

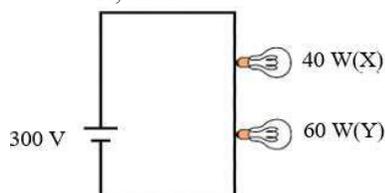
Physics - Section A

Section A Shall Consist Of 35 (Thirty-five) Questions In Each Subject .All Questions Are Compulsory.

1. The potential difference in open circuit for a cell is 2.2 volts. When a 4 ohm resistor is connected between its two electrodes the potential difference becomes 2 volts. The internal resistance of the cell will be-

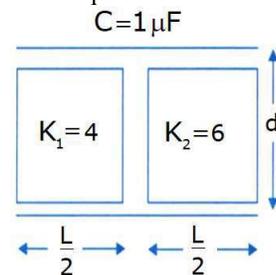
- (1) 1 ohm (2) 0.2 ohm
(3) 2.5 ohm (4) 0.4 ohm

2. Two bulbs X and Y having same voltage rating and of power 40 watt and 60 watt respectively are connected in series across a potential difference of 300 volt, then



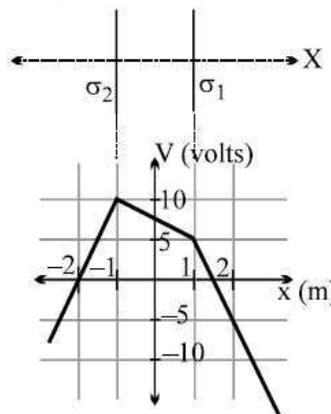
- (1) X will glow brighter
(2) Resistance of Y is greater than X
(3) Heat produced in Y will be greater than X
(4) Y will glow brighter

3. A capacitor of capacitance $1 \mu\text{F}$ is filled with two dielectrics of dielectric constants 4 and 6. What is the new capacitance ?



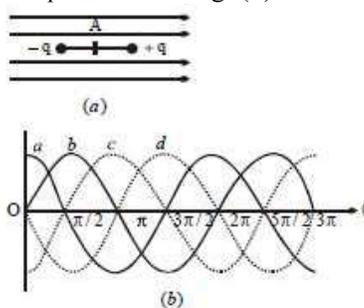
- (1) $10 \mu\text{F}$ (2) $5 \mu\text{F}$
(3) $4 \mu\text{F}$ (4) None of these

4. The figure to the right shows the potential due to two likely charged infinite sheets with charge per unit area σ_1 and σ_2 . From examining this plot we can deduce that



- (1) $\sigma_2 > \sigma_1$ (2) $\sigma_2 < \sigma_1$
(3) $\sigma_2 = \sigma_1$ (4) none of these

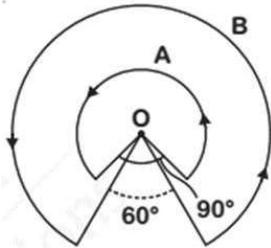
5. The electric dipole is situated in an electric field as shown in figure. The dipole and electric field are both in the plane of paper. The dipole is rotated about an axis perpendicular to the paper at point A in anticlockwise direction. If the angle of rotation is measured with respect to the direction of the electric field, then the torque require to hold the dipole at rest for different values of the angle of rotation θ will be as represented in fig. (b).



- (1) a (2) b
(3) c (4) d

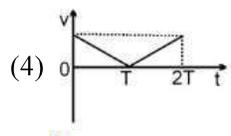
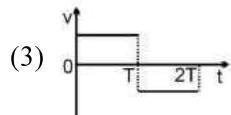
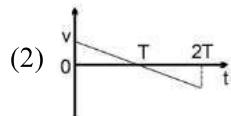
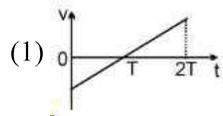
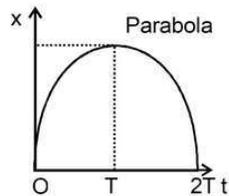


6. A wire A, bent in the shape of an arc of a circle, carrying a current of 2A and having radius 2 cm and another wire B, also bent in the shape of arc of a circle, carrying a current of 3 A and having radius of 4 cm, are placed as shown in the figure. The ratio of the magnetic field due to the wires A and B at the common centre O is :

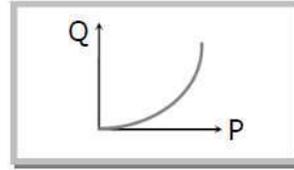


- (1) 2 : 5
 (2) 6 : 5
 (3) 6 : 4
 (4) 4 : 6

7. The v-t graph of the particle is correctly shown by

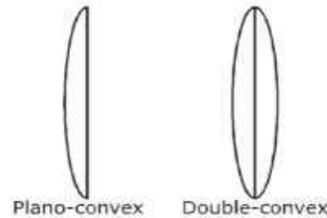


8. The graph shows the behaviour of a length of wire in the region for which the substance obeys Hooke's law. P and Q represent



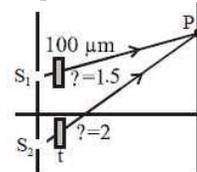
- (1) P = applied force, Q = extension
 (2) P = extension, Q = applied force
 (3) P = extension, Q = stored elastic energy
 (4) P = stored elastic energy, Q = extension

9. You are given two thin identical plano-convex lenses, one of which is shown to the right. When you place an object 20 cm to the left of a single plano-convex lens, the image appears 40 cm to the right of the lens. You then arrange the two plano-convex lenses back to back to form a double convex lens. If the object is at 20 cm to the left of this new lens, what is the approximate location of the image?



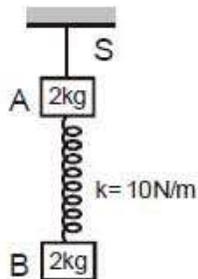
- (1) 6.7 cm to the right of the lens
 (2) 10 cm to the right of the lens
 (3) 20 cm to the right of the lens
 (4) 80 cm to the right of the lens

10. In a Young's double slit experiment, a sheet of thickness $100 \mu\text{m}$ and refractive index 1.5 is introduced as shown in the figure. A sheet of thickness t and refractive index 2 is introduced in lower ray's path. It is observed that there is no displacement in the fringes. The value of t is



- (1) $100 \mu\text{m}$
 (2) $200 \mu\text{m}$
 (3) $150 \mu\text{m}$
 (4) $50 \mu\text{m}$

18. The system shown in figure is in equilibrium. The spring is light, the acceleration of both the blocks (in m/s^2) just after the string S is cut is -

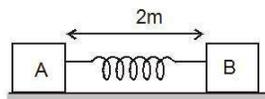


- (1) $a_A = 10, a_B = 0$ (2) $a_A = 0, a_B = 10$
 (3) $a_A = 20, a_B = 0$ (4) $a_A = 0, a_B = 20$
19. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1 . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be
- (1) $\frac{t_1+t_2}{2}$ (2) $\frac{t_1 t_2}{t_1 - t_2}$
 (3) $\frac{t_1 t_2}{t_1 + t_2}$ (4) $t_1 - t_2$
20. Equal masses of H_2 and O_2 gases are filled in two vessels A and B at the same temperature. The volume of vessel A is half that of B. Which of the following statements is correct ? (P-pressure < E_k > Average KE, (C_{rms}) - RMS velocity)
- (1) $P_A = P_B$
 (2) $(C_{\text{rms}})_A = (C_{\text{rms}})_B$
 (3) $\langle E_k \rangle_A = \langle E_k \rangle_B$
 (4) All
21. The internal energy (U), pressure (P) and volume (V) of an ideal gas are related as $U = 3PV + 4$. The gas is :
- (1) polyatomic only
 (2) monoatomic only
 (3) either monoatomic or diatomic
 (4) diatomic only.

22. Initial pressure and volume of a gas are P and V respectively. First its volume is expanded to $4V$ by isothermal process and then again its volume makes to be V by adiabatic process then its final pressure is ($\gamma = 1.5$)
- (1) $8P$ (2) $4P$
 (3) P (4) $2P$
23. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is
- (1) 6.25% (2) 20%
 (3) 26.8% (4) 12.5%
24. A man runs towards the plane mirror at 2 ms^{-1} . The relative speed of his image w.r.t. him will be
- (1) 2 ms^{-1} (2) 4 ms^{-1}
 (3) 8 ms^{-1} (4) 10 ms^{-1}
25. A ray of light incident at a certain angle on a refracting face of a prism, emerges from the other face normally. If the angle of prism is 3° and prism is made of a material of refractive, index 1.63, the angle of incidence is approximately
- (1) 6.0° (2) 4.9°
 (3) 7.5° (4) 3.5°
26. Tyndall effect in colloidal solution is due to -
- (1) Scattering of light
 (2) Reflection of light
 (3) Absorption of light
 (4) Presence of electrically charged particles
27. A presbyopic patient has near point as 30 cm and far point as 40 cm. The dioptric power for the corrected lens for seeing distant objects is:
- (1) 40 (2) - 4 (3) -2.5 (4) -0.25
28. A plano-convex lens with a radius of curvature R, is lying on a reflecting plane surface such that the convex part of the lens is in contact with the plane surface. The lens is illuminated from above. The shape of interference fringes is :-
- (1) circular (2) hyperbolic
 (3) elliptical (4) parabolic



29. Consider the diffraction pattern obtained from the sunlight incident on a pinhole of diameter $0.1 \mu\text{m}$. If the diameter of the pinhole is slightly increased, it will affect the diffraction pattern such that:
- (1) its size decreases, but intensity increases
 - (2) its size increases, but intensity decreases
 - (3) its size increases, and intensity increases
 - (4) its size decreases, and intensity decreases
30. The motion of a particle executing S.H.M. is given by $x = 0.01 \sin(100\pi t + \pi/3)$, where x is in meters and time is in seconds. The time period is
- (1) 0.01 sec
 - (2) 0.02 sec
 - (3) 0.1 sec
 - (4) 0.2 sec
31. A string of length 2 m is fixed at both ends. If this string vibrates in its fourth normal mode with a frequency of 500 Hz then the waves would travel on it with a velocity of.
- (1) 125 m/s
 - (2) 250 m/s
 - (3) 500 m/s
 - (4) 1000 m/s
32. When a body starts to roll on an inclined plane, its potential energy is converted into :
- (1) Translational kinetic energy only
 - (2) Translational and rotational kinetic energy
 - (3) Rotational energy only
 - (4) None of these
33. At a height above the surface of the earth equal to the radius of the earth, the value of g' will be :
- (1) Zero
 - (2) \sqrt{g}
 - (3) $\frac{g}{4}$
 - (4) $\frac{g}{2}$
34. Two ordinary satellites are revolving round the earth in same elliptical orbit, then which of the following quantities is conserved :-
- (1) velocity
 - (2) angular velocity
 - (3) Angular momentum
 - (4) none of above
35. Two blocks are connected by a spring of natural length 2 m. The force constant of spring is 200 N/m. Find spring force in following situations. If block 'A' and 'B' both are displaced by 0.5 m in same direction.

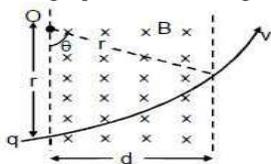


- (1) 25 N
- (2) 100 N
- (3) 30 N
- (4) Zero

Physics - Section B

Section B Shall Consist Of 15 (Fifteen) Questions In Each Subject. Candidate Needs To Attempt Any 10 (Ten) Questions Out Of 15 (Fifteen) In Each Subject.

36. A charge particle q enters a region of uniform magnetic field normally and exits from the other end of the magnetic field space. The deflection of the charge particle in magnetic field is



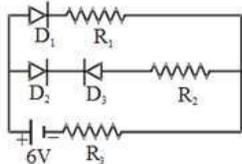
- (1) $\theta = \cos^{-1}\left(\frac{dqB}{mv}\right)$
- (2) $\theta = \cos^{-1}\left(\frac{dqB}{2mv}\right)$
- (3) $\theta = \sin^{-1}\left(\frac{dqB}{mv}\right)$
- (4) $\theta = \sin^{-1}\left(\frac{dqB}{2mv}\right)$

37. A charge Q is situated at the center of a cube, the electric flux passed through all the six faces of the cube is-

- (1) $\frac{Q}{6\epsilon_0}$
- (2) $\frac{Q}{8\epsilon_0}$
- (3) $\frac{Q}{\epsilon_0}$
- (4) $\frac{Q}{2\epsilon_0}$

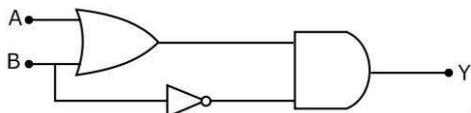


38. Figure shows a circuit in which three identical diodes are used. Each diode has forward resistance of $20\ \Omega$ and infinite backward resistance. Resistors $R_1 = R_2 = R_3 = 50\ \Omega$. Battery voltage is 6 V. The current through R_3 is :



- (1) 60 mA (2) 100 mA
 (3) 50 mA (4) 25 mA
39. A galvanometer can be changed into ammeter by connecting:
- (1) high resistance in parallel
 (2) high resistance in series.
 (3) low resistance in parallel
 (4) low resistance in series

40. The output for the given, circuit is



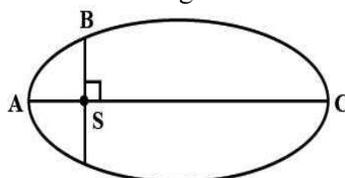
- (1) $(A + B) \cdot \bar{B}$ (2) $(A \cdot B) \cdot \bar{B}$
 (3) $(A + B) \cdot B$ (4) $(A \cdot B) + B$
41. A small sphere is hang with a string of length ℓ , this sphere moves in a horizontal circular path making an angle θ with vertical then its time period is -
- (1) $T = 2\pi\sqrt{\frac{\ell}{g}}$ (2) $T = 2\pi\sqrt{\frac{\ell\sin\theta}{g}}$
 (3) $T = 2\pi\sqrt{\frac{\ell\cos\theta}{g}}$ (4) $T = 2\pi\sqrt{\frac{\ell}{g\cos\theta}}$
42. If the de-Broglie wavelength for a proton and for a α -particle are equal, then the ratio of their velocities will be :
- (1) 4 : 1 (2) 2 : 1
 (3) 1 : 2 (4) 1 : 4

43. An X-ray tube produces a continuous spectrum of radiation with a cutoff wavelength of $45 \times 10^{-3}\ \text{nm}$. The maximum energy of a photon in the radiation (in eV) is

$$[h = 6.62 \times 10^{-34}\ \text{J s}, c = 3 \times 10^8\ \text{m s}^{-1}]$$

- (1) 27500 (2) 22500
 (3) 17500 (4) 12500
44. Which of the following represents the γ -decay?
- (1) ${}^A_Z X + {}^1_0 n_0 = {}^{A-3}_Z X_{Z-2} + {}^A_Z X + \gamma = {}^A_{Z-1} X + a + l$
 (2) ${}^A_Z X = {}^A_Z X + f$ ${}^A_Z X + e^{-1} \rightarrow {}^A_{Z-1} X + g$
 (3) ${}^A_Z X = {}^A_Z X + f$ ${}^A_Z X + e^{-1} \rightarrow {}^A_{Z-1} X + g$
45. Identify the missing product in the given nuclear reaction
- $${}^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow ? + {}^{92}_{36}\text{Kr} + 3{}^1_0\text{n}$$
- (1) ${}^{141}_{56}\text{Ba}$ (2) ${}^{139}_{56}\text{Ba}$
 (3) ${}^{139}_{54}\text{Ba}$ (4) ${}^{141}_{54}\text{Ba}$

46. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A , K_B and K_C , respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then

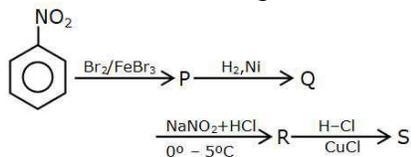


- (1) $K_B < K_A < K_C$ (2) $K_A > K_B > K_C$
 (3) $K_A < K_B < K_C$ (4) $K_B > K_A > K_C$
47. A wire of length 2 m is moving with a velocity of 1 m/s normal to a magnetic field of $0.5\ \text{Wb/m}^2$. The emf induced in it will be - $(\vec{\ell} \perp \vec{B})$
- (1) 0.5 V (2) 0.1 V (3) 2 V (4) 1 V
48. The distance between the ends of wings of an aeroplane is 5m. The aeroplane is moving with velocity of 200 km/sec in a magnetic field of 10T. The emf induced across the ends of wings will be :
- (1) 10^7 volt (2) 10 volt
 (3) 10^6 volt (4) none of these

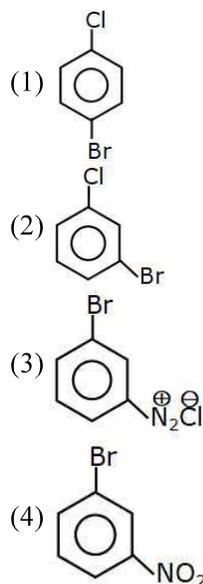
Chemistry - Section A

Section A Shall Consist Of 35 (Thirty-five) Questions In Each Subject .All Questions Are Compulsory.

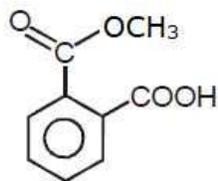
51. Consider the following reactions-



The end product 'S' is-



52. Correct name for given compound is-



- (1) Aspirin
 (2) Acetylsalicylic acid
 (3) 2-methoxy carbonyl benzoic acid
 (4) All

53. Consider 0.2 M aqueous solutions of (a) NaCl (b) BaCl₂ (c) Sugar

The relative lowering of vapour pressure will be such that -

- (1) $b > a > c$ (2) $b > c > a$
 (3) $a > b > c$ (4) $c > a > b$

54. An open beaker of water in equilibrium with water vapour is in a sealed container. When a few grams of glucose are added to the beaker of water, the rate at which water molecules-

- (1) leaves the vapour increases
 (2) leaves the solution increases
 (3) leaves the vapour decreases
 (4) leaves the solution decreases

55. K_{sp} of a CaSO₄.5H₂O is 9×10^{-6} Find the volume of CaSO₄ for 1 gm ($M_w = 136$)-

- (1) 2.45 litre (2) 5.1 litre
 (3) 4.52 litre (4) 3.2 litre

56. The electrolysis of a solution resulting in the formation of H₂ at the cathode and Cl₂ at the anode. The liquid is-

- (1) Pure water (2) H₂SO₄ solution
 (3) NaCl solution in water (4) CuCl₂ solution in water

57. Consider the following reactions at 300 K.

$A \rightarrow B$ (uncatalyzed reaction)

$A \xrightarrow{\text{Catalyst}} B$ (catalyst reaction)

The activation energy is lowered by 8.314 KJmol⁻¹ for the catalyzed reaction. How many times the rate of this catalyzed reaction greater than that of uncatalyzed reaction? (Given $e^{3.33} = 28$)

- (1) 15 times (2) 38 times
 (3) 22 times (4) 28 times

58. The number of Cl⁻ ions around one Na⁺ in NaCl crystal lattice is-

- (1) 12 (2) 4 (3) 8 (4) 6

59. The nature of charge on resulting colloidal particles when FeCl₃ is added to excess of hot water is:

- (1) positive
 (2) neutral
 (3) sometimes positive and sometimes negative
 (4) negative



60. As_2S_3 sol is-
- (1) positive colloid (2) negative colloid
(3) neutral colloid (4) none of these
61. The equation :
 $2\text{Al}(\text{S}) + \frac{3}{2}\text{O}_2(\text{g}) \rightarrow \text{Al}_2\text{O}_3(\text{s})$ shows that
- (1) 2 mole of Al reacts with $\frac{3}{2}$ mole of O_2 to produce $\frac{7}{2}$ mole of Al_2O_3
(2) 2 gm of Al reacts with $\frac{3}{2}$ g of O_2 to produce one mole of Al_2O_3
(3) 2 gm mole of Al reacts with $\frac{3}{2}$ lite of O_2 to produce 1 mole of Al_2O_3
(4) 2 mole of Al reacts with $\frac{3}{2}$ mole of O_2 to produce 1 mole of Al_2O_3
62. The wavelength (in cm) of second line in the Lyman series of hydrogen atomic spectrum is: (Rydberg constant = $R \text{ cm}^{-1}$)-
- (1) $\left(\frac{8R}{9}\right)$ (2) $\left(\frac{9}{8R}\right)$
(3) $\left(\frac{4}{3R}\right)$ (4) $\left(\frac{3R}{4}\right)$
63. The correct order of liquification of the gases NH_3 , CO_2 , SO_2 and HCl is-
- (1) $\text{NH}_3 > \text{CO}_2 > \text{HCl} > \text{SO}_2$
(2) $\text{CO}_2 > \text{NH}_3 > \text{SO}_2 > \text{HCl}$
(3) $\text{HCl} > \text{CO}_2 > \text{NH}_3 > \text{SO}_2$
(4) $\text{SO}_2 > \text{NH}_3 > \text{HCl} > \text{CO}_2$
64. For the reaction $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$, $\Delta H > 0$. The concentration of $\text{NO}(\text{g})$ in the reaction at equilibrium is increased when-
- (1) temperature is increased
(2) temperature is decreased
(3) inert gas is introduced in the container
(4) a catalyst is introduced
65. At constant volume 1150 kcal heat is released when following reaction is carried out at 27°C .
 $\text{C}_7\text{H}_{16}(\text{l}) + 11\text{O}_2(\text{g}) \rightarrow 7\text{CO}_2(\text{g}) + 8\text{H}_2\text{O}(\text{l})$
The heat change at constant pressure is-
- (1) -1152.4 Kcal (2) -1116.2 Kcal
(3) -1167.4 Kcal (4) -1150.17 Kcal
66. How many mole of $\text{K}_2\text{Cr}_2\text{O}_7$ can be reduced by 1 mole of Sn^{2+} ?
- (1) $\frac{1}{3}$ (2) $\frac{1}{6}$
(3) $\frac{2}{3}$ (4) 1
67. Which of the following reactions will not result in the formation of carbon-carbon bonds?
- (1) Reimer-Tieman reaction
(2) Cannizzaro reaction
(3) Wurtz reaction
(4) Friedel-Crafts acylation
68. $\text{CH}_3 - \text{CH}_2 - \text{CHCl}_2 \xrightarrow[\text{Excess}]{\text{NaNH}_2} \text{P} \xrightarrow{\text{CH}_3-\text{I}} \text{Q}$; Q is-
- (1) $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{CH}$
(2) $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{C} - \text{CH}_3$
(3) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_3$
(4) $\text{CH}_3 - \text{C} \equiv \text{CH}$
69. The correct order of reactivity of PhMgBr with the following compounds will be-
- $(\text{C}_6\text{H}_5)_2\text{CO}$, $\text{CH}_3 - \text{CH} = \text{O}$, $(\text{CH}_3)_2\text{C} = \text{O}$
- (1) (2) (3)
- (1) $1 > 2 > 3$ (2) $2 > 3 > 1$
(3) $3 > 2 > 1$ (4) $1 > 3 > 2$
70. To which of the following compound HI adds most readily?
- (1) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$
(2) $\text{CH}_3 - \text{C} \equiv \text{CH}$
(3) $\begin{array}{c} \text{CH}_3 - \text{C} = \text{CH} - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$
(4) $\text{CH}_2 = \text{CH}_2$
71. Dehydration of alcohol to alkene by heating with conc. H_2SO_4 , the initiation step is _____ followed with _____ mechanism-
- (1) Elimination of water, free radical
(2) Formation of an ester, free radical
(3) Protonation of alcohol, carbocation
(4) Protonation of alcohol, carbanion

72. Which of the following compounds does not react with NaHSO_3 ?

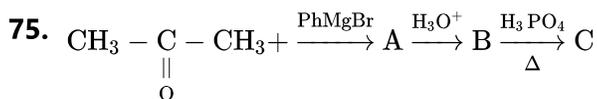
- (1) $\text{C}_6\text{H}_5\text{CHO}$ (2) $\text{C}_6\text{H}_5\text{COCH}_3$
 (3) CH_3COCH_3 (4) $\text{C}_2\text{H}_5\text{COCH}_3$

73. Compound A gives D-Galactose and D-Glucose on hydrolysis. The compound A is-

- (1) Lactose (2) Amylose
 (3) Sucrose (4) Maltose

74. Which of the following process/step not involved in the extraction of silver?

- (1) Hydrometallurgy (2) Reduction by Zinc metal
 (3) Formation of $[\text{Ag}(\text{CN}_2)]^-$ (4) Electrolytic reduction



Compound C is-

- (1) $\text{Ph} - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3$
 |
 CH_3
 (2) $\text{Ph} - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3$
 |
 OH
 (3) $\text{Ph} - \overset{\text{O}}{\parallel}{\text{C}} = \text{CH}_2$
 |
 CH_3
 (4) $\text{Ph} - \overset{\text{O}}{\parallel}{\text{C}}\text{H} = \text{CH}_3$
 |
 CH_3

76. Heating of ore in presence of air to remove sulphur impurities is called-

- (1) Calcination (2) Roasting
 (3) Smelting (4) None

77. Ammonium compound which on heating does not give NH_3 is-

- (1) $(\text{NH}_4)_2\text{SO}_4$ (2) $(\text{NH}_4)_2\text{CO}_3$
 (3) NH_4NO_2 (4) NH_4Cl

78. Of the following, which one is a correct statement-

- (1) Ionic radius of a metal is same as its atomic radius
 (2) The ionic radius of a metal greater than its atomic radius
 (3) The atomic radius of a non-metal is more than its ionic radius
 (4) The ionic radius of a metal is less than its atomic radius

79. Match List I with List-II

List-I		List-II	
(a) PCl_5	(i)	Square pyramidal	
(b) SF_6	(ii)	Trigonal planar	
(c) BrF_5	(iii)	Octahedral	
(d) BF_3	(iv)	Trigonal bipyramidal	

Choose the correct answer from the options given below-

- (1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (2) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
 (3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
 (4) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

80. The correct order of C-O bond length among CO , CO_3^{2-} , CO_2 is-

- (1) $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$
 (2) $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$
 (3) $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
 (4) $\text{CO}_2 < \text{CO} < \text{CO}_3^{2-}$

81. Which of the following compound of Xe disproportionate on hydrolysis?

- (1) XeF_2 (2) XeF_4
 (3) XeF_6 (4) All of these

82. Compound of a metal 'M' is M_2O_3 . The formula of its nitride will be -

- (1) M_3N (2) MN
 (3) M_3N_2 (4) M_2N_3

83. Maximum number of unpaired electrons are present in-

- (1) B_2^+ (2) O_2 (3) O_2^- (4) O_2^{2-}

84. Calamine is an ore of-

- (1) Zn (2) Mg (3) Ca (4) Pb

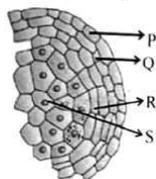


95. The enthalpy of formation for $C_2H_4(g)$, $CO_2(g)$ and $H_2O(l)$ at $25^\circ C$ and 1 atm pressure are 52, -394 and -286 $kJ\ mol^{-1}$ respectively. The enthalpy of combustion of C_2H_4 will be-
- (1) $+1412\ kJ\ mole^{-1}$
 - (2) $-1412\ kJ\ mole^{-1}$
 - (3) $+142.2\ kJ\ mole^{-1}$
 - (4) $-141.2\ kJ\ mole^{-1}$
96. $xCr_2O_7^{2-} + ySO_2(g) \rightarrow Cr_{(aq)}^{3+} + SO_4^{2-}$ the x and y respectively in the above reaction-
- (1) 1, 3
 - (2) 2, 3
 - (3) 3, 4
 - (4) 4, 5
97. Which one is correctly matched?
- (1)
- | | |
|-------|------------------|
| Metal | Refining Process |
| Ti | Zone refining |
- (2)
- | | |
|-------|------------------|
| Metal | Refining Process |
| Ni | Van Arkel method |
- (3)
- | | |
|-------|------------------|
| Metal | Refining Process |
| Zn | Mond's process |
- (4)
- | | |
|-------|------------------|
| Metal | Refining Process |
| Sn | Liquation |
98. Which of the following properties given in pair are shown by nitric acid ?
- (1) Bleaching and oxidising
 - (2) Acidic and oxidising
 - (3) Reducing and oxidising
 - (4) Bleaching and reducing
99. When sodium metal is dissolved in liquid ammonia, a blue solution is formed. The blue color is due to-
- (1) Solvated Na^+ ions
 - (2) Solvated electrons
 - (3) Solvated NH_2^- ions
 - (4) Solvated protons
100. In the dichromate anion ($Cr_2O_7^{2-}$)-
- (1) all C—O bonds are equivalent
 - (2) 6 Cr—O bonds are equivalent
 - (3) 3 Cr—O bonds are equivalent
 - (4) no bonds in $Cr_2O_7^{2-}$ are equivalent

Botany - Section A

Section A Shall Consist Of 35 (Thirty-five) Questions In Each Subject .All Questions Are Compulsory.

101. Identify the parts labelled P, Q, R and S, and select the **right** option about them.



Option	Part-[P]	Part-[Q]	Part-[R]	Part-[S]
(a)	Epidermis	Endothecium	Microspore mother cells	Middle layer
(b)	Epidermis	Endothecium	Middle layer	Microspore mother cells
(c)	Endothecium	Epidermis	Microspore mother cells	Middle layer
(d)	Endothecium	Epidermis	Middle layer	Microspore mother cells

- (1) a
- (2) b
- (3) c
- (4) d

102. The protein coat of virus is called

- (1) Capsid
- (2) Cosmid
- (3) Capsomere
- (4) Chromophore



- 115.** Oxygenic photosynthesis occurs in :-
(1) Oscillatoria (2) Rhodospirillum
(3) Chlorobium (4) Chromatium
- 116.** The incomplete Oxidation of food during fermentation does not involves :-
(1) Glycolysis
(2) Oxidation of NADH₂
(3) Oxidation of reduced coenzymes in mitochondria
(4) Reduction of NAD
- 117.** The number of ATP produced during the production of 1 molecule of acetyl CoA from 1 molecule of Pyruvic acid is :
(1) 3 ATP (2) 8 ATP
(3) 36 ATP (4) 38 ATP
- 118.** Which of the following pair is mismatched?
(1) Spinach — LDP (2) Zea mays — DNP
(3) Glycine max — SDP (4) Lettuce — DNP
- 119.** Which one of the following population interactions is widely used in medical science for the production of antibiotics ?
(1) Parasitism (2) Mutualism
(3) Commensalism (4) Amensalism
- 120.** A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is
(1) ectoparasitism (2) symbiosis
(3) commensalism (4) amensalism
- 121.** Consider the following four statements (a-d) and select option which includes all correct ones only :-
(a) Plants capture 1-5% of incident solar radiation
(b) Ecosystems are not exempted from laws of thermodynamics
(c) Some common herbivores in terrestrial ecosystem are insects, birds and mammals
(d) flow of energy is multidirectional
(1) Statement b,c (2) Statement a,b,c
(3) Statement b,c,d (4) Statement c,d
- 122.** Pyramid of numbers is
(1) Always upright
(2) Always inverted
(3) Either upright or inverted
(4) Neither upright nor inverted.
- 123.** The term "The evil quartet" is related with four major causes of
(1) forest loss (2) population explosion
(3) air pollution (4) biodiversity losses
- 124.** Catalytic converter is used to control :-
(1) Particulate matter
(2) Carbon monoxide and nitrogen oxides
(3) High noise level
(4) Solid wastes
- 125.** Use of DDT as pesticide in high concentrations eventually caused significant decline in bird populations because it-
(1) Is a biodegradable pollutant
(2) Caused thinning of egg shell and their premature breaking
(3) Increased calcium absorption in birds
(4) Did not show biological magnification
- 126.** Read the following statements :
(i) Long thin flexible petioles allow leaf blades to flutter in wind, thereby cooling the leaf and bringing fresh air to leaf surface
(ii) Leaf lamina lacks vascular bundles
(iii) Veins provide rigidity to leaf blades
(iv) Leaf possess reticulate or parallel venation
(v) The axil of leaflets possess many axillary buds
How many of the above statements are correct ?
(1) Three (2) Two
(3) One (4) Five
- 127.** Pedicellate bisexual flowers borne acropetally on an elongated peduncle form an inflorescence called
(1) Spike (2) Corymb
(3) Raceme (4) Catkin

- 128.** The innermost layer of cortex in a dicot root:
- (1) Comprises a single layer of barrel shaped cells without any intercellular spaces
 - (2) Are composed of cells which have depositions of impermeable cutin and lignin mainly in their radial and tangential walls
 - (3) Comprises a group of dead cells
 - (4) Contain abundant intercellular spaces

- 129.** Which one is true for the tissue which constitutes the hypodermis of dicot stem?
- (1) It is found either collenchymatous or sclerenchymatous
 - (2) It consists of cells which are much thickened at the corners due to deposition of cellulose, hemicelluloses and lignin
 - (3) The cells are never photosynthetic
 - (4) Intercellular spaces are abundantly present

- 130.** Mendel selected *Pisum sativum* for hybridisation experiments because of
- (1) Clear contrasting characters and short life span
 - (2) Long life span and non-fertile hybrids
 - (3) Presence of unisexual flowers
 - (4) Infertile hybrids and production of large number of seeds by each plant

- 131.** Which is an example of multiple allele :-
- (1) MN blood group
 - (2) Coat colour in rat
 - (3) Eye colour in human
 - (4) Coat colour in rabbit

- 132.** A female silk moth with genotype MmRrNn produces how many types of gametes :-
- (1) 4-types
 - (2) 8-types
 - (3) One type
 - (4) Two types

- 133.** In crop improvement programme, haploids are of great importance because they
- (1) Are useful in studies on meiosis
 - (2) Require only about half the amount of chemical fertilisers as compare to diploids
 - (3) Give homozygous lines following diploidisation
 - (4) Grow better under adverse condition

- 134.** When nucleosome becomes once again coiled, in the form of spring it is called-
- (1) Solenoid
 - (2) Chromomeres
 - (3) Chromatin
 - (4) None of these

- 135.** Who used heavy nitrogen N^{15} for proving semiconservative way of DNA replication
- (1) Masters and Broda
 - (2) Meselson and Stahl
 - (3) Watson and Crick
 - (4) Jacob and Monad

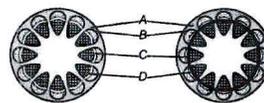
Botany - Section B

Section B Shall Consist Of 15 (Fifteen) Questions In Each Subject. Candidate Needs To Attempt Any 10 (Ten) Questions Out Of 15 (Fifteen) In Each Subject.

- 136.** Which is a taxon :-
- (1) Genera
 - (2) Plantae
 - (3) Class
 - (4) All the above

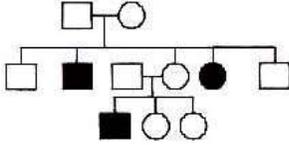
- 137.** The biosynthesis of auxin in plants will be inhibited due to deficiency of -
- (1) Mg
 - (2) Zn
 - (3) CO
 - (4) K

- 138.** Given below the diagram of TS of dicot stem showing secondary growth. Identify A to D.



- (1) A-Cortex, B-Secondary xylem, C-Secondary phloem, D-Vascular cambium
- (2) A-Cortex, B-Primary phloem, C-Vascular cambium, D-Primary xylem
- (3) A-Cortex, B-Secondary xylem, C-Vascular cambium D-Primary phloem
- (4) A-Cortex, B-Primary xylem, C-Vascular cambium D-Primary phloem

139. The given pedigree chart shows the inheritance of which of the following Mendelian disorders ?



- (1) Autosomal dominant trait -myotonic dystrophy
 (2) Autosomal recessive trait -haemophilia
 (3) Autosomal recessive trait -sickle cell anaemia
 (4) Autosomal dominant trait -cystic fibrosis

140. Which one is amoebic parasite ?

- (1) Trypanosoma (2) Plasmodium
 (3) Entamoeba (4) Liver fluke

141. Which kingdom was added by R.H. Whittaker in Classification-

- (1) Only Protista (2) Only Plantae
 (3) Protista and Plantae (4) Fungi

142. The first stable product of carboxylation reaction in C_4 plants is :-

- (1) PEP (2) OAA
 (3) PGA (4) RuBP

143. Respiratory chain occurs on inner membrane of mitochondria this takes place during :-

- (1) Day time (2) Night time
 (3) In presence of dark (4) All time

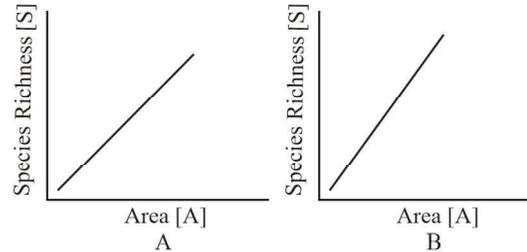
144. Tropical dense forest is due to—

- (1) High temperature and excess rain
 (2) Low temperature and excess rain
 (3) High temperature and lesser rain
 (4) Wild animals (tigers, lions, bears etc.)

145. Mark the odd one (w.r.t. second trophic level) :-

- (1) Wolf (2) Grasshopper
 (3) Cow (4) Zooplanktons

146. $\text{Log } s = \log c + z \log A$



The conclusion about given graphs is-

- (1) Area A possesses high species richness than area B
 (2) Z-value is high in area A than area B
 (3) Species richness is high in area B than area A
 (4) Both area A and area B possess same Z-value

147. Function of stem is

- (1) Bear leaves and branches
 (2) Conduction of water & minerals
 (3) Conduction and storage of food
 (4) All of the above

148. Which is not true for lac operon :-

- (1) Discovered by Jacob & Monod
 (2) Operates in catabolic pathway
 (3) Example of inducible operon
 (4) 5-structural genes are present

149. Which is an ultimate source of variation :

- (1) Crossing over (2) Mutation
 (3) Adaptation (4) Non disjunction

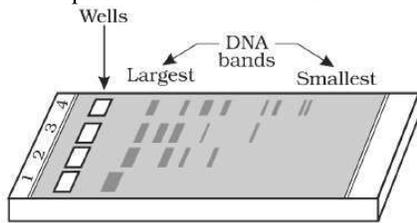
150. X-linked recessive gene is :-

- (1) Always expressed in male (2) Always expressed in female
 (3) Lethal (4) Sub-lethal

Zoology -Section A

Section A Shall Consist Of 35 (Thirty-five) Questions In Each Subject .All Questions Are Compulsory.

151. Given below, is a typical agarose gel in which electrophoresis had occurred.



In this agarose gel :

- (1) Lane-1 shows migration of digested DNA fragments
- (2) Only Lane-4 shows migration of digested DNA fragments
- (3) Lane-2 to 4 shows migration of digested set of DNA fragments
- (4) Wells are always placed towards positive electrode during electrophoresis

152. Action potential of a nerve cell is generated by :

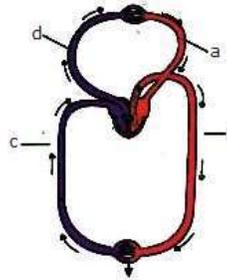
- (1) Na^+
- (2) K^+
- (3) Ca^{++}
- (4) Cl^-

153. Match the items given in **column-I** with those in **column-II** and select the **correct** option given below

Column I (Function)	Column II (Part of Excretory System)
(a) Ultrafiltration	(i) Henle's loop
(b) Concentration of urine	(ii) Ureter
(c) Transport of urine	(iii) Urinary bladder
(d) Storage of urine	(iv) Malpighian corpuscle
	(v) Proximal convoluted tubule

- (1) (a)-(v), (b)-(iv), (c)-(i), (d)-(ii)
- (2) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
- (3) (a)-(iv), (b)-(v), (c)-(ii), (d)-(iii)
- (4) (a)-(v), (b)-(iv), (c)-(i), (d)-(iii)

154. Figure shows schematic plan of blood circulation in humans with labels a to d. Identify the label and give its functions

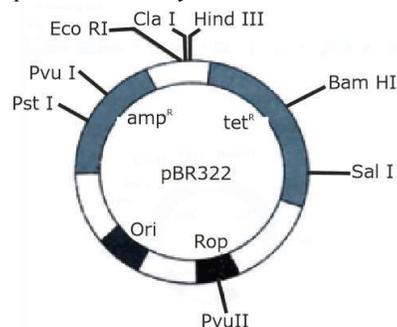


- (1) **d**-Dorsal aorta-takes blood from heart to body parts, $\text{PO}_2 = 95 \text{ mm Hg}$
- (2) **a**-Pulmonary vein-takes impure blood from body parts, $\text{PO}_2 = 60 \text{ mm Hg}$
- (3) **b**-Pulmonary artery-takes blood from heart to lungs, $\text{PO}_2 = 90 \text{ mm Hg}$
- (4) **c**-Vena Cava-takes blood from body parts to the right auricle, $\text{PCO}_2 = 45 \text{ mm Hg}$

155. *Monascus purpureus* is a yeast used commercially in the production of :-

- (1) Citric acid
- (2) Blood cholesterol lowering statins
- (3) Ethanol
- (4) Streptokinase for removing clots from the blood vessels.

156. The figure below is the diagrammatic representation of the E.Coli vector pBR 322. Which one of the given options correctly identifies its certain component(s) ?



- (1) Hind III, EcoRI-selectable markers
- (2) amp^R , tet^R -antibiotic resistance genes
- (3) ori-original restriction enzyme
- (4) rop-reduced osmotic pressure



157. Restriction enzymes were firstly isolated from -

- (1) Haemophilus influenzae (2) E. coli
(3) Pseudomonas putida (4) Agrobacterium

158. Which one of the following is a **correct** statement :

- (1) "Bt" in "Bt-cotton" indicates that it is a genetically modified organism produced through biotechnology
(2) Gene transfer in any organism is always beneficial
(3) The anticoagulant Hirudin is being produced from transgenic Brassica campestris seeds
(4) In "Flavr Savr" variety of tomato, the polygalactouranase enzyme has been inactivated which in turn inhibits over ripening

159. A gene cry-I Ac has been found to be useful in the control of the population of insects like

- (1) Bugs (2) Cotton bollworm
(3) Corn borer (4) Beetles

160. Microsomes are modification of :

- (1) SER (2) RER
(3) Nucleus (4) Golgi body

161. The cell organelle associated with photorespiration is :-

- (1) Mesosome (2) Ribosome
(3) Peroxisome (4) Lysosome

162. The leucoplasts, that store oils and fats ?

- (1) Amyloplasts (2) Elaioplasts
(3) Aleuroplasts (4) Glyceroplasts

163. Which spindle fibre have smallest size :-

- (1) Chromosomal fibre (2) Supporting fibre
(3) Interzonal fibre (4) Continuous fibre

164. Significance of mitosis includes ?

- (1) Equal distribution of chromosomes to daughter cells
(2) Restoration of surface/volume ratio and nucleocytoplasmic ratio
(3) Repair of the body
(4) All of these

165. There are two alleles (A_1 & A_2) out of which one (A_1) has nil abundance in a population then the abundance of second allele (A_2) is :-

- (1) 0.25 (2) 1.00
(3) 0.40 (4) 0.50

166. Fossil Lucy belonged to

- (1) Ramapithecous (2) Australopithecus
(3) Dryopithecus (4) Aegyptopithecus.

167. An old view about evolution states that the organisms were created by a super organism in the same condition as they exist now. This theory is called

- (1) Theory of special creation
(2) Theory of natural selection
(3) Lamarck's theory of evolution
(4) Theory of spontaneous generation,

168. About 350 mya, _____ could move on land and go back to water. Find the correct option to fill the blank.

- (1) Amphibians (2) Reptiles
(3) Coelocanth (4) Invertebrates

169. Apposition image is characteristic of-

- (1) Nocturnal insects (2) Diurnal insect
(3) Both A and B (4) None of the above

170. Which is exopeptidase :-

- (1) Carboxypeptidase (2) Trypsin
(3) Chymotrypsin (4) None of the above

171. Match the column-I with column-II :

Column-I		Column-II	
(A)	Abnormal frequency of bowel movement and increased liquidity of faeces	(i)	Constipation
(B)	Faeces retained in the rectum as the bowel movement occurs irregularly	(ii)	Vomiting
(C)	Skin and eyes turn yellow due to the deposition of bile pigment	(iii)	Jaundice
(D)	Ejection of gastric content through mouth	(iv)	Diarrhoea

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



- 172.** Choose **incorrect** statement from following :
- (a) In AI many progeny are formed at a time.
 - (b) In MOET many eggs are formed at a time.
 - (c) In MOET, fertilized eggs are removed surgically.
 - (d) In MOET, 8 to 32 cells stage is transfer into uterus of genetic mother.
- (1) a and b only (2) a and c only
(3) a, b and c (4) a, c, and d
- 173.** Energy transformation during nerve conduction is
- (1) Chemical to radiant (2) Chemical to mechanical
(3) Chemical to electrical (4) Chemical to osmotic
- 174.** Main function of eustachian tube is to :-
- (1) Protect tympanic membrane from bacteria
 - (2) Support the bones of middle ear
 - (3) Equalize pressure on two sides of tympanic membrane
 - (4) Prevent infection entering ear drum
- 175.** Use of an artificial kidney during hemodialysis may result in:
- (a) Nitrogenous waste build-up in the body
 - (b) Non-elimination of excess potassium ions
 - (c) Reduced absorption of calcium ions from gastrointestinal tract
 - (d) Reduced RBC production
- Which of the following options is the most appropriate?
- (1) (c) and (d) are correct (2) (a) and (d) are correct
(3) (a) and (b) are correct (4) (b) and (c) are correct
- 176.** Which statement is true ?
- (1) By the contraction in diaphragm, volume of thoracic cavity increases in dorso-ventral axis.
 - (2) By the contraction in diaphragm, volume of thoracic cavity increases in antero-posterior axis.
 - (3) By the contraction in EICM, volume of thoracic cavity increases in antero-posterior axis
 - (4) By the contraction in IICM, volume of thoracic cavity increases in antero-posterior axis.
- 177.** Which methods are generally advised for the male/female partner as a terminal method to prevent any more pregnancies ?
- (1) Sterilisation (2) Barrier method
(3) IUDs (4) Oral Contraceptives
- 178.** Store house of calcium in muscle is :
- (1) Sarcormere (2) Sarcosome
(3) Sarcoplasmic reticulum (4) Myofibril
- 179.** The blood calcium level is lowered by the deficiency of
- (1) Parathormone (2) Thyroxine
(3) Cortisol (4) Calcitonin
- 180.** In the case of a couple where the male is having a very low sperm count, which technique will be suitable for fertilization?
- (1) Intrauterine transfer
(2) Gamete intracytoplasmic fallopian transfer
(3) Artificial Insemination
(4) Intracytoplasmic sperm injection
- 181.** Secretion of thyroid gland is controlled by :
- (1) TRH from posterior pituitary gland and TSH from hypothalamus
(2) TSH from posterior pituitary gland and TRH from hypothalamus
(3) TRH from anterior pituitary gland and TSH from hypothalamus
(4) TRH from hypothalamus and TSH from anterior pituitary gland

Zoology -Section B

**Section B Shall Consist Of 15 (Fifteen) Questions In Each Subject. Candidate Needs To Attempt Any 10 (Ten) Questions
Out Of 15 (Fifteen) In Each Subject.**

- 186.** If there are 27 chromosomes, with 10 pg of DNA in a sperm of a fish, then the number of chromosomes and amount of DNA in the G₂ phase of its sperm mother cell will be-
- (1) 54 and 20 pg (2) 54 and 60 pg
(3) 27 and 40 pg (4) 54 and 40 pg
- 187.** The chromatin material which takes darker stain in interphase is called?
- (1) Euchromatin (2) Heterochromatin
(3) Primary constriction (4) Satellite body
- 188.** For transformation, micro-particles coated with DNA to be bombarded with gene gun are made up of :-
- (1) Silicon or Platinum (2) Gold or Tungsten
(3) Silver or platinum (4) Platinum or zinc
- 189.** In which of the following process is not used recombinant DNA technology-
- (1) For preparation of Bt-cotton
(2) Obtained hirudin from Brassica napus
(3) Obtained humuline from E.coli
(4) Obtained single cell protein from natural mushroom
- 190.** Second heart sound is :-
- (1) Lubb sound at the end of ventricular systole
(2) Dub sound at the end of ventricular systole
(3) Lubb sound at the beginning of ventricular systole
(4) Dub sound at the beginning of ventricular diastole
- 191.** If in a person 100 ml. of pure blood is carrying 13.4 ml. of O₂. The Hb count of his blood is :-
- (1) 15 gm / 100 ml (2) 10 gm / 100 ml
(3) 1.34 gm / 100 ml (4) 20 gm / 100 ml
- 192.** Systole is contraction of :-
- (1) AV node (2) SA node
(3) Major arteries (4) atria and ventricles
- 193.** Which wave pattern appear in E.E.G. during deep sleep :-
- (1) α (2) β
(3) δ (4) θ
- 194.** Function of Sertoli cells is controlled by :
- (1) Estrogen (2) FSH
(3) Testosterone (4) ACTH
- 195.** Read the following statements (A - D)
- (i) Benign tumors normally remain confined to their original location.
(ii) Malignant tumors grow very rapidly invading and damaging the surrounding normal tissues.
(iii) Metastasis is the most feared property of malignant tumors.
(iv) Proto-oncogene when activated under certain conditions, Could lead to oncogenic transformation of cells.
- How many of the above statements are **correct**?
- (1) 3 (2) 4
(3) 2 (4) 1
- 196.** Read the given statements carefully.
- (i) Innate immunity is a specific type of defense, that is present at the time of birth.
(ii) Malignant malaria is caused by Plasmodium falciparum.
(iii) Malaria could be confirmed by Widal test.
(iv) Active immunity is slow and takes time to give its full effective response.
(v) Saliva in the mouth acts as physiological barrier for pathogens.
- Which of the above statements are **correct**?
- (1) (ii), (iv) and (v) (2) (i), (iii) and (v)
(3) (i) and (v) (4) (ii), (iii) and (v)
- 197.** _____ is a very effective sedative and painkiller and is very useful in patients who have undergone surgery
- (1) Cocaine (2) Marijuana
(3) Morphine (4) Nicotine



198. If ADH level of blood is less:

- (1) Volume of urine increase
- (2) Volume of urine decrease
- (3) Volume of urine is normal
- (4) Volume of urine is unaffected

199. Find out the characters which are similar in Bufo and Calotes.

- (i) The skin is dry and cornified with epidermal scales.
- (ii) Tympanum represents the ear.
- (iii) The heart is three chambered.
- (iv) Fertilisation is internal and development is direct.
- (v) Oviparous

- (1) i, ii, iii
- (2) ii, iii, v
- (3) i, iii, iv
- (4) ii, iv, v

200. Ejaculatory duct is formed by the-

- (1) Vas deferens along with the prostatic duct
- (2) Epididymis along with a duct from the seminal vesicle
- (3) Epididymis along with the prostatic duct
- (4) Vas deferens along with a duct from the seminal vesicle

STEPS TO APPEAR FOR THE TEST & GET RESULTS



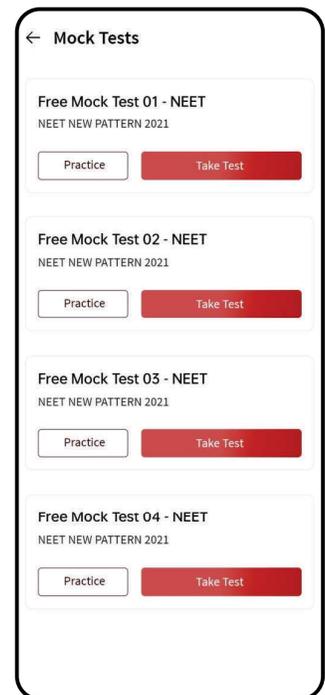
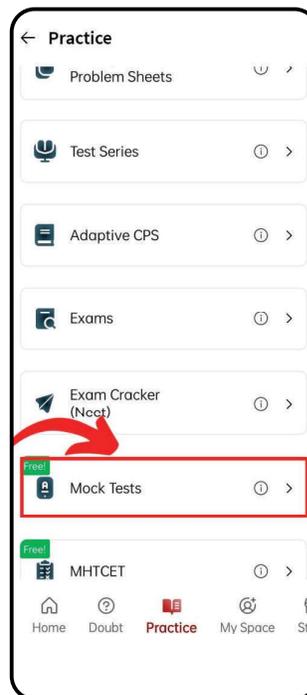
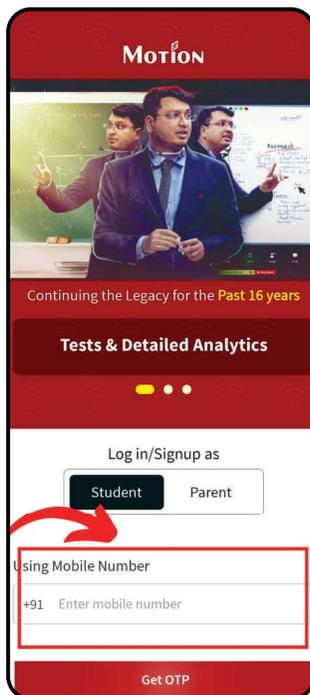
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