0.01 cm
   (C) 0.001 cm
   (D) 0.0001 cm

2. The refractive index of glass measured by a given method by four independent measurements is found to have values of 1.54, 1.58, 1.52 and 1.56 respectively. The mean value of refractive index with percentage error is

   (A) 1.55 ± 1.29 %
   (B) 1.55 ± 0 %
   (C) 1.56 ± 6 %
   (D) 1.56 ± 0 %

3. A particle moves for 20 seconds with velocity 3 m/s and then with velocity 4 m/s for another 20 seconds and finally moves with velocity 5 m/s for next 20 seconds. Then the average velocity of the particle is

   (A) 3 m/s
   (B) 4 m/s
   (C) 5 m/s
   (D) Zero

4. An athlete completes one round of a circular track of radius R in 40 s. What will be his displacement at the end of 2 min 40 seconds?

   (A) $8R$
   (B) $8\pi R$
   (C) $2R$
   (D) Zero

5. A wheel having 1 m diameter makes 60 revolutions per minute. The linear speed of a point on its circumference is

   (A) $\pi/2$ m/s
   (B) π m/s
   (C) 2π m/s

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(D) 60π m/s

6. A car starts from rest to cover a distance *s*. The coefficient of friction between the road and the tyres is μ. The maximum time in which the car can cover the distance is proportional to

(A) μ
(B) $\sqrt{\mu}$
(C) $1/\mu$
(D) $1/\sqrt{\mu}$

7. A diesel engine pumps 40 kg of water in 1 second. The water comes out vertically upwards with a velocity of 3 m/s. What is the power of the engine in kilo Watt?

(A) 12 kW
(B) 1.2 kW
(C) 120 kW
(D) 1200 kW

8. Which one of the following is the S.I. unit of electric field strength?

(A) Am^{-1}
(B) Nm^{-1}
(C) Vm^{-1}
(D) Coulomb $s^{-1}cm^{-1}$

9. If the distance between the two charged particles is reduced to half the original distance, then the force between them becomes

(A) doubled
(B) one-forth
(C) one-half
(D) four times

10. A metal sheet is placed between two charges separated by a distance. Then the force between them will

(A) increase
(B) decrease
(C) remains the same
(D) be reduced to half the initial value

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11. If the separation between carbon and oxygen in CO molecule is 0.12 nm, then the distance of the center of mass from the carbon atom is

(A) 0.03 nm
(B) 0.068 nm
(C) 0.05 nm
(D) 0.06 nm

12. A hole is drilled along the earth's diameter and a stone is dropped into it. When the stone is at the center of the earth, it has

(A) mass
(B) weight
(C) potential energy
(D) zero mass

13. Two wires of the same radius and material have lengths in the ratio 1:2. If these are stretched by the same force, the strain produced in the two cases will be in the ratio

(A) 1:2
(B) 2:1
(C) 1:1
(D) 4:1

14. The phase difference between the displacement and velocity of a particle executing SHM is

(A) $\pi/2$
(B) π
(C) $\pi/4$
(D) 0

15. Standing waves are produced in a 10 m long stretched string. If the string vibrates in 5 segments and the wave velocity is 20 m/sec, the frequency is

(A) 2 Hz
(B) 4 Hz
(C) 5 Hz
(D) 10 Hz

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16. A parallel plate condenser is charged and isolated. When a sheet of glass is interposed between the plates

(A) the charges on the plates will be reduced
(B) the potential difference between the plates will be reduced
(C) the potential difference between the plates will be increased
(D) the charges on the plates will be increased

17. If a capacitor of Capacitance 10 micro Farad (μF) is charged to a potential difference of 100 V, the energy stored in it is

(A) 0.5 J
(B) 0.05 ergs
(C) 10 J
(D) 0.05 J

18. With increase in altitude, the conductivity of the atmosphere

(A) first increases and then decreases
(B) increases
(C) decreases
(D) remains constant

19. An electric iron box has a heater coil of resistance 50 Ω. If it is connected to 230 V AC mains, the current flowing through the heater coil will be

(A) 4.6 mA
(B) 5 A
(C) 4.6 A
(D) 15 A

20. Glass has a resistivity of the order of

(A) 10^{-8} Ω m
(B) 10^{-5} Ω m
(C) 10^{8} Ω m
(D) 10^{12} Ω m

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21. A long solenoid of n turns has a self inductance L and area of cross section a. When a current flows through the solenoid, it produces a magnetic field B. The current flowing through the solenoid is

(A) $B\,a\,n\,/\,L$
(B) $BanL$
(C) $Bn\,/\,aL$
(D) $B\,/\,anL$

22. A conductor of length r moves in a uniform magnetic field of induction B with a velocity $\boldsymbol{v}$. The emf induced across the conductor is

(A) $(v \times B)\,.\,r$
(B) $v.\,(r \times B)$
(C) $B\,.\,(r \times v)$
(D) $r \times (v \times B)$

23. The penetrating powers of α, β and γ radiation, in decreasing order are

(A) α, β, γ
(B) γ, α, β
(C) β, γ, α
(D) γ, β, α

24. A half-wave rectifier is being used to rectify an alternating voltage of frequency 50 Hz. The number of pulses of rectified current obtained in one second is

(A) 50
(B) 25
(C) 100
(D) 6

25. The voltage V and the current I flowing through an A.C circuit are given by $V = 2 \cos 100\,\pi t$ and $I = 4 \sin 100\,\pi t$, where t represents time. The power dissipated in the circuit is

(A) zero Watt
(B) 8 Watt
(C) 4 Watt
(D) 2 Watt

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26. An alternating e.m.f. is given by $V = 100 \sin 314\, t$. Its frequency is

(A) 100 Hz
(B) 50 Hz
(C) 314 Hz
(D) 60 Hz

27. In a purely inductive circuit, the current

(A) is in phase with voltage
(B) is out of phase with voltage
(C) leads the voltage by 90°
(D) lags behind the voltage by 90°

28. The current and voltage in an A.C. circuit are given by $I = I_o \sin\left(\omega t - \frac{\pi}{2}\right)$ and $E = E_o \sin \omega t$. Then the average power consumption P in the circuit is

(A) $P = \frac{E_o I_o}{\sqrt{2}}$
(B) $P = \frac{EI}{\sqrt{2}}$
(C) $P = \frac{E_o I_o}{2}$
(D) zero

29. Two electric bulbs whose resistances are in the ratio 1:2, are connected in parallel to a constant voltage source. The power dissipated in them is in the ratio

(A) 1:2
(B) 2:1
(C) 1:1
(D) 1:4

30. The neutral temperature for a thermocouple is 270°C. If the temperature of the cold junction is 15°C, then the inversion temperature is

(A) 255°C
(B) 285°C
(C) 570°C
(D) 525°C

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31. A source emits a sound of frequency 400 Hz but the listener hears it to be 390 Hz. Then

(A) the listener is moving towards the source
(B) the source is moving toward the listener
(C) the listener is moving away from the source
(D) the listener has a defective ear

32. The binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is

(A) 122.4 eV
(B) 30.6 eV
(C) 13.6 eV
(D) 3.4 eV

33. Which of the following nuclei has lowest value of the binding energy per nucleon?

(A) ${}_2He^4$
(B) ${}_{24}Cr^{52}$
(C) ${}_{62}Sm^{152}$
(D) ${}_{80}Hg^{100}$

34. The average number of neutrons emitted during the fission of U^{235} is

(A) 3
(B) 2
(C) 1.5
(D) 2.5

35. The radioactive decay of uranium into thorium is represented by the equation ${}_{92}U^{238} \rightarrow {}_{90}Th^{234} + X$, then X is

(A) an electron
(B) a neutron
(C) a proton
(D) an alpha particle

36. The same radioactive nucleus may emit

(A) all the three α, β and γ simultaneously
(B) either α or β or γ at a time
(C) all the three α, β and γ at a time
(D) only α and β

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37. The radius of a nucleus of mass number A is proportional to

(A) A
(B) $A^{½}$
(C) $A^{⅓}$
(D) A^{3}

38. Which one of the statements about nuclear forces is INCORRECT?

(A) Nuclear forces are short range forces
(B) Nuclear forces are charge independent forces
(C) Nuclear forces are exchange forces
(D) Nuclear forces are central forces

39. Which one of the statements about neutron is INCORRECT?

(A) Neutron is a fundamental particle
(B) Neutron has no charge
(C) Nuclei of all elements in nature contain neutron
(D) Neutron has a spin

40. The ground state energy of the hydrogen atom is

(A) 13.6 eV
(B) 0 eV
(C) –3.4 eV
(D) –13.6 eV

41. Which one of the statements about matter waves is INCORRECT?

(A) Matter waves are not electromagnetic waves
(B) Matter waves are also called probability waves
(C) de Broglie waves are pilot waves i.e., these waves guide the particle
(D) The phase velocity of the matter waves in vacuum is independent of wavelength

42. Kinetic energy of the cathode rays (electrons) depend on

(A) voltage applied to the electrode
(B) depend on work function
(C) depend on both (A) and (B)
(D) does not depend on any physical quantity

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43. A man cannot see objects clearly at a distance greater than 2 m. He is then suffering from

(A) short sight
(B) long sight
(C) astigmatism
(D) presbyopia

44. The magnifying power of a simple microscope can be increased by if we use eyepiece of

(A) higher focal length
(B) smaller focal length
(C) higher diameter
(D) smaller diameter

45. If the focal length of the objective and eyepiece lens of an astronomical telescope are f_o and f_e respectively, then its magnifying power is

(A) $\frac{f_o}{f_e}$
(B) $\frac{f_e}{f_o}$
(C) $\frac{2f_o}{f_e}$
(D) $2f_e$

46. If f_r and f_v stand for focal length of the lens for red colour and violet colour respectively, then the longitudinal chromatic aberration of the lens for parallel rays is given by

(A) $f_r - f_v$
(B) $f_v - f_r$
(C) $f_r f_v$
(D) $f_v + f_r$

47. The deviation produced by a flint glass prism for violet and red light rays are 3.25° and 3.10° respectively. Then the angular dispersion is

(A) 6.35°
(B) 3.175°
(C) 0.15°
(D) 6.35 radians

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48. Total internal reflection is NOT possible in the case when light travels from

(A) glass to air
(B) glass to water
(C) water to glass
(D) water to air

49. When the angle of incidence on a certain material is 60°, the reflected light is completely polarized. The angle of refraction is then

(A) 60°
(B) 90°
(C) 30°
(D) 45°

50. A sugar solution of length 15 cm has specific rotation of 65° and produces a optical rotation of 7°. Then the concentration of the solution is

(A) 0.7 g/cc
(B) 13.9 g/cc
(C) 0.0717 g/cc
(D) 0.01g/cc

51. To observe diffraction, the size of an obstacle

(A) should be of the order of wavelength
(B) should be much larger than the wavelength
(C) has no relation to wavelength
(D) should be exactly $\lambda/2$.

52. If the distance between the screen and the slit is doubled in Young's double slit experiment, the fringe width will become

(A) four times
(B) two times
(C) one-half
(D) one-fourth

53. When light waves suffer reflection at the interface between air and glass, the change of phase of the reflected wave is

(A) zero
(B) π
(C) 2π
(D) $\pi/2$

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54. If a string of string constant k is stretched by a length x under tension T, the energy stored is

(A) $\frac{2k}{T^2}$

(B) $\frac{2T^2}{k^2}$

(C) $\frac{T^2}{2k}$

(D) $\frac{2T}{k^2}$

55. The Young's modulus of a perfectly rigid body is

(A) zero
(B) unity
(C) infinite
(D) may be any finite non-zero value

56. A wire elongates by l mm when a load W is hanged at from it. If the wire goes over a pulley and the two weights W each are hung at the two ends, the elongation of the wire (in mm) will be

(A) $l/2$
(B) l
(C) $2l$
(D) zero

57. If two liquids of same masses but densities ρ_1 and ρ_2 respectively are mixed, then the density of the mixture is

(A) $\rho_1 + \rho_2$

(B) $\frac{\rho_1 + \rho_2}{2}$

(C) $\frac{\rho_1 \rho_2}{\rho_1 + \rho_2}$

(D) $\frac{2\rho_1 \rho_2}{\rho_1 + \rho_2}$

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58. A boy carries on his head an airtight box containing a bird resting on the floor of the box. When the bird starts flying inside the box, he will feel that the box is now

(A) lighter
(B) heavier
(C) same in weight as before
(D) lighter in the beginning and heavier later

59. A cork ball is floating on the surface of water in a beaker. The beaker is covered with a bell jar and the air is evacuated. What will happen to the ball?

(A) Sink a little
(B) Rise a little
(C) Remain unchanged
(D) Sink completely

60. The thermometer used as a reference standard is

(A) mercury thermometer
(B) platinum resistance thermometer
(C) gas thermometer
(D) thermocouple thermometer

61. If α is coefficient of linear expansion, β is coefficient of superficial expansion and γ is the coefficient of cubical expansion, then for the same rise in temperature, the percentage changes in α, β and γ are in the ratio

(A) 1:2:3
(B) 3:2:1
(C) 1:1:1
(D) 1:2:4

62. If K and σ respectively are the thermal and electrical conductivities of a metal at absolute temperature T, then

(A) $\frac{K}{\sigma T} = \text{constant}$
(B) $\frac{K}{\sigma} = \text{constant}$
(C) $\frac{K}{T} = \text{constant}$
(D) $\frac{\sigma}{KT} = \text{constant}$

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63. The velocity V of thermal radiation is (C = velocity of light in vacuum)

(A) $V < C$
(B) $V > C$
(C) $V = C$
(D) dependent on the medium

64. Which one of the following statements about electromagnetic waves is INCORRECT?

(A) They do not require material medium for propagation
(B) They are not deflected in electric an magnetic fields
(C) The waves are transverse in nature
(D) They cannot be diffracted

65. If $\vec{E}$ and $\vec{B}$ represent electric and magnetic field vectors of the electromagnetic waves, then the direction of propagation of the waves will be along

(A) $\vec{B} \times \vec{E}$
(B) $\vec{E}$
(C) $\vec{B}$
(D) $\vec{E} \times \vec{B}$

66. The area of B-H hysteresis loop in a ferromagnetic material is a measure of the

(A) net energy dissipated per unit volume per cycle of magnetization of the material
(B) permeability of the material
(C) susceptibility of the material
(D) retentivity of the material

67. The unit cubic cell of Al has an edge length equal to 4.5×10^{-10} m. The number of unit cells in an aluminium foil of volume 91×10^{-6} m^3 is

(A) 10^{24}
(B) 10^{-24}
(C) 10^{8}
(D) 10^{23}

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68. The gate with the Boolean expression $Y = \overline{A \cdot B}$ for its output is

(A) AND
(B) NAND
(C) XOR
(D) XNOR

69. The Boolean expression for NOR gate is

(A) $Y = A + \overline{B}$
(B) $Y = \overline{A + B}$
(C) $Y = \overline{A} + B$
(D) $Y = \overline{A} + \overline{B}$

70. What gate has the truth table given below?

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(A) NOT
(B) AND
(C) NAND
(D) NOR

71. A transistor amplifier is operated in common emitter configuration at constant collector voltage of V_C = 1.5 V, such that the change in the base current from 100 μA to 150 μA produces a change in the collector current from 5 mA to 10 mA. The current gain β of the circuit is then

(A) 50
(B) 67
(C) 75
(D) 100

72. A two stage transistor amplifier has a gain of 10 for the first stage and a gain of 20 for the second stage. The overall gain of the cascade amplifier will be

(A) 30
(B) 10
(C) 200
(D) 2

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73. Long range radio transmission is possible when the radio waves are reflected from the ionosphere. For this to happen, the frequency of the radio waves must be in the range

(A) 80-150 MHz
(B) 8-25 MHz
(C) 1-3 MHz
(D) 150-1500 kHz

74. The colour of a star is dependent on its

(A) radius
(B) distance from the earth
(C) temperature
(D) structure

75. Hubble constant *H* has the dimensions of

(A) mass
(B) length
(C) $(\text{time})^{-1}$
(D) temperature

CHEMISTRY

76. Given the latent heat of vapouration of water as 40.7 kJ mol^{-1} at 373 K, ΔS for one mole of water converted to steam at 373 K is

(A) 109.1 JK^{-1} mol^{-1}
(B) 40.7 kJ mol^{-1}
(C) 81.4 kJ mol^{-1}
(D) 218.2 JK^{-1} mol^{-1}

77. For a non-linear triatomic gas the value of the ratio of C_p and C_v at laboratory temperature is (assuming no vibrational contribution)

(A) 7/5
(B) 9/7
(C) 8/3
(D) 4/3

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78. 6 moles of SO_2 and 6 moles of O_2 are allowed to form SO_3 in a closed vessel. At the equilibrium stage, 60% of SO_2 is used up. The total number moles of the mixture at equilibrium is

(A) 10.2
(B) 9.8
(C) 7.2
(D) 11.2

79. pH of a solution obtained by mixing equal volumes of the solutions with pH 3 and pH 5 is

(A) 4.0
(B) 3.5
(C) 3.3
(D) 2.0

80. The K_{sp} of AgCl is 1×10^{-10}, its solubility in pure water in 0.01 M NaCl is

(A) 2×10^{-10}
(B) 1×10^{-8}
(C) 2×10^{-8}
(D) 1×10^{-10}

81. The edge length of fcc unit cell is 508 pm. The radius of the atom is …… pm.

(A) 180
(B) 200
(C) 618
(D) 288

82. Crystalline solids having the least enthalpy of fusion is

(A) Molecular solid
(B) Metallic solid
(C) Ionic solid
(D) Covalent solid

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83. Vapour pressure of water at 298 K is 19.8 mm of Hg. 0.1 mole of glucose is dissolved in 172.8 g of water. The vapour pressure of the solution is

(A) 19.6 mm
(B) 16.9 mm
(C) 19.0 mm
(D) 18.9 mm

84. Osmotic pressure of blood is 8.21 atm at 37°C. Amount of glucose that should be used per litre of intravenous injection that is at the same osmotic pressure of blood is

(A) 58.4 g
(B) 29.2 g
(C) 5.84 g
(D) 2.92 g

85. The equitant conductance of 1 M benzoic acid is 12.8 $Scm^2\ eq^{-1}$ and if the limiting equivalent conductance of benzoate ion and H^+ ion are 42 and 288.42 $Scm^2\ eq^{-1}$, respectively, its degree of dissociation is

(A) 39%
(B) 3.9%
(C) 0.35%
(D) 0.039%

86. Two half-cells of electrode potentials of E_1 and E_2 are combined to form a cell of potential E_3, (n_1, n_2 and n_3 are number of electrons involved in first electrode, second electrode and the cell) E_3 is

(A) $E_3 = E_2 - E_1$
(B) $E_3 = (E_1n_1 + E_2n_2)/n_3$
(C) $E_3 = (E_1n_1 - E_2n_2)/n_3^2$
(D) $E_3 = E_1 + E_2$

87. The potential of half-cell consisting of zinc electrode in 0.01 M $ZnSO_4$ solution at 25°C is ($E° = -0.763$ V)

(A) –0.8221 V
(B) –0.704 V
(C) –0.881 V
(D) –0.645 V

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88. A dilute aqueous solution of $CuSO_4$ is electrolyzed using Pt electrodes. The products at the anode and cathode are

(A) O_2, H_2
(B) H_2, O_2
(C) O_2, Cu
(D) $S_2O_8^{2-}$, H_2

89. The half-life for radioactive decay of C^{14} is 5730 years. An archaeological artefact containing wood had only 80% of the C^{14} found in living tree. The age of the sample is

(A) 1845 years
(B) 2865 years
(C) 4584 years
(D) 1146 years

90. If the volume of the reaction vessel is halved, for the reaction, $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$, then the rate is

(A) $1/6^{th}$ of its initial value
(B) $1/4^{th}$ of its initial value
(C) 8 times of its initial value
(D) 4 times of its initial value

91. The rate equation for a reaction: $A \rightarrow B$ is $r = k[A]^0$. If the initial concentration of the reactant is 'a' mol dm^{-3}, then half-life period of reaction is

(A) a/k
(B) 2a/k
(C) a/2k
(D) k/a

92. The number of unit cells present in 39 g of potassium that crystallizes as body centered cubic structure is (N_A = Avogadro number)

(A) N_A
(B) 0.25 N_A
(C) 0.5 N_A
(D) 0.75 N_A

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93. Which one of the following is not correctly matched?

(A) $[Ni(CN)_4]^{2-}$ – dsp^2 hybridization, dia-magnetic
(B) $[Cu(NH_3)_4]^{2+}$ – sp^3 hybridization, para-magnetic
(C) $[NiCl_4]^{2-}$ – sp^3 hybridization, tetrahedral
(D) $[CuCl_4]^{2-}$ – sp^3 hybridization, para-magnetic

94. Which one of the following statements is not true according to Werner's theory of coordination compounds?

(A) Both primary and secondary valencies can be satisfied by anions
(B) Secondary valency is non-directional
(C) Primary valency is ionic valency
(D) Metal ions exhibit two types of valencies

95. Which one of the following is true regarding the energies of d-orbitals of tetragonally distorted octahedral geometry?

(A) $d_{yz} > d_{xz} > d_{xy}$
(B) $d_{x^2-y^2} = d_{z^2}$
(C) $d_{xz} > d_{yz}$
(D) $d_{z^2} > d_{x^2-y^2}$

96. In the estimation of Ca(II) ions, in the presence of ammonia-ammonium chloride buffer solution, EDTA acts as a …… ligand.

(A) flexidentate
(B) pi-donor
(C) hexadentate
(D) tetradentate

97. How much amount of oxalic acid dihydrate crystals are required to prepare 1 L of a decinormal solution of it?

(A) 6.3 g
(B) 12.6 g
(C) 3.15 g
(D) 9 g

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98. What is correct order of increasing acidic strength of oxides of nitrogen?

(A) $NO < N_2O_3 < N_2O_4 < N_2O_5$
(B) $NO = N_2O_3 < N_2O_4 = N_2O_5$
(C) $NO > N_2O_3 < N_2O_4 > N_2O_5$
(D) $NO > N_2O_3 > N_2O_4 > N_2O_5$

99. Regarding compounds of sulfur, which one of the following statements in not true?

(A) SF_6 does not undergo hydrolysis
(B) SF_4 undergoes hydrolysis
(C) SF_6 is thermally stable and chemically inert
(D) SF_4 acts as Lewis acid

100. Fluorine does not act as the central atom in interhalogen compounds, because

(A) it is highly electronegative
(B) of absence of d-orbitals
(C) of its small size
(D) of its gaseous nature

101. A hydrometallurgical process involves the following steps.

$Ag_2S + 4\ NaCN \rightarrow 2\ Na[Ag(CN)_2] + Na_2S$

$2\ Na[Ag(CN)_2] + Zn \rightarrow Na_2[Zn(CN)_4] + 2\ Ag\downarrow$

Which one of the following statements is true?

(A) In the second step Zn(II) is reduced to Zn(0)
(B) Dicyanoargentum(I) complex is insoluble in water
(C) In the first step Ag(I) is reduced to Ag(0)
(D) Tetracyanozinc(II) complex is soluble in water

102. Transition metals exhibit variable oxidation states. This is because

(A) the outermost shell is empty
(B) they are all metals
(C) the energies of $(n - 1)$d and ns orbitals are almost equal
(D) the ionization energy to remove electron from ns orbital is very low

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103. The general electronic configuration of inner-transition elements is

(A) $(n-2)f^{1-14}\ (n-1)d^{0,\,1}$
(B) $(n-2)f^{1-14}\ (n-1)d^{0-1}\ ns^2$
(C) $(n-1)f^{1-14}\ (n-1)d^{0-1}\ ns^2$
(D) $(n-2)f^{1-14}\ ns^2$

104. Which of the following species would be diamagnetic?

(A) Cr^{3+}
(B) Co^{3+}
(C) Br
(D) Zn^{2+}

105. Which orbital is designated by the quantum numbers: $n = 5$, $l = 1$, $m_l = 0$?

(A) 5s
(B) 5p
(C) 5d
(D) 5f

106. If travelling at equal speeds, which of the following matter waves have the longest wavelength?

(A) Electron
(B) Proton
(C) Neutron
(D) α particle

107. Number of angular nodes for 4d orbital is

(A) 4
(B) 3
(C) 2
(D) 1

108. Which of the following will not show deflection from the path on passing through electric field?

(A) Electron
(B) Neutron
(C) Cathode rays
(D) Proton

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109. Complete the following nuclear equation:

$^{59}_{27}Co + {}^{1}_{0}n \rightarrow {}^{56}_{25}Mn + ?$

(A) $4\,{}^{1}_{1}H$

(B) $4\,{}^{1}_{1}n$

(C) ${}^{4}_{2}He$

(D) $2\,{}^{1}_{1}H$

110. Which among the following sequence is best suited for selective transformation on 2-methylbutane to 2-methylbutan-2-ol?

(A) Treatment with Cl_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in water

(B) Treatment with Cl_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in ethanol

(C) Treatment with Br_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in water

(D) Treatment with I_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in a 1:1 mixture of water and ethanol

111. Ozone depletion in Antartica is due to

(A) sulphur containing gases
(B) peroxy acetyl nitrate
(C) chlorine nitrate
(D) fluorine

112. When an organic compound 'A' was treated sequentially with ammonia and Br_2/KOH, methanamine was obtained. Then 'A' is an

(A) ethanol
(B) ethyl acetate
(C) acetonitrile
(D) acetic acid

113. How many structural isomers are possible for C_3H_9N?

(A) 3
(B) 4
(C) 5
(D) 6

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114. Which is a non-reducing sugar?

(A) Glucose
(B) Sucrose
(C) Maltose
(D) Fructose

115. 0.200 g of an organic compound contains 71% carbon. What is the mass of CO_2 produced when it is subjected to complete combustion?

(A) 0.142
(B) 0.039
(C) 0.521
(D) 0.733

116. Consider the following compounds:

(i) hydrazine
(ii) paracetamol
(iii) chlorophyll
(iv) saccharin

How many among them will test negative for nitrogen in Lassaigne's test ?

(A) 1
(B) 2
(C) 3
(D) 4

117. Which among the following is more reactive towards nitration using nitrating mixture?

(A) *tertiary*-Butylbenzene
(B) Toluene
(C) Benzene
(D) Chlorobenzene

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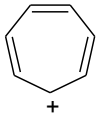
118. Which among the following is antiaromatic?

(A)

(B)

(C)

(D) 

119. Hydrogenation of acetyl chloride in the presence of Pd-$BaSO_4$ as catalyst to obtain ethanal is

(A) Clemmensen reduction
(B) Rosenmund reduction
(C) Schmidt reaction
(D) Dakin reaction

120. Which among the following compounds will selectively give the same addition product with HBr under both Markonikkoff's and anti-Markonikkoff's addition conditions?

(A) CH_3-CH=CH-CH_2-CH_3
(B) CH_3-CH=CH-$C(CH_3)_2$
(C) CH_3-CH=CH-$CH(CH_3)_2$
(D) C_6H_5-CH=CH_2

121. Among the following, the organic compound that gives propyne on treatment with sodamide with minimal side products is

(A) $CH_3CH_2CHCl_2$
(B) $CH_3CCl=CH_2$
(C) $CH_3CCl=CH_2Cl$
(D) CH_3CCl_2-CH_3

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122. Which among the following tests is useful to differentiate between styrene and phenol?

(A) Lucas test
(B) Test with bromine water
(C) Test with bromine in dry chloroform
(D) Test with $KMnO_4$

123. Identify the **incorrect** statement about natural rubber.

(A) Double bonds are located between C_2 and C_3 of each isoprene unit
(B) Has mostly trans double bonds
(C) Intermolecular forces are quite weak
(D) Has a randomly coiled structure

124. The monomer unit/units in cellulose is/are

(A) α-D-glucose
(B) β-D-glucose
(C) Alternating α-D-glucose and D-fructose units
(D) Alternating β-D-fructose and D-fructose units

125. Which among the following vitamins is the most efficient antioxidant?

(A) Vitamin D
(B) Vitamin C
(C) Vitamin B
(D) Vitamin A

BIOLOGY

126. The relationship between the moth *Tegeticula yuccasella* and *Yucca* is an example for

(A) obligate mutualism
(B) facultative mutualism
(C) trophic mutualism
(D) defensive mutualism

127. The growth of any microbial cell will be high at

(A) exponential phase
(B) lag phase
(C) death phase
(D) stationary phase

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128. In plants like Elodes and Hydrilla, pollination takes place through

(A) anemophily
(B) epihydrophily
(C) zoophily
(D) myrmecophily

129. Human appendix and wings of Ostrich represent the organs which

(A) have same anatomy but different functions
(B) have different anatomy but same functions
(C) present in reduced form with no function
(D) None of the above

130. Assertion: The person vaccinated by Covishield got some side-effects.

Reason: This is due to the activation of Active immune system.

(A) both the assertion and the reason are true and the reason is a correct explanation of the assertion
(B) both the assertion and reason are true but the reason is not a correct explanation of the assertion
(C) assertion is true but reason is false
(D) assertion is false but reason is true

131. The racemose inflorescence is seen in

(A) *Mangifera indica* (Mango)
(B) *Azadirachta indica* (Neem)
(C) *Delonix regia* (Gulmohar)
(D) All the above

132. The urine of a person undergoing prolonged fasting has abundant quantities of

(A) glucose
(B) ketones
(C) amino acids
(D) fats

133. …… is the oldest national park established for the protection of Bengal tigers.

(A) Gir National Park
(B) Kaziranga National Park
(C) Corbett National Park
(D) Bandhavgarh National Park

Only for reference. Do not copy

134. Sea urchin belong to the class of

(A) echinoida
(B) holothuroidea
(C) ophiuroidea
(D) asteroidea

135. LSD is a/an

(A) synthetic hallucinogen
(B) opioid
(C) natural hallucinogen
(D) angel dust

136. The gland located at the anterior wall of vagina is called as

(A) bartholins glands
(B) skenes glands
(C) cowpers glands
(D) None of the above

137. The automated species identification cyber tool DAISY is the abbreviation of

(A) Digital Automated Identification System
(B) Digital Automatic Identification System
(C) Digital Automatic Identifiable System
(D) Digitally Automated Identification System

138. Which one of the following statements is true for class Amphibian?

(i) Body is divisible into head and trunk
(ii) Respiration is through gills only
(iii) Heart is three chambered – two auricles and one ventricle
(iv) Fertilization is internal

(A) only (iv)
(B) only (i) and (iii)
(C) only (ii) and (iii)
(D) All are correct

139. Fats $\xrightarrow{?}$ Diglycerides

(A) Amylase
(B) Chymotrypsin
(C) Carboxypeptidase
(D) Lipase

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140. In the dividing cell of an animal, the two poles of the spindle bears asters which is referred as

(A) amphiaster
(B) centric
(C) Both (A) and (B)
(D) None of the above

141. Colchicine affects

(A) DNA synthesis
(B) Doubling of chromosome
(C) Cytokinesis
(D) Formation of spindles

142. A condition called Erythroblastosis Foetalis had caused the termination of second pregnancy in a woman. The reason for this may be

(A) husband is +ve for Rh factor
(B) woman is -ve for Rh factor
(C) Both (A) and (B)
(D) None of the above

143. The blood group B will have the genotype

(A) I^AI^A
(B) I^AI^B or I^BI^O
(C) I^OI^O
(D) I^BI^B or I^BI^O

144. Duration of erythrocytic cycle of mild tertian malaria is

(A) 48 hrs
(B) 72 hrs
(C) 50 hrs
(D) 36 hrs

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145. Match the following systematic position of *Hibiscus rosa-sinensis* in the Column I with that of column II.

	Column I		**Column II**
(1)	Class	(i)	Plantae
(2)	Family	(ii)	Magnoliopsida
(3)	Kingdom	(iii)	Malvales
(4)	Order	(iv)	Malvaceae

(A) (1) - (iv), (2) - (ii), (3) - (iii), (4) - (i)
(B) (1) - (ii), (2) - (iv), (3) - (i), (4) - (iii)
(C) (1) - (i), (2) - (ii), (3) - (iv), (4) - (iii)
(D) (1) - (iii), (2) - (iv), (3) - (i), (4) - (ii)

146. The ATP synthesis during light reaction is

(A) Photolysis
(B) Phosphorylation
(C) Oxidative phosphorylation
(D) Photophosphorylation

147. Acentric or Anastral form of mitosis refers to

(A) Presence of asters in mitotic apparatus
(B) Equational division in mitosis
(C) Absence of asters in mitotic apparatus
(D) None of the above

148. An example of polycyclic stele with vascular tissues present in the form of two or more concentric cylinders is

(A) Monocot stem
(B) Pteridium
(C) Dicot stem
(D) Adiantum pedatum

149. The factor that does not lead to alteration of Hardy-Weinberg law is

(A) natural selection
(B) mutation
(C) random mating
(D) migration

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150. Heparin, the anti-coagulant is produced by

(A) interstitial cells
(B) platelets
(C) mast cells
(D) eosinophils

151. The Plymouth rock variety is a/ an

(A) American breed of chicken
(B) Asiatic breed of chicken
(C) Mediterranean breed of chicken
(D) English breed of cow

152. The potential that describes the alteration between water and the hydrating colloid or gel like organic molecule in the cell wall is

(A) Solute potential
(B) Pressure potential
(C) Matric potential
(D) None of the above

153. The four kingdom system of classification was proposed by

(A) Ernst Haeckel
(B) Copeland
(C) R.H.Whittaker
(D) Carl Linnaeus

154. In Fabaceae, the gynoecium is

(A) Unicarpellary
(B) Bicarpellary
(C) Tetracarpellary
(D) Multicarpellary

155. In a dihybrid test cross experiment of the garden pea, the resultant individual is crossed with recessive parent of the F1 generation. The resulting phenotypic ratio will be

(A) 1:2:1
(B) 1:3
(C) 1:1:1:1
(D) 9:3:3:1

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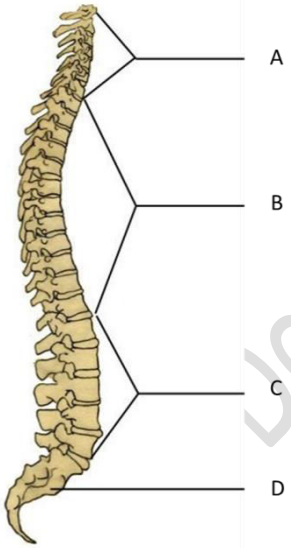
156. DPT vaccine is given for

(A) Tetanus, Plague, whooping cough
(B) Diphtheria, Pertussis, Tetanus
(C) Diphtheria, Pneumonia, Tetanus
(D) Plague, Polio, Tetanus

157. The figure shows the parts of lateral view of the vertebral column of the human being. Identify the parts labeled from A to D and select the correct option.



(A) (A) – Cervical, (B) – Lumbar, (C) – Thoracic, (D) – Sacral
(B) (A) – Lumbar, (B) – Thoracic, (C) – Coccyx, (D) – Cervical
(C) (A) – Cervical, (B) – Thoracic, (C) – Lumbar, (D) – Sacral
(D) (A) – Thoracic, (B) – Cervical, (C) – Lumbar, (D) – Coccyx

158. What kind of cell division occurs in cancer cells?

(A) Mitotic division
(B) Meiotic division
(C) Either mitotic or meiotic
(D) Cell division does not occurs

159. Statement A: Taq polymerase has been isolated from the bacterium *Thermus aquaticus*
Statement B: Taq polymerase enzyme is easily degraded in high temperature

(A) A and B is Correct
(B) A is wrong and B is correct
(C) A and B is wrong
(D) A is correct and B is wrong

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160. The secondary metabolite caffeine is produced by the plants for the purpose of

(A) nutritive value
(B) defense action
(C) growth response
(D) reproduction

161. Who is considered as the father of genetic engineering?

(A) Steward Linn
(B) Stanley Cohen
(C) Paul Berg
(D) Kary Mullis

162. Choose which of the following flowers stands for the below floral diagram.

(A) *Hibiscus rosa-sinensis*
(B) *Datura metel*
(C) *Ricinus communis*
(D) *Musa paradisiaca*

163. Which one of the following is an example of housekeeping gene?

(A) Glyceraldehyde 3-phosphate dehydrogenase
(B) RNA polymerase
(C) r-RNA genes
(D) All the above

164. The location of the Bartholin's glands in human are

(A) either side of the fallopian tube
(B) either side of the penis
(C) either side of the vas deferens
(D) either side of the vagina

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165. If the DNA content at G1 phase is 1C, what will be the DNA content of the cells at S, G2, and M phase respectively?

(A) 2C, 2C, and 2C
(B) 2C, 1C, and 1C
(C) 1C, 1C, and 1C
(D) 1C, 2C, and 2C

166. Lichens are

(A) fungi
(B) bizarre organisms
(C) algae
(D) bryophytes

167. Which among the following is not a correct step in the DNA recombination during crossing over?

(A) Homologous DNA molecules are paired side by side with their duplicated copies of DNAs
(B) One strand of both DNAs cut in one place by the enzyme endonuclease
(C) DNA strands cut along the vertical (V) line
(D) The vertical cut will result in hetero duplexes with recombinants

168. The plasmids that are designed to replicate in cells of two different species are

(A) YAC vector
(B) Shuttle vector
(C) BAC vector
(D) Phagemid vector

169. Match the column I with column II and find the correct option.

Column I		**Column II**
(1) Nephridia	(i)	Annelida
(2) Choanocytes	(ii)	Porifera
(3) Flame cells	(iii)	Ctenophora
(4) Comb plates	(iv)	Platyhelminthes

(A) (1) - (i), (2) - (ii), (3) - (iv), (4) - (iii)
(B) (1) - (iii), (2) - (ii), (3) - (iv), (4) - (i)
(C) (1) - (iv), (2) - (i), (3) - (ii), (4) - (iii)
(D) (1) - (ii), (2) - (iii), (3) - (iv), (4) - (i)

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170. The double tetrasomy condition involves

(A) $(2n + 2)$
(B) $(2n + 2 + 2)$
(C) $(2n + 2 + 2 + 2)$
(D) $(2n + 3)$

171. The books 'Systema Naturae' and 'Species Plantarum' were written by

(A) Carolous Linnaeus
(B) Aristotle
(C) Theophrastus
(D) John ray

172. The invasive species *Prosopis juliflora* was first introduced in …… to counter desertification and later in Tamil Nadu as a source of firewood.

(A) Maharashtra
(B) Gujarat
(C) Andhra Pradesh
(D) Uttar Pradesh

173. The cell organelle that has hydrolytic enzymes are

(A) Lysosome
(B) Ribosome
(C) Microsome
(D) Mesosome

174. A typical coral polyp is a small organism of about

(A) 0.5 mm
(B) 2 mm
(C) 5 mm
(D) 10 mm

Only for reference. Do not copy

175. Match column I with column II and find the correct option.

	Column I		Column II
(1)	Xylem	(i)	Photosynthesis, Secretion, Storage
(2)	Sclerenchyma	(ii)	Transports food
(3)	Parenchyma	(iii)	Conducts water from roots to stem and leaves
(4)	Collenchyma	(iv)	Present in the seed coat, pulp and walls of fruits
(5)	Phloem	(v)	Mechanical support

(A) (1) - (iii), (2) - (iv), (3) - (i), (4) - (v), (5) - (ii)
(B) (1) - (iii), (2) - (ii), (3) - (iv), (4) - (i), (5) - (v)
(C) (1) - (iv), (2) - (i), (3) - (ii), (4) - (v), (5) - (iii)
(D) (1) - (ii), (2) - (iv), (3) - (i), (4) - (v), (5) - (iii)

176. Identify the 'mismatch' pair among the following.

(A) *i* gene - Repressor
(B) *z* gene - Lactosidase
(C) *a* gene - Transacetylase
(D) *y* gene - Permease

177. The fibrous joint in our body exists between

(A) phalanges
(B) vertebrae
(C) skull bones
(D) atlas and axis

178. Galapagos finches is an example of

(A) convergent evolution
(B) divergent evolution
(C) parallel evolution
(D) All the above

179. Which one of the following characters does not come under Dicotyledonous Stem?

(A) Pith is large and no secondary growth
(B) The outermost layer is the epidermis with cuticle
(C) Trichomes and stomata may be present on the epidermis
(D) The cortex consists of three layers; outermost hypodermis (collenchymatous), middle parenchymatous cortical layer and the endodermis containing starch grains

Only for reference. Do not copy

180. Numerical taxonomy developed between

(A) 1950-1954
(B) 1957-1961
(C) 1972-1976
(D) 1980-1984

181. Energy plantations are specifically meant for

(A) Oil
(B) Fuel
(C) Food
(D) Wood

182. The enzyme necessary for the synthesis of melanin from dihydroxyphenyl-alanine is

(A) Catalase
(B) Fructokinase
(C) Tyrosinase
(D) Xanthine oxidase

183. Match column I with column II.

	Column I		**Column II**
(1)	Ocean warming	(i)	Reduced water quality
(2)	Ocean acidification	(ii)	Coral bleaching
(3)	Cyclones	(iii)	Reduced reef calcification
(4)	Rise in sea level	(iv)	Loss of structure habitat

(A) (1) - (ii), (2) - (iii), (3) - (iv), (4) - (i)
(B) (1) - (iv), (2) - (ii), (3) - (i), (4) - (iii)
(C) (1) - (i), (2) - (ii), (3) - (ii), (4) - (iv)
(D) (1) - (iii), (2) - (i), (3) - (i), (4) - (ii)

184. What are the causes of seed dormancy?

(A) Hard and impermeable seed coat
(B) Immature embryo
(C) Both (A) and (B)
(D) Only (A)

185. Pteridophytes belong to

(A) Phanerogams
(B) Cryptogams
(C) Thallophyta
(D) Spermatophyta

Only for reference. Do not copy

186. Hydroponics involves

(A) plant culture in solid medium
(B) culture of plants
(C) plant culture in liquid medium
(D) culture of genetically modified plants

187. Main purpose of chemotaxonomy is

(a) To improve the existing system of plant classification
(b) To develop the present day knowledge of natural relationship of plants
(c) To improve the nutrient value of plants
(d) To develop the research

(A) (a) and (b)
(B) (b) and (d)
(C) (a) and (c)
(D) (c) and (d)

188. Which one of the following organisms is not a eukaryote?

(A) *Paramecium caudatum*
(B) *Escherichia coli*
(C) *Euglena viridis*
(D) *Amoeba proteus*

189. Acharya Jagadish Chandra Bose Indian Botanical garden is situated at

(A) Howrah
(B) New Delhi
(C) Lucknow
(D) Dehradun

190. Rachel Carson's book 'Silent Spring' is related to

(A) noise pollution
(B) population explosion
(C) ecosystem management
(D) pesticide pollution

Only for reference. Do not copy

191. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using

(A) Eco R1
(B) Taq polymerase
(C) Polymerase III
(D) Ligase

192. The Book 'Anatomy of Seed Plants' was written by

(A) Ernst Mayr
(B) Katherine Esau
(C) Carolus Linnaeus
(D) Stephen Hales

193. All the enzymes involved in TCA cycle are available in the mitochondrial matrix, except

(A) isocitrate dehydrogenase
(B) ketoglutarate dehydrogenase
(C) succinate dehydrogenase
(D) malate dehydrogenase

194. Which of the following statements is incorrect regarding the decomposition of detritus in soil?

(A) Decomposition is largely an oxygen-requiring process.
(B) The rate of decomposition is controlled by chemical composition of detritus and climatic factors.
(C) Decomposition rate is slower if detritus is rich in nitrogen, and water-soluble substances like sugars.
(D) Warm and moist environment favours decomposition whereas low temperature inhibits decomposition.

195. Choose the WRONG statement about pollen grain.

(A) The hard outer layer is made up of sporopollenin
(B) In over 60 per cent of angiosperms, pollen grains are shed at 2-celled stage
(C) The vegetative cell is smaller than the generative cell
(D) Germ pore located in intine

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196. Match the following (column I with column II)

	Column I		Column II
(I)	Asymmetrical	(a)	Aschelminthes
(II)	Pseudocoelomates	(b)	Porifera
(III)	Acoelomata	(c)	Platyhelminthes
(IV)	Coelomates	(d)	Arthropoda

Choose the answer

(A) (I) - (a), (II) - (b), (III) - (d), (IV) - (c)
(B) (I) - (b), (II) - (a), (III) - (c), (IV) - (d)
(C) (I) - (c), (II) - (d), (III) - (a), (IV) - (b)
(D) (I) - (d), (II) - (c), (III) - (b), (IV) - (a)

197. Which of the following depicts the correct sequence of cell division stages?

(A) Prophase-Anaphase-Metaphase-Cytokinesis-Telophase
(B) Prophase- Metaphase- Anaphase-Cytokinesis-Telophase
(C) Prophase- Metaphase- Anaphase-Telophase –Cytokinesis
(D) Anaphase-Metaphase-Prophase-Telophase-Cytokinesis

198. Nitrogen exists as two nitrogen atoms joined by a very strong bond known as

(A) double covalent bond
(B) covalent single bond
(C) ionic bond
(D) triple covalent bond

199. The pancreatic juice contains inactive enzymes. Which of the following is NOT present in pancreatic juice?

(A) Trypsinogen
(B) Nucleases
(C) Procarboxypeptidases
(D) Papain

200. The limbic system is concerned with

(A) Regulation of sexual behaviour, expression of emotional reactions, and motivation
(B) Controls the body temperature, eating and drinking
(C) Respiration, cardiovascular reflexes, and gastric secretions
(D) Auditory system

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FINAL ANSWER KEY

Subject Name: 104 MSc FIVE YEAR INTEGRATED 16-S2

SI No.	Key	SI No.	Key	SI No.	Key	SI No.	Key	SI No.	Key	SI No.	Key	SI No.	Key
1	C	31	C	61	A	91	C	121	A	151	A	181	B
2	A	32	B	62	A	92	C	122	C	152	C	182	C
3	B	33	A	63	C	93	B	123	B	153	B	183	A
4	D	34	D	64	D	94	B	124	B	154	A	184	C
5	B	35	D	65	D	95	D	125	B	155	C	185	B
6	D	36	B	66	A	96	C	126	A	156	B	186	C
7	B	37	C	67	A	97	A	127	A	157	C	187	A
8	C	38	D	68	B	98	A	128	B	158	A	188	B
9	D	39	C	69	B	99	D	129	C	159	D	189	A
10	A	40	D	70	B	100	B	130	A	160	B	190	D
11	B	41	D	71	D	101	D	131	D	161	C	191	D
12	A	42	C	72	C	102	C	132	B	162	A	192	B
13	C	43	A	73	B	103	B	133	C	163	D	193	C
14	A	44	B	74	C	104	D	134	A	164	D	194	C
15	C	45	A	75	C	105	B	135	C	165	A	195	C
16	C	46	A	76	A	106	A	136	B	166	B	196	B
17	D	47	C	77	D	107	C	137	A	167	C	197	C
18	B	48	C	78	A	108	B	138	B	168	B	198	D
19	C	49	C	79	C	109	C	139	D	169	A	199	D
20	D	50	C	80	B	110	D	140	C	170	B	200	A
21	A	51	A	81	A	111	C	141	D	171	A		
22	A	52	B	82	A	112	B	142	C	172	B		
23	D	53	B	83	A	113	B	143	D	173	A		
24	B	54	C	84	A	114	B	144	A	174	D		
25	A	55	C	85	B	115	C	145	B	175	A		
26	B	56	B	86	A	116	A	146	D	176	B		
27	D	57	D	87	A	117	B	147	C	177	C		
28	D	58	C	88	C	118	A	148	B	178	B		
29	B	59	A	89	A	119	B	149	C	179	A		
30	D	60	C	90	C	120	C	150	C	180	B		

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