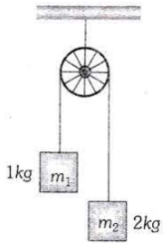
PHYSICS

(SECTION-A)

1. The angle between the two vectors $\vec{A} = 5\hat{i} + 5\hat{j}$ and $\vec{B} = 5\hat{i} - 5\hat{j}$ will be.
(A) Zero (B) 45°
(C) 90° (D) 180°

2. A body is released from the top of a tower of height h. It takes t sec to reach the ground. Where will be the ball after time t/2 sec
(A) At h/2 from the ground
(B) At h/4 from the ground
(C) Depends upon mass and volume of the body
(D) At 3h/4 from the ground

3. Two masses m1 = 1kg and m2 = 2kg are connected by a light inextensible string and suspended by means of a weightless pulley as shown in the figure. Assuming that both the masses start from rest, the distance travelled by the centre of mass in two seconds is (Take g = $10ms^{-2}$).



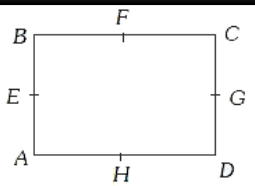
(A) $\frac{20}{9}$m (B) $\frac{40}{9}$m (C) $\frac{2}{3}$m (D) 4m

4. An object takes placed on an inclined plane starts sliding when the angle of incline becomes 30°. The coefficient of static friction between the object and the plane is.

(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$
(C) $\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$

5. The quantity that is not conserved in an inelastic collision is
(A) Momentum (B) Kinetic energy
(C) Total energy (D) All of these

6. In a rectangle ABCD (BC = 2 AB). The moment of inertia along which axes will be minimum



(A) BC (B) BD (C) HF (D) EG

7. A cylinder rolls up an inclined plane, reaches some height, and then rolls down (without slipping throughout th
(A) Speed and time of descent will be same
(B) Speed will be same, but time of descent will be different
(C) Speed will be different, but time of descent will be same
(D) Speed and time of descent both are different

8. If mass of a satellite is doubled and time period remain constant the ratio of orbit in the two cases will be
(A) 1 : 2 (B) 1 : 1
(C) 1 : 3 (D) None of these

9. Two wires of the same material and same length but diameters in the ratio 1 : 2 are stretched by the same force. The potential energy per unit volume of the two wires will be in the ratio
(A) 1 : 2 (B) 4 : 1
(C) 2 : 1 (D) 16 : 1

10. A block of wood weight 4N in air and 3N when immersed in a liquid. The buoyant force in newton is
(A) Zero (B) 1 (C) ¾ (D) 4/3

11. Two solid spheres of same metal but of mass M and 8M fall simultaneously n a viscous liquid and their terminal velocities are v and nv, then value of n is
(A) 16 (B) 8 (C) 4 (D) 2

12. Surface of the lake is at 2°C. Find the temperature of the bottom of the lake
(A) 2°C (B) 3°C (C) 4°C (D) 1°C

13. Three liquids with masses m_1, m_2, m_3 are thoroughly mixed, If their specific heats are c_1, c_2, c_3 and their temperature T_1, T_2, T_3 respectively, then the temperature of the mixture is

(A) $\frac{c_1T_1 + c_2T_2 + c_3T_3}{m_1c_1 + m_2c_2 + m_3c_3}$

(B) $\frac{m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3}{m_1c_1 + m_2c_2 + m_3c_3}$

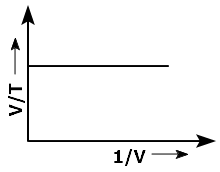
(C) $\frac{m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3}{m_1T_1 + m_2T_2 + m_3T_3}$

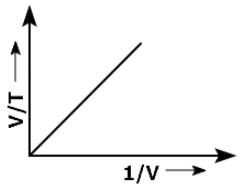
(D) $\frac{m_1T_1 + m_2T_2 + m_3T_3}{T_1c_1 + T_2c_2 + Tc_3}$

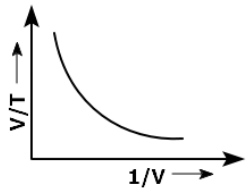
14. For a gas at a temperature T the root-mean-square velocity v_{rms}, the most probable speed v_{mp}, and the average speed v_{av} obey the relationship

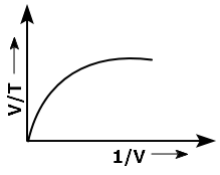
(A) $v_{av} > v_{rms} > v_{mp}$ (B) $v_{rms} > v_{av} > v_{mp}$
(C) $v_{mp} > v_{av} > v_{rms}$ (D) $v_{mp} > v_{rms} > v_{av}$

15. Which one of the following graph is correct at constant pressure.

(A) 

(B) 

(C) 

(D) 

16. If Q, E and W denote respectively the heat added, change in internal energy and the work done in a closed cycle process, then

(A) E = 0 (B) Q = 0
(C) W = 0 (D) Q = W = 0

17. The maximum energy in thermal radiation from a source occurs at the wavelength 4000Å. The effective temperature of the source is

(A) 7000 K (B) 80000 K
(C) 10^4 K (D) 10^6 K

18. Two spherical black bodies of radii r_1 and r_2 and with surface temperature T_1 and T_2 respectively radiate the same power. Then the ratio or r_1 and r_2 will be

(A) $\left(\frac{T_2}{T_1}\right)^2$ (B) $\left(\frac{T_2}{T_1}\right)^4$
(C) $\left(\frac{T_1}{T_2}\right)^2$ (D) $\left(\frac{T_1}{T_2}\right)^4$

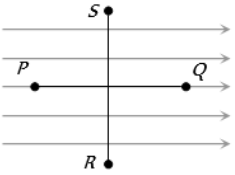
19. How does the time period of pendulum vary with length

(A) $\sqrt{L}$ (B) $\sqrt{\frac{L}{2}}$ (C) $\frac{1}{\sqrt{L}}$ (D) 2L

20. In one metre long open pipe what is the harmonic of resonance obtained with a tuning fork of frequency 480 Hz

(A) First (B) Second
(C) Third (D) Fourth

21. The points resembling equal potentials are



(A) P and Q (B) S and Q
(C) S and R (D) P and R

22. Electric potential at an equatorial point of a small dipole with dipole moment P(r. distance from the dipole) is

(A) zero (B) $\frac{p}{4\pi\varepsilon_0 r^2}$

(C) $\frac{p}{4\pi\varepsilon_0 r^3}$ (D) $\frac{2p}{4\pi\varepsilon_0 r^3}$

23. The distance between the plates of a parallel plate condenser is $8mm$ and P.D. $120\ volts$. If a $6mm$ thick slab of dielectric constant 6 is introduced between its plates, then

(A) The charge on the condenser will be doubled

(B) The charge on the condenser will be reduced to half

(C) The P.D. across the condenser will be $320\ volts$

(D) The P.D. across the condenser will be $45\ volts$

24. The resistance of a wire is R. If the length of the wire is doubled by stretching, then the new resistance will be

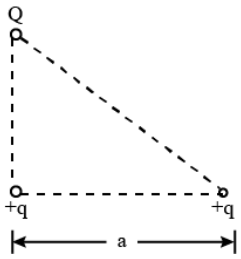
(A) 2R (B) 4R (C) R (D) $\frac{R}{4}$

25. Light travels in two media A and B with speeds 1.8×10^{3} ms^{-1} and 2.4×10^{8} ms^{-1} respectively. Then the critical angle between them is

(A) $\sin^{-1}\left(\frac{2}{3}\right)$ (B) $\tan^{-1}\left(\frac{2}{3}\right)$

(C) $\tan^{-1}\left(\frac{2}{3}\right)$ (D) $\sin^{-1}\left(\frac{3}{4}\right)$

26. Three charges Q, +q and +q are placed at the vertices of a right-angled isosceles triangle as shown. The net electrostatic energy of the configuration is zero if Q is equal to



(A) $\frac{-q}{1+\sqrt{2}}$ (B) $\frac{-2q}{2+\sqrt{2}}$ (C) –2q (D) –q

27. **Assertion :** Neutral temperature of a thermocouple does not depend upon temperature of cold junction.

Reason : Its value is constant for the given metals of the couple.

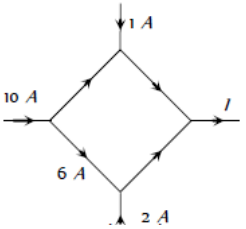
(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(B) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(C) If assertion is true but reason is false.

(D) If the assertion and reason both are false.

28. The figure hows a network of currents. The magnitude of currents is shown here. The current I will be



(A) 3 A (B) 9 A

(C) 13 A (D) 19 A

29. The magnetic dipole moment of a current loop is independent of

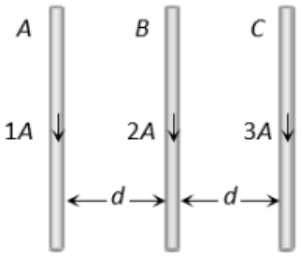
(A) Magnetic field in which it is lying

(B) Number of turns

(C) Area of the loop

(D) Current in the loop

30. Three long straight wires A, B and C are carrying current as shown in the figure. Then the resultant force on B is directed



(A) Towards A

(B) Towards C

(C) Perpendicular to the plane of paper and outward

(D) Perpendicular to the plane of paper and inward

31. If a ferromagnetic material is inserted in a current carrying solenoid, the magnetic field of solenoid

(A) Largely increases

(B) Slightly increases

(C) Largely decreases

(D) Slightly decreases

32. **Assertion :** Lenz's law violates the principle of conservation of energy.

Reason : Induced e.m.f., opposes always the change in magnetic flux responsible for its production.

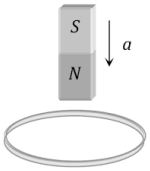
(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(B) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(C) If assertion is true but reason is false.

(D) If assertion is false but reason is true.

33. A metallic ring is attached with the wall of a room. When the north pole of a magnet is brought near to it, the induced current in the ring will be



(A) First clockwise then anticlockwise
(B) In clockwise direction
(C) In anticlockwise direction
(D) First anticlockwise then clockwise

34. An electron of mass m and a photon have same energy E. The ratio of de-Broglie wavelengths associated with them is.

(A) $\frac{1}{c}\left(\frac{E}{2m}\right)^{\frac{1}{2}}$ (B) $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

(C) $c(2mE)^{\frac{1}{2}}$ (D) $\frac{1}{xc}\left(\frac{2m}{E}\right)^{\frac{1}{2}}$

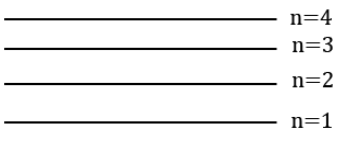
35. Energy associated with a moving charge is due to a
(A) Electric field
(B) Magnetic field
(C) Both electric field and magnetic field
(D) None of these

SECTION-B

36. The ratio of the kinetic energy to the total energy of an electron in a Bohr orbit is

(A) - 1 (B) 2
(C) 1 : 2 (D) None of these

37. Four lowest energy levels of H-atom are shown in the figure. The number of possible emission lines would be



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

38. Select the correct statement
(A) In a full wave rectifier, two diodes work alternately
(B) In a full wave rectifier, two diodes work simultaneously
(C) The efficiency of full wave and half wave rectifier is same
(D) The full wave rectifier is bi-directional.

39. Which logic is represented by following diagram.

(A) AND (B) OR
(C) NOR (D) XOR

40. The radius of curvature for a convex lens is 40 cm, for each surface. Its refractive index is 1.5. The focal length will be
(A) 40 cm (B) 20 cm
(C) 80 cm (D) 30 cm

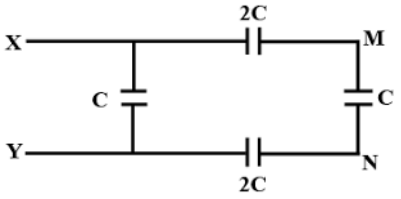
41. Two mirrors are inclined at an angle of 50°. The number of images formed for an object placed in between the mirrors is
(A) 5 (B) 6 (C) 7 (D) 8

42. In order to see diffraction the thickness of the film is
(A) 100 Å (B) 10,000 Å
(C) 1 mm (D) 1 cm

43. If the amplitude ratio of two sources producing interference is 3 : 5, the ratio of intensities at maxima and minima is
(A) 25 : 16 (B) 5 : 3
(C) 16 : 1 (D) 25 : 9

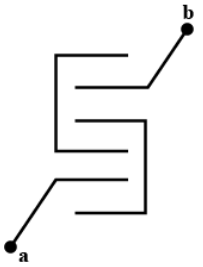
44. In Young's double slit experiment the amplitudes of two sources are 3a and a respectively. The ratio of intensities of bright and dark fringes will be
(A) 3 : 1 (B) 4 : 1
(C) 2 : 1 (D) 9 : 1

45. In the adjoining figure the potential differcence between X and Y is 60V . The potential difference between the points M and N will be



(A) 10 V (B) 15 V
(C) 20 V (D) 30 V

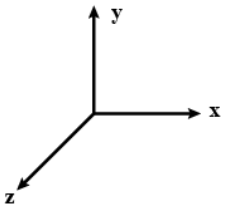
46. Plates of area A are arranged as shown. The distance between each plate is d, the net capacitance is



(A) $\frac{\varepsilon_0 A}{d}$ (B) $\frac{7\varepsilon_0 A}{d}$

(C) $\frac{6\varepsilon_0 A}{d}$ (D) $\frac{5\varepsilon_0 A}{d}$

47. Light wave is travelling along y-direction. If the corresponding $\vec{E}$ vector at any time is along the x-axis, the direction of $\vec{B}$ vector at that time is along.

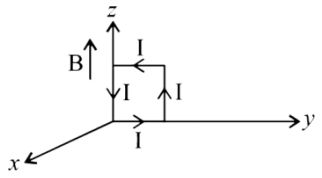


(A) y-axis (B) x-axis

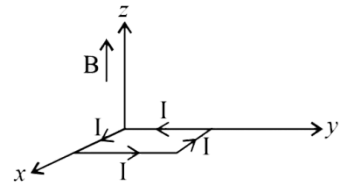
(C) + z-axis (D) - z axis

48. A rectangular loop of sides 10 cm and 5 cm carrying a current I of 12 A is placed in different orientations as shown in the figure below

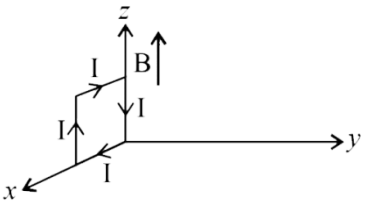
(A)



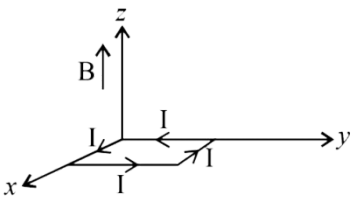
(B)



(C)



(D)



If there is a uniform magnetic field of 0.3 T in the positive z direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium

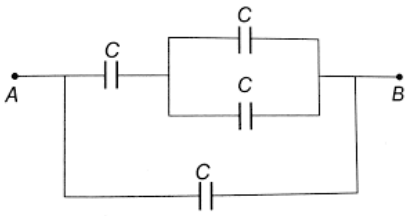
(A) (A) and (B), respectively

(B) (A) and (C), respectively

(C) (B) and (D), respectively

(D) (B) and (C), respectively

49. Four equal capacitors, each of capacity C, are arranged as shown. The effective capacitance between A and B is



(A) $\frac{5}{8}$C (B) $\frac{3}{5}$C (C) $\frac{5}{3}$C (D) C

50. A coil of inductive reactance 31 Ω has a resistance of 8 Ω. It is placed in series with a condenser of capacitative reactance 25 Ω. The combination is connected to an a.c. source of 110 volt. The power factor of the circuit is

(A) 0.80 (B) 0.33

(C) 0.56 (D) 0.64

CHEMISTRY

(SECTION-A)

51. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :
(A) 40 (B) 10 (C) 20 (D) 30

52. Number of electrons transferred in each case when $KMnO_4$ acts as an oxidising agent to give MnO_2, Mn^{2+}, $Mn(OH)_3$ and MnO_4^{2-} are respectively :
(A) 3,5,4 and 1 (B) 4,3,1 and 5
(C) 1,3,4 and 5 (D) 5,4,3 and 1

53. The correct order of electron gain enthalpy with negative sign of F, Cl, Br and I, having atomic number 9, 17, 35 and 53 respectively, is:
(A) F > Cl > Br > I (B) Cl > F > Br > I
(C) Br > Cl > I > F (D) I > Br > Cl > F

54. In which case is the number of molecules of water maximum ?
(A) 18 mL of water
(B) 10^{-3} mol of water
(C) 0.00224 L of water vapours at 1 atm and 273 K
(D) 0.18 g of water

55. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of
(A) K $[AlF_3H]$ (B) K_3 $[AlF_3H_3]$
(C) K_3 $[AlF_6]$ (D) AlH_3

56. For N_3^- which statement is wrong
(A) Iso electronic with CO_2
(B) NH_2OH and N_3^- have same O.N. on nitrogen atom
(C) N–N bond length are same
(D) HN_3 have linear shape

57. In $Fe(CO)_5$, the Fe – C bond possesses :
(A) π-character only
(B) both σ and π characters
(C) ionic character only
(D) σ-character only

58. The uncertainties in the velocities of two particles, A and B are 0.05 and 0.02 ms^{-1}, respectively. The mass of B is five times of that of the mass of A. What is the ratio of uncertainties $\left(\frac{\Delta x_A}{\Delta x_B}\right)$
(A) 2 (B) 0.25 (C) 4 (D) 1

59. The major organic product in the reaction,
$CH_3OCH(CH_3)_2 + HI \rightarrow$ Product, is/are
(A) $CH_3OH + (CH_3)_2CHI$
(B) $ICH_2OCH(CH_3)_2$
(C) $CH_3OC(CH_3)_2$ with I below
(D) $CH_3I + (CH_3)_2CHOH$

60. A first order reaction has a specific reaction rate of 10^{-2}. How much time will it take for 20 g of the reaction to reduce to 5 g ?
(A) 238.6 sec (B) 138.6 sec
(C) 346.5 sec (D) 693.0 sec

61. Which of the following factors may be regarded as the main cause of lanthanide contraction ?
(A) Greater shielding of 5d electrons by 4f electrons.
(B) Poorer shielding of 5d electron by 4f electrons.
(C) Effective shielding of one of 4f electrons by another in the sub-shell.
(D) Poor shielding of one of 4f electron by another in the sub-shell.

62. Consider the cell potentials $E^\circ_{Mg^{2+}|Mg} = -2.37$ V and $E^\circ_{Fe^{3+}|Fe} = -0.04$ V. The best reducing agent would be
(A) Mg^{2+} (B) Fe^{3+} (C) Mg (D) Fe

63. Which of the following reduces Tollen's reagent ?
(A) Glucose (B) Fructose
(C) Lactose (D) All

64. The stability of dihalides of Si, Ge, Sn and Pb increases steadily in the sequence.
(A) $SiX_2 << GeX_2 << SnX_2 << PbX_2$
(B) $PbX_2 << SnX_2 << GeX_2 << SiX_2$
(C) $GeX_2 << SiX_2 << SnX_2 << PbX_2$
(D) $SiX_2 << GeX_2 << PbX_2 << SnX_2$

65. Which one has the highest boiling point ?
(A) He (B) Ne (C) Kr (D) Xe

66. Total number of lone pair of electrons in I_3^- ion is :

(A) 9 (B) 12 (C) 3 (D) 6

67. The element that shows greater ability to form pπ-pπ multiple bonds, is:

(A) Ge (B) Sn (C) C (D) Si

68. Which one of the following pairs is isostructural (i.e. having the same shape and hybridization) ?

(A) [BCl_3 and $BrCl_3$]
(B) [NH_3 and NO^-_3]
(C) [NF_3 and BF_3]
(D) [BF_4^- and NH^+_4]

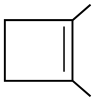
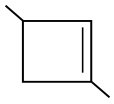
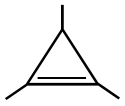
69. The radius of La^{3+} (Atomic number of La = 57) is 1.06Å. Which one of the following given values will be closest to the radius of Lu^{3+} (Atomic number of Lu = 71) ?

(A) 1.60Å (B) 1.40Å
(C) 1.06Å (D) 0.85Å

70. Identify E in the following sequence of reaction.

E (C_6H_{10}) $\xrightarrow{H_2 / Ni}$ F (C_6H_{12})

$\xrightarrow{Cl_2 / h\upsilon}$ G $(C_6H_{11}Cl)$ (only one isomer)

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

71. Which of the following will show optical isomerism ?

(A) $[Cu(NH_3)_4]^{2+}$ (B) $[ZnCl_4]^{2-}$
(C) $[Cr(C_2O_4)_3]^{3-}$ (D) $[Co(CN)_6]^{3-}$

72. The coordination number and the oxidation state of the element 'E' in the complex $[E(en)_2(C_2O_4)]\ NO_2$ (when 'en' is ethylene diamine) are, respectively,

(A) 4 and 2 (B) 4 and 3
(C) 6 and 3 (D) 6 and 2

73. Which one of the following has an optical isomer ?

(A) $[Zn(en)(NH_3)_2]^{2+}$ (B) $[Co(en)_3]^{3+}$
(C) $[Co(H_2O)_4(en)]^{3+}$ (D) $[Zn(en)_2]^{2+}$
(en = ethylenediamine)

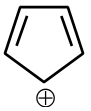
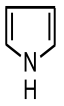
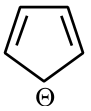
74. (a) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

(b) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

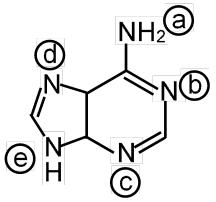
Role of hydrogen peroxide in the above reactions is respectively:

(A) oxidizing in (a) and reducing in (b)
(B) reducing in (a) and oxidizing in (b)
(C) reducing in (a) and (b)
(D) oxidizing in (a) and (b)

75. Which of the following compounds is not aromatic?

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

76. In the following compound.



the favourable site/s for protonation is /are :

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

77. Using the Gibbs change, ΔG^o = + 63.3 kJ, for the following reaction, $Ag_2CO_3(g) \rightleftharpoons 2Ag^+(aq) + CO_3^{2-}(aq)$ the K_{sp} of $Ag_2CO_3(s)$ in water at 25ºC is (R = 8.314 $JK^{-1}\ mol^{-1}$)

(A) 3.2×10^{-26} (B) 8.0×10^{-12}
(C) 2.9×10^{-3} (D) 7.9×10^{-2}

78. Solubility of a M_2S type salt is 3.5×10^{-16}, then find out its solubility product :

(A) 1.7×10^{-6} (B) 1.7×10^{-16}
(C) 1.7×10^{-18} (D) 1.7×10^{-12}

79. For a given reaction ΔH = 35.5 kJ mol^{-1} and ΔS = 83.6 $JK^{-1}\ mol^{-1}$. The reaction is spontaneous at : (Assume that ΔH and ΔS do not vary with temperature)

(A) T < 425 K (B) T > 425 K

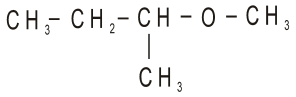
(C) All temperatures (D) T > 298 K

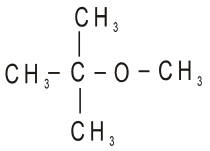
80. An ideal gas expands isothermally from 10^{-3} m^3 to 10^{-2} m^3 at 300 K against a constant pressure of 10^5 Nm^{-2}. The work done on the gas is :
(A) + 270 kJ (B) –900 J
(C) + 900 kJ (D) –900 kJ

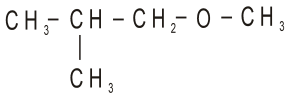
81. A solution of 0.10 M NaZ has pH = 8.90. The K_a of HZ is :
(A) 1.6×10^{-4} (B) 1.6×10^{-5}
(C) 6.3×10^{-10} (D) 6.3×10^{-11}

82. The product formed by the reaction of an aldehyde with a primary amine is :
(A) Aromatic acid (B) Schiff base
(C) Ketone (D) Carboxylic acid

83. Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated Hl ?

(A) 

(B) 

(C) 

(D) $CH_3 - CH_2 - CH_2 - CH_2 - O - CH_3$

84. The solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility (in mol/L) is
(A) 5.6×10^{-6} (B) 3.1×10^{-4}
(C) 2×10^{-4} (B) 4×10^{-4}

85. A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be :
(A) 700 (B) 360
(C) 350 (D) 300

SECTION – B

86. The vapour pressure of acetone at 20ºC is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 g of acetone at 20ºC, its vapour pressure was 183 torr. The molar mass ($g\ mol^{-1}$) of the substance is:
(A) 32 (B) 64
(C) 128 (D) 488

87. Which of the following statements about the spontaneous reaction occurring in a galvanic cell is always true ?

(A) $E^o_{cell} > 0$, $\Delta G^o < 0$, and $Q < K$

(B) $E^o_{cell} > 0$, $\Delta G^o < 0$, and $Q > K$

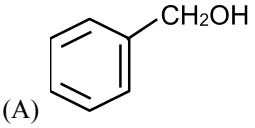
(C) $E^o_{cell} > 0$, $\Delta G^o > 0$, and $Q > K$

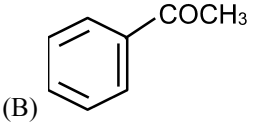
(D) $E_{cell} > 0$, $\Delta G < 0$, and $Q < K$

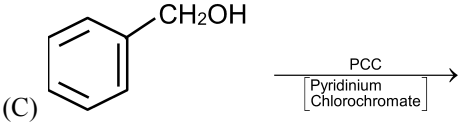
88. In an electrolytic cell of Ag | $AgNO_3$ | Ag, when current is passed, the concentration of $AgNO_3$
(A) Increases (B) Decreases
(C) Remains same (D) None of these

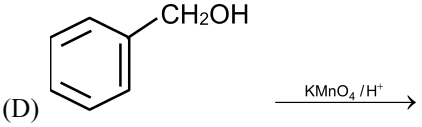
89. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecularmass. It is due to their :
(A) Formation of intramolecular H-bonding
(B) Formation of intermolecular H-bonding
(C) more extensive association of carboxylic acid via vander Waals force of attraction
(D) formation of carboxylate ion

90. The reaction that does not give benzoic acid as the major product is –

(A) 

(B) 

(C) 

(D) 

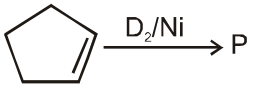
91. A binary liquid solution is prepared by mixing n-heptane and ethanol. Which one of the

following statement is correct regarding the behaviour of the solution ?

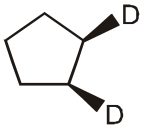
(A) The solution is non-ideal, showing +ve deviation from Raoult's Law.
(B) The solution in non-ideal, showing –ve deviation from Raoult's Law.
(C) n-heptane shows +ve deviation while ethanol shows –ve deviation from Raoult's Law.
(D) The solution formed is an ideal solution.

92. A first order reaction has a rate constant of $2.303 \times 10^{-3}\ s^{-1}$. The time required for 40 g of this reactant to reduce to 10 g will be – [Given that $\log_{10} 2 = 0.3010$]

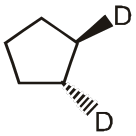
(A) 230.3 s (B) 301 s
(C) 2000 s (D) 602 s

93. 

, P is : (P gS)



(A)



(B)

(C) both are correct (D) None

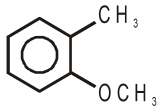
94. **Assertion :** According to Kohlrausch law the molar conductivity of a strong electrolyte at infinite dilution is sum of molar conductivities of its ions.
Reason : The current carried by cation and anion is always equal.
(A) If both assertion and reason are true and reason is the correct explanation of assertion.
(B) If both assertion and reason are true but reason is not the correct explanation of assertion.
(C) If Assertion is true but reason is false.
(D) If both assertion and reason are false.

95. Which of the following oxides is the most acidic ?

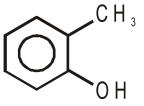
(A) N_2O_5 (B) P_2O_5
(C) As_2O_5 (D) Sb_2O_5

96. A piston filled with 0.04 mol of an ideal gas expands reversibly from 50.0 mL to 375 mL at a constant temperature of 37.0ºC. As it does so, it absorbs 208 J of heat. The values of q and w for the process will be:
(R = 8.314 J/mol K) (ln 7.5 = 2.01)
(A) q = +208 J, w = – 208 J
(B) q = –208 J, w = – 208 J
(C) q = –208 J, w = + 208 J
(D) q = +208 J, w = + 208 J

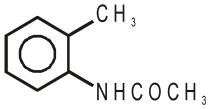
97. Which one of the following is most reactive towards electrophilic reagent ?



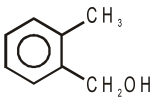
(A)



(B)



(C)



(D)

98. Which one of the following statements regarding Henry's law is not correct ?
(A) Different gases have different K_H (Henry' law constant) values at the same temperature.
(B) The value of K_H increases with increase of temperature and K_H is function of the nature of the gas
(C) The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution.
(D) Higher the value of K_H at a given pressure, higher is the solubility of the gas in the liquids.

99. Which of the following statements is correct for complex $[Cr(NH_3)(CN)_4(NO)]^{2-}$ (given that n = 1)?
(A) It is d^2sp^3 hybridised .
(B) The chromium is in +I oxidation state
(C) It is heteroleptic complex and its aqueous solution is coloured
(D) All of these.

100. Match the correct atomic radius with the element :

S.No.	**Element**	**Code**	**Atomic radius (pm)**
(i)	Be	(p)	74
(ii)	C	(q)	88
(iii)	O	(r)	111
(iv)	B	(s)	77
(v)	N	(t)	66

(A) (i) – r, (ii) – q, (iii) – t, (iv) – s, (v) – p
(B) (i) – t, (ii) – s, (iii) – r, (iv) – p, (v) – q
(C) (i) – r, (ii) – s, (iii) – t, (iv) – q, (v) – p
(D) (i) – t, (ii) – p, (iii) – r, (iv) – s, (v) – q

BIOLOGY

BOTANY (SECTION-A)

101. Arrange the following taxa in descending order of their taxonomic hierarchy and select the correct option:
Mangifera (A), Dicotyledoneae (B), Sapindales (C), Anacardiaceae (D), Angiospermae (E)
(A) A, C, D, B, E (B) A, D, C, B, E
(C) E, B, C, D, A (D) E, D, B, C, A

102. Phototropic curvature is the result of uneven distribution of?
(A) Gibberellin (B) Phytochrome
(C) Cytokinins (D) Auxin

103. Which of the following is not recognized by Botanist?
(a) Division (b) Tautonyms
(c) Variety (d) Phylum
(e) Subspecies (f) Order
(A) (b), (d), (e) (B) (b), (c), (d)
(C) (a), (c), (e) (D) (a), (e), (f)

104. Select incorrectly matched pair:
(A) Prions--Neurodegenerative disease
(B) Virusoid--Not cause any infection
(C) Viroid--Cucumber pale fruit
(D) Virion--Virus inside the host cell

105. The core of cilium or flagellum is composed of microtubules and their associated protein is called
(A) Blepharoplast (B) Axoneme
(C) Microfilament (D) Basal body

106. Select the features true for mycoplasma:
(a) Are highly pleomorphic.
(b) Resistant or non-sensitive to Penicillin.
(c) Has double-stranded circular DNA.
(d) Cannot survive in the presence of oxygen.
(A) (a) and (b) (C) (a) and (d)
(B) (b) and (c) (D) (c) and (d)

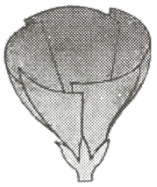
107. The prothallus of pteridophytes is/has
A. Small but multicellular
B. Inconspicuous
C. Free living and photosynthetic
D. Thalloid and gametophytic
E. Differentiated plant body
F. Vascular tissue
(A) (A), (C), (E) and (F)
(B) (A), (B), (C) and (D)
(C) (A), (C), (D), (E) and (F)
(D) (A), (B), (C) and (E)

108. In gymnosperm, sporangia are born on sporophylls which are arranged _____ along an axis to from fax or compact strobili or cones
(A) Oppositely (B) Radially
(C) In whorl (D) Spirally

109. Select the incorrect match:
(A) Chemotaxonomy − Chemical nature of proteins
(B) Numerical taxonomy − Number and codes
(C) Natural affinities − Bentham and Hooker
(D) Fossil record − Artificial classification

110. In anaerobic respiration the numbers of ATP molecules produced are:
(A) 1 (B) 2 (C) 3 (D) 8

111. The given aestivation is ___A___ and found in ___B___



A	B
(A) Valvate	Calotropis
(B) Twisted	Lady finger
(C) Imbricate	China rose
(D) Vexillary	Pea

112. How many of the following plants belong to the family whose formula is given below?

$\% \, ♀ \, K_{(5)}C_{1+2+(2)}A_{(9)+1}G_{1}$

Soybean, groundnut, Indigofera, chilli, Solanum, Trifolium, Sesbania, tulip , sun hemp, Colchicum, Asparagus, Petunia

(A) Six (B) Five
(C) Seven (D) Four

113. Aleurone layer occurs in the peripheral region of "A" and is made up of "B".
A **B**

(A) Coleoptile Protein
(B) Scutellum Lipid
(C) Endosperm Protein
(D) Endosperm Lipid

114. Vascular bundles having cambium are called:-
(A) Open (B) Closed
(C) Endarch (D) Exarch

115. Vascular cambium form xylem on inner side and phloem on outer side due to
(A) Effect of gravity.
(B) Differential activity of auxin.
(C) Shearing force of wind.
(D) Lateral meristem.

116. Which of the following is an **incorrect** statement?
(A) Mature sieve tube elements possess a conspicuous nucleus and usual cytoplasmic organelles.
(B) Microbodies are present both in plant and animal cells.
(C) The perinuclear space forms a barrier between the materials present inside the nucleus and that of the cytoplasm.
(D) Nuclear pores act as passages for proteins and RNA molecules in both directions between nucleus and cytoplasm.

117. Which one forms nucleolus:
(A) Vesicles of ER
(B) SAT chromosome
(C) RNA
(D) Nuclear membrane

118. Crossing over is advantageous because it brings about
(A) Variation (B) Inbreeding
(C) Linkage (D) Stability

119. It a diploid cell carries 24 chromosomes, what will be the number of tetrads during its pachytene stage?
(A) 6 (B) 48 (C) 24 (D) 12

120. Match the given columns and choose the correct option

	Column I	Column II
(A)	Zygotene	(i) Formation of recombination nodule
(B)	Diakinesis	(ii) Synapsis
(C)	Diplotene	(iii) Dissolution of synaptonemal complex
(D)	Pachytene	(iv) Terminalisation of chiasmata

(A) A (ii), B (iv), C (iii), D (i)
(B) A (ii), B (iii), C (iv), D (i)
(C) A (i), B (iii), C (iv), D (ii)
(D) A (i), B (iv), C (ii) D (iii)

121. The chromosomes cluster at opposite poles and their identity is lost as disease elements during
(A) Telophase (B) Anaphase
(C) Metaphase (D) Prophase

122. State true (T) or False (F) for the following statements and choose the correct option:
(A) Cell growth in terms of cytoplasmic increase is a continuous process
(B) The M-phase of human lasts for about an hour
(C) Due to absence of cell growth, the interphase is called resting phase
(D) The cells do not divide further exist G_1-phase to enter an inactive stage

	A	B	C	D
(A)	F	T	F	T
(B)	T	T	F	T
(C)	F	T	F	F
(D)	T	F	T	F

123. Which of the following is an important biofertilizer in paddy fields?
(A) Frankia
(B) Blue green algae
(C) Glomus
(D) Rhizobium

124. (A) In majority of plants, light saturation occurs at__ A__ of the total sunlight available to plants.
(II) Photosynthetic process utilizes __B__ of water absorbed by plant.

	A	B
(A)	10%	1%
(B)	50%	10%
(C)	25%	5%
(D)	10%	5%

125. The biosynthetic phase of photosynthesis
(A) Involves use of ATP and NADPH to produce sugar.
(B) Takes place in the stroma of chloroplast.
(C) Does not depend directly on the presence of light.
(D) Depends on the product of light reaction.
The correct statements are
(A) Only (B) and (C).
(B) Only (A), (B), and (C).
(C) Only (A) and (C).
(D) (A (B) , (C) and (D).

126. At the end of Kreb's cycle, most of the energy removed from glucose molecule has been transferred to
(A) Citric acid
(B) OAA
(C) ATP
(D) $NADH_2$ and $FADH_2$

127. Which hormone is used to induce ripening in banana
(A) Cytokinin (B) Ethylene
(C) ABA (D) GA_3

128. Which one of the following acids is a derivative of carotenoids?
(A) Indole–3–acetic acid
(B) Gibberellic acid
(C) Abscisic acid
(D) Indole butyric acid

129. Which of the following plants causes pollen allergy?
(A) Parthenium (B) Amaranthus
(C) Chenopodium (D) All of the above

130. Egg apparatus of an embryo sac consists of
(A) Egg cells only
(B) One egg cell + polar nuclei
(C) One egg cell + two synergids
(D) One egg cell + two synergids + two polar nuclei

131. When the pollens of one flower falls on the stigma of another flower of the same plant then it is known as:-
(A) Cleistogamy (B) Allogamy
(C) Autogamy (D) Dichogamy

132. Sex determination in humans takes place by:-
(A) sex chromosomes of father
(B) measurement of sperm
(C) measurement of ovum
(D) sex chromosomes of mother

133. Mendel's Law is valid only when:-
(A) Two F_1 hybids are crossed
(B) One parent is crossed with F_1 hybrid
(C) Two pure breeding contrasting characters are crossed
(D)None of the above

134. The DNA in nucleoid is organized in
(A) Small loops held by histones
(B) Large loops held by nucleosomes
(C) Large loops held by proteins
(D) Small loops held by basic proteins-polyamines

135. Consider the following statements regarding transforma- tion experiment.
(A) It was performed by F. Griffith on Streptococcus pneumoniae.
(B) It proved that DNA is the genetic material.
(C) Avery, Macleod, and McCarty worked to determine the biochemical nature of transforming principle.
(D)vDNase inhibits the transformation.
The correct statement is/are
(A) (A) and (B) only
(B) (A) only
(C) (A), (B), and (C) only
(D) (A), (B), (C), and (D)

(SECTION-B)

136. Match the columns.

Column I	Column II
A. Transformation	(i) Miescher
B. Reverse central dogma	(ii) Griffith
C. Nuclein	(iii) Wilkins
D. X-ray diffraction data	(iv) Temin and Baltimore

(A) A-II; B-IV; C-I; D-III
(B) A-IV; B-II; C-III; D-I
(C) A-II; B-IV; C-III; D-I
(D) A-I; B-III; C-IV; D-II

137. Biofertilizers are microorganisms that bring about
(A) Soil nutrient enrichment
(B) Minimizing ecological benefits
(C) Maximizing environmental hazards
(D) All of the above

138. Phytoplankton are dominant in :
(A) Limnetic zone (B) Profundal zone
(C) Littoral zone (D) Benthic zone

139. Stomata open at night in :
(A) Succulents (B) Xerophytes
(C)Hydrophytes (D) Mesophytes

140. What percentage of incident solar radiations are captured by plants during photosynthesis?
(A) 1-5% (B) 0.2-1%
(C) >50% (D) 15-25%

141. The primary productivity of an ecosystem depends on
A. Available solar radiations.
B. Availability of nutrients in soil.
C. Photosynthetic capacity of producers.
D. Abiotic factors of that area.
(A) (A) and (B) only
(B) All except (D)
(C) All except (C)
(D) All (A),(B),(C,) and (D)

142. Which of the following methods could be used to restore a population of animals from a few male and female individuals?
(A) Intellectual breeding
(B) Interbreeding
(C) Captive breeding
(D) Selective breeding

143. Sacred grooves are especially useful in
(A) Generating environmental awareness
(B) Preventing soil erosion
(C) Year-round flow of water in rivers
(D) Conserving rare and threatened species

144. The drug streptomycin inhibits the process of :-
(A) Prokaryotic translation
(B) Eukaryotic translation
(C) Prokaryotic transcripion
(D) Eukaryotic transcription

145. Retrovirus have genetic material :-
(A) DNA only (B) RNA only
(C) DNA or RNA only (D) None

146. Select the mismatched pair.
(A) Cytidine-Nucleoside
(B) Human genome-Nucleoside
(C) 5-methyl uracil-RNA
(D) Dimension of typical nucleus-10°M

147. The unequivocal proof that DNA is the genetic material came from the experiment that utilized
(A) Streptococcus
(B) T_2 Bacteriophage, E. coli
(C) E. coli, heavy nitrogen
(D) P^{32}, S^{35}, S, and R type of bacteri

148. RNA is not genetic material in
(A) TMV
(B) QB bacteriophage
(C) HIV
(D) φ× 174

149. What is pollen grain:-
(A) Microspore mother cell
(B) Male gamete
(C) Male gametophyte
(D) Partially developed embryo

150. When a diploid female plant is crossed with a tetraploid male, the ploidy of endosperm cells in the resulting seed is :-
(A) Pentaploidy (B) Diploidy
(C) Triploidy (D) Tetraploidy

ZOOLOGY (SECTION-A)

151. Which of the following is not a characteristic feature of amphibians?
(A) Amniotic eggs
(B) Cutaneous respiration
(C) Thin skin without scales
(D) Requirement of water for reproduction

152. Which of the following is incorrect?
(A) *Meandrina* − Brain coral
(B) *Gorgonia* − Sea fan
(C) *Adamsia* − Sea anemone
(D) *Aurelia* − Sea feather

153. Hydra is a
(A) Triploblastic, radially symmetrical, and coelomate organism
(B) Diploblastic, radially symmetrical, and medusoid
(C) Triploblastic, bilaterally symmetrical, and coelomate
(D) Diploblastic, radially symmetrical, and polyp

154. Identify the incorrect statement w.r.t. bone:
(A) Bone has hard and non-pliable ground substance rich in calcium salts and collagen fibres.
(B) Bone is the main tissue that provides structural frame to the body.
(C) The bone cells are present in spaces called lacunae.
(D) The longitudinal Volkmann's canals are intercon- nected by transverse Haversian canals.

155. The cells of areolar tissue that secrete fibres and the ground substance or matrix are
(A) Fibroblasts (B) Plasma cells
(C) Mast cells (D) Macrophage

156. Which is not a component of areolar tissue
(A) Macrophage (B) Plasma cell
(C) Schwann cell (D) Adipose cell.

157. Choose the odd one with respect to structure.
(A) Linoleic acid (B) Linolenic acid
(C) Palmitic acid (D) Oleic acid

158. Lecithin is an example of
(A) Glycolipid. (B) Phospholipid.
(C) Lipoprotein. (D) Chromolipid

159. Which one of the following is the most abundant protein in the animals?
(A) Insulin (B) Haemoglobin
(C) Collagen (D) Lectin

160. During hibernation period, frog's respiration is:-
(A) cutaneous
(B) pulmonary
(C) pharyngeal
(D) buccopharyngeal

161. In alveolar air, the partial pressure of CO_2 is:-
(A) 40 mm of Hg (B) 42 mm of Hg
(C) 44 mm of Hg (D) 46 mm of Hg

162. Two friends are eating together on a dining table. One of them suddenly starts caughing while swallowing some food. This caughing would have been due to improper movement of:
(A) Epiglottis (B) Diaphragm
(C) Neck (D) Tongue

163. The blood circulation which starts and ends into capillaries is:-
(A) Renal circulation
(B) Portal circulation
(C) Hepatic circulation
(D) Lymphatic circulation

164. Maximum surface area of circulating system is seen in:-
(A) Heart (B) Capillaries
(C) Arterioles (D) Veins

165. Match the options given in Column I with those inColumn II.

Column I	**Column II**
A. Factor I	(i) Prothrombin
B. Factor II	(ii) Fibrinogen
C. Factor VIII	(iii) Christmas factor
D. Factor IX	(iv) Anti-haemophilicglobulin

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

166. The normal level of haemoglobin in blood is
(A) 12-16 mg/dL (B) 12 - 16g / dL
(C) 4-6 g/dL (D) 20-25 mg/dL

167. Which of the following is an incorrect statement w.r.t. the rib cage of human?
(A) The 8th, 9th and 10th pairs of ribs are called false ribs.
(B) Vertebrosternal ribs do not articulate directly with the sternum but join the seventh rib with the help of hyaline cartilage.
(C) Last 2 pairs (11th and 12th) of ribs are not connected ventrally and are therefore called floating ribs.
(D) Thoracic vertebrae, ribs and sternum together form the rib cage.

168. The entire muscle is covered with a sheath called
(A) Perimysium (C) Endomysium
(B) Epimysium (D) Epineurium

169. Pivot joint occurs at
(A) The hip and shoulder joint
(B) Between the atlas and the odontoid process of axis
(C) Sternoclavicular joint
(D) Temporomandibular joint

170. Trochlear notch is present in:-
(A) Ulna (B) Tibia
(C) Humerus (D) Femur

171. The human hind brain comprises three parts, one of which is
(A) Thalamus
(B) Midbrain
(C) Cerebellum
(D) Corpus callosum

172. Tight junction between the axon of one neuron and the dendrite of the next is called:
(A) a joint (B) synapse
(C) constant bridge (D) junction point

173. Which of the following is a motor nerve?
(A) auditory
(B) abducens
(C) optic
(D) trigeminal nerve

174. Insulin
(A) Is an anabolic hormone
(B) Causes hypoglycemia
(C) Is secreted as a pro-hormone with an additional C-peptide
(D) All are correct

175. Which of the following function(s) can be linked to the thyroid gland?
(A) To regulate the metabolic rate.
(B) To maintain normal body temperature.
(C) To enhance some actions of neurotransmitters adrenaline and noradrenaline.
(D) All of these.

176. Progesterone is secreted from:
(A) Testes (B) Adrenal gland
(C) Pituitary gland (D) corpus luteum

177. Capacitation of sperms occurs in
(A) Vas deferens (B) Uterus
(C) Epididymis (D) Vasa efferentia

178. If implantation occurs outside uterus, it is called
(A) Normal pregnancy
(B) Ectopic pregnancy
(C) Pseudo-pregnancy
(D) Improper pregnancy

179. What happens during fertilization in human after many sperms reach close to the ovum?
(A) Only two sperms nearest to the ovum penetrate zona pellucida
(B) Cells of corona rodiata trap all sperms except one
(C) Secretions of acrosome helps one sperm to enter cytoplasm of ovum through zona pellucida
(D) All sperms except one nearest to the ovum lose their tails

180. A patient has a painless, clean ulcer on external genitalia as a result of a STI. Which disease is the patient suffering from?
(A) Chancroid (B) Syphilis
(C) HPV (D) HIV

181. If a female had conceived in past, but fails to reproduce subsequently, then she is suffering with
(A) Primary infertility
(B) Secondary infertility
(C) Impotency
(D) ART

182. Tubectomy is a method of sterilization in which
(A) Uterus is removed surgically
(B) Small part of the fallopian tube is removed or tied up
(C) Ovaries are removed surgically
(D) Small part of vas deferens is removed or tied up

183. Identify the correct sequence of stages in the evolution of modern human (Homo sapiens sapiens).
I. Cro-Magnon man
II. Neanderthal man
III. Australopithecus
IV Java man
V Homo habilis
VI Modern huma
(A) III IV V I II VI
(B) III V IV II I VI
(C) III IV V II I VI
(D) IV III V II I VI

184. The concept that "Population tends to increase geometrically food arithmetically" was put forward by resources while
(A) Alfred Wallace.
(B) Darwin. increase
(C) T. Malthus.
(D) Lyell.

185. Which one of the following options gives the correct matching of a disease with its causative organism and?

	Disease	**Causative organism**	**mode of infection**
(A)	Elephantiasis	Wuchereria bancrofti	Bite of female Anopheles
(B)	Typhoid	Salmonella typhi	With inhaled air
(C)	Pneumonia	Streptococcus pneumonia	Droplet infection
(D)	Malaria	Plasmodium vivax	Bite of male Culex

(SECTION-B)

186. Darwin in his 'Natural Selection Theory, did not believe in any role of which one of the following in organic evolution
(A)Discontinuous variations
(B) Parasites and predators as natural enemies
(C) Survival of the fittest
(D) Struggle for existence

187. Asthma may be attributed to
(A) allergic reaction of the mast cells in the lungs

(B) inflammation of the trachea
(C) accumulation of fluid in the lungs
(D) bacterial infection of the lungs

188. Diphtheria is caused by
(A) Toxins secreted by virus into host tissues
(B) Excessive immune response by the host's body
(C) Toxins released by dead bacteria into the host's body
(D) Toxins secreted by live bacterial cells into host tissues

189. Identify the wrong match of the disease with its corresponding vector: Disease Vector
(A) Kala azar Phlebotomus (sandfly)
(B) Sleeping sickness Glossina palpalis (Tsetse fly)
(C) Plague Pasteurella pestis
(D) Chagas disease Triatoma (bug

190. Identify the wrong statement about PCR technique.
(A) PCR technique was discovered by Kary Mullis.
(B) The optimum temperature for the polymerisation step is 72°C.
(C) Taq polymerase enzyme is obtained from Thermus aquaticus.
(D) Denaturation in PCR is done at 65°C.

191. Match the options given in Column I with Column II andchoose the correct option.

Column I	**Column II**
A. Gene taxi	(i) Restriction endonuclease
B. HindII	(ii) Vector-less transfergene
C. Gene gun	(iii) Transposon
D. Mobile genetic element	(iv) Plasmid

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

192. In the first artificial cloning vector pBR322, letters B and R represent
(A) Strains of bacteria from which the plasmid was obtained.
(B) Names of countries Bolivia and Russia who collaborated in constructing the plasmid.
(C) Names of laboratory where the plasmid was constructed.
(D) Names of scientists Bolivar and Rodriguez who constructed the plasmid.

193. At present about recombinant therapeutics have been approved for human use the world over and of these are presently been marketed in India.
(A) 30, 5 (B). 30, 12
(C) 57, 30 (D) 45, 15

194. Which of the following is incorrect among the given statements?
(A) Green Revolution succeeded in tripling the food supply.
(B) Brazzein is a lipid 2000 times sweeter than sugar.
(C) The PCR technique is helpful in detecting bacterial and viral diseases even when symptoms of the diseases are not yet visible.
(D) Indian plants such as basmati rice, turmeric, and neem have been either patented or attempts have been made to patent them by Western nations for commercial use.

195. HIV that causes AIDS, first starts destroying :
(A) Thrombocytes
(B) Helper T-lymphocytes
(C) B-lymphocytes
(D) Leucocytes

196. A genetically engineered bacteria used for clearing oil spills is :-
(A) Escherischia coli
(B) Bacillus subtilis
(C) Agrobacterium tumifaciens
(D) Pseudomonas putida

197. E. coli are used in production of :-
(A) Rifampicin (B) LH
(C) Ecdyson (D) Interferon

198. Cry-gene which synthesize crystal protein isolated from :-
(A) Bacillus thuriengensis
(B) Rhizobium
(C) Bacillus polymyxa
(D) Clostridium

199. Which of the following combination of risk are associated with genetically modified food :-
(A) Toxicity
(B) Allergic reaction
(C) Antibiotic resistance in microorganism present in alimentary canal
(D) All the above

200. Four-chambered heart is found in
(A) Aves
(B) Mammals
(C) Some reptiles like crocodiles
(D) All of these