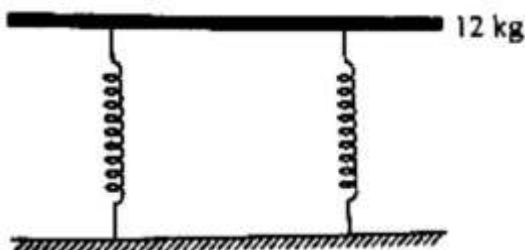


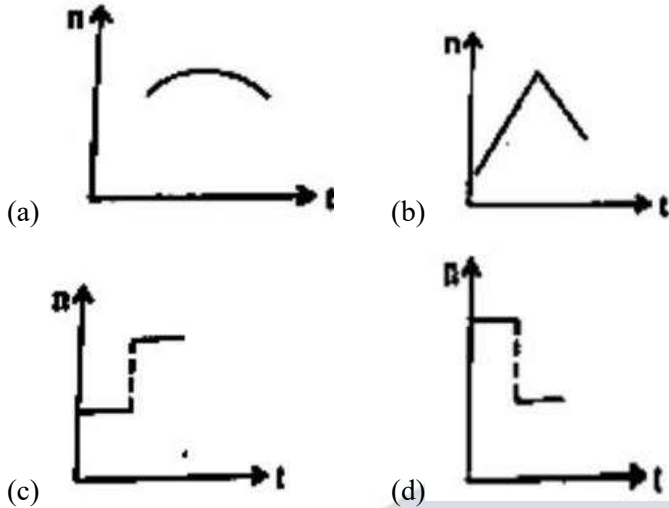
Physics

1. The value of acceleration due to gravity at a height of 10 km from the surface of earth is x . At what depth inside the earth is the value of the acceleration due to gravity has the same value x ?
 (a) 5 km (b) 20 km
 (c) 10 km (d) 15 km
2. Young's modulus of a perfect rigid body is
 (a) Zero (b) Unity
 (c) Infinity (d) Between zero and unity
3. A wheel starting from rest gains an angular velocity of 10 rad/s after uniformly accelerated for 5 sec. The total angle through which it has turned is
 (a) 25 rad
 (b) 100 rad
 (c) $25\pi\text{ rad}$
 (d) $50\pi\text{ rad}$ about a vertical axis
4. Iceberg floats in water with part of it submerged. What is the fraction of the volume of iceberg submerged if the density of ice is $\rho_i = 0.917\text{ g cm}^{-3}$?
 (a) 0.917 (b) 1
 (c) 0.458 (d) 0
5. A sphere, a cube and a thin circular plate all of same material and same mass initially heated to same high temperature are allowed to cool down under similar conditions. Then the
 (a) plate will cool the fastest and cube the slowest
 (b) sphere will cool the fastest and cube the slowest
 (c) plate will cool the fastest and sphere the slowest
 (d) cube will cool the fastest and plate the slowest
6. In an adiabatic expansion of an ideal gas the product of pressure and volume
 (a) Decreases
 (b) Increases
 (c) Remains constant
 (d) At first increases and then decreases
7. A certain amount of heat energy is supplied to a monoatomic ideal gas which expands at constant pressure. What fraction of the heat energy is converted into work?
 (a) 1 (b) $\frac{2}{3}$
 (c) $\frac{2}{5}$ (d) $\frac{5}{7}$
8. A tray of mass 12 kg is supported by two identical springs as shown in figure. When the tray is pressed down slightly and then released, it executes SHM with a time period of 1.5 s. The spring constant of each spring is

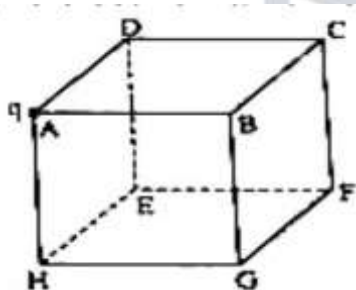


- (a) 50Nm^{-1} (b) 0
(c) 105Nm^{-1} (d) ∞

9. A train whistling at constant frequency ' n ' is moving towards a station at a constant speed V . The train goes past a stationary observer on the station. The frequency ' n ' of the sound as heard by the observer is plotted as a function of time ' t '. Identify the correct curve

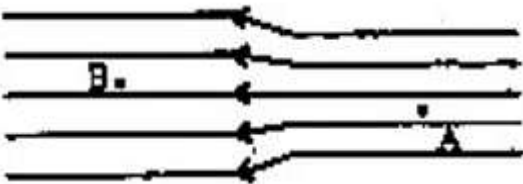


10. A point charge ' q ' is placed at the corner of a cube of side ' a ' as shown in the figure. What is the electric flux through the face ABCD?



- (a) 0 (b) $\frac{q}{24\epsilon_0}$
(c) $\frac{q}{6\epsilon_0}$ (d) $\frac{q}{72\epsilon_0}$

11. The electric field lines on the left have twice the separation on those on the right as shown in figure. If the magnitude of the field at A is 40Vm^{-1} , what is the force on $20\mu\text{C}$ charge kept at B?



- (a) $4 \times 10^{-4}\text{Vm}^{-1}$ (b) $8 \times 10^{-4}\text{Vm}^{-1}$
(c) $16 \times 10^{-4}\text{Vm}^{-1}$ (d) $1 \times 10^{-4}\text{Vm}^{-1}$

12. An infinitely long thin straight wire has uniform charge density of $\frac{1}{4} \times 10^{-2}\text{cm}^{-1}$. What is the magnitude of electric field at a distance 20 cm from the axis of the wire ?

- (a) $1.12 \times 10^8\text{NC}^{-1}$ (b) $4.5 \times 10^8\text{NC}^{-1}$
(c) $2.25 \times 10^8\text{NC}^{-1}$ (d) $9 \times 10^8\text{NC}^{-1}$

13. A dipole moment 'P' and moment of inertia I is placed in a uniform electric field $\vec{E}$. If it is displaced slightly from its stable equilibrium position, the period of oscillation of dipole is

- (a) $\sqrt{\frac{PE}{I}}$ (b) $2\pi\sqrt{\frac{I}{PE}}$
 (c) $\frac{1}{2\pi}\sqrt{\frac{PE}{I}}$ (d) $\pi\sqrt{\frac{I}{PE}}$

14. The difference between equivalent capacitances of two identical capacitors connected in parallel to that in series is $6\mu\text{F}$. The value of capacitance of each capacitor is

- (a) $2\mu\text{F}$ (b) $3\mu\text{F}$
 (c) $4\mu\text{F}$ (d) $6\mu\text{F}$

15. Figure shows three points A, B and C in a region of uniform electric field $\vec{E}$. The line AB is perpendicular and BC is parallel to the field lines. Then which of the following holds good? (V_A , V_B and V_C represent the electric potential at points A, B and C respectively)



- (a) $V_A = V_B = V_C$ (b) $V_A = V_B > V_C$
 (c) $V_A = V_B < V_C$ (d) $V_A > V_B = V_C$

16. When a soap bubble is charged?

- (a) Its radius increases
 (b) Its radius decreases
 (c) The radius remains the same
 (d) Its radius may increase or decrease

17. A hot filament liberates an electron with zero initial velocity. The anode potential is 1200 V. The speed of the electron when it strikes the anode is

- (a) $1.5 \times 10^5 \text{ ms}^{-1}$ (b) $2.5 \times 10^6 \text{ ms}^{-1}$
 (c) $2.1 \times 10^7 \text{ ms}^{-1}$ (d) $2.5 \times 10^8 \text{ ms}^{-1}$

18. A metal rod of length 10 cm and a rectangular cross-section of $1 \text{ cm} \times \frac{1}{2} \text{ cm}$ is connected to a battery across opposite faces. The resistance will be

- (a) maximum when the battery is connected across $1 \text{ cm} \times \frac{1}{2} \text{ cm}$ faces
 (b) maximum when the battery is connected across $10 \text{ cm} \times \frac{1}{2} \text{ cm}$ faces
 (c) maximum when the battery is connected across $10 \text{ cm} \times 1 \text{ cm}$ faces
 (d) same irrespective of the three faces

19. A car has a fresh storage battery of e.m.f 12 V and internal resistance $2 \times 10^{-2} \Omega$. If the starter motor draws a current of 80A. Then the terminal voltage when the starter is on is

- (a) 12 V (b) 8.4 V
 (c) 10.4 V (d) 9.3 V

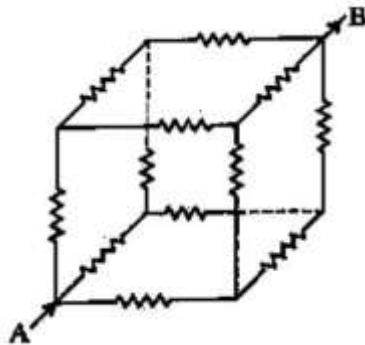
20. A potentiometer has a uniform wire of length 5 m. A battery of emf 10 V and negligible internal resistance is connected between its ends. A secondary cell connected to the circuit gives balancing length at 200 cm. The emf of the secondary cell is

- (a) 4 V (b) 6 V
(c) 2 V (d) 8 V

21. The colour code for a carbon resistor of resistance $0.28k\Omega \pm 10\%$ is

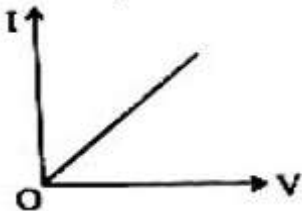
- (a) Red, Grey, Brown, Silver
(b) Red, Green, Brown, Silver
(c) Red, Grey, Silver, Silver
(d) Red, Green, Silver

22. Each resistance in the given cubical network has resistance of 1Ω and equivalent resistance between A and B is



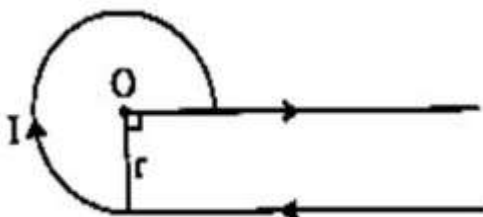
- (a) $\frac{5}{6}\Omega$ (b) $\frac{6}{5}\Omega$
(c) $\frac{5}{12}\Omega$ (d) $\frac{12}{5}\Omega$

23. I-V characteristic of a copper wire of length L and area of cross-section A is shown in figure. The slope of the curve becomes



- (a) More if experiment is performed at higher temperature
(b) More if a wire of steel of same dimension is used
(c) Less if the area of the wire is increased
(d) Less if the length of the wire is increased

24. In the given figure, the magnetic field at 'O'.

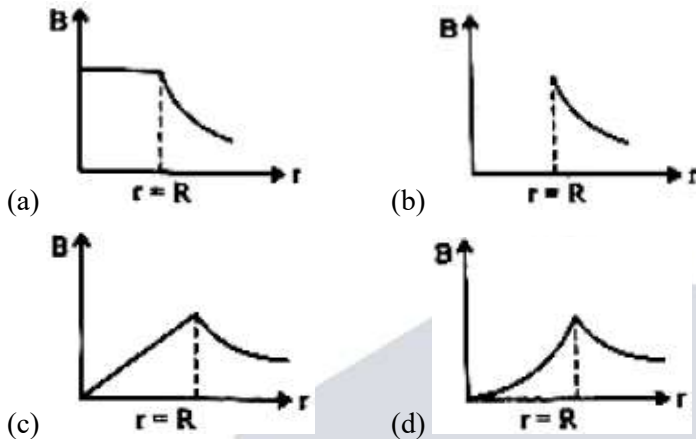


- (a) $\frac{3\mu_0 I}{4r} + \frac{\mu_0 I}{4\pi r}$ (b) $\frac{3\mu_0 I}{10r} - \frac{\mu_0 I}{4\pi r}$
 (c) $\frac{3\mu_0 I}{8r} + \frac{\mu_0 I}{4\pi r}$ (d) $\frac{3\mu_0 I}{8r} - \frac{\mu_0 I}{4\pi r}$

25. The magnetic field at the origin due to a current element $i \vec{dl}$ placed at a point with vector position $\vec{r}$ is

- (a) $\frac{\mu_0 i \vec{dl} \times \vec{r}}{4\pi r^3}$ (b) $\frac{\mu_0 i \vec{r} \times \vec{dl}}{4\pi r^3}$
 (c) $\frac{\mu_0 i \vec{dl} \times \vec{r}}{4\pi r^2}$ (d) $\frac{\mu_0 i \vec{r} \times \vec{dl}}{4\pi r^2}$

26. A long cylindrical wire of radius R carries a uniform current I flowing through it. The variation of magnetic field with distance ' r ' from the axis of the wire is shown by



27. A cyclotron is used to accelerate protons (${}^1_1\text{H}$), Deuterons (${}^2_1\text{H}$) and α -particles (${}^4_2\text{He}$). While exiting under similar conditions, the minimum K.E. is gained by

- (a) α -particle (b) Proton
 (c) Deuteron (d) Same for all

28. A paramagnetic sample shows a net magnetization of 8Am^{-1} when placed in an external magnetic field of 0.6 T at a temperature of 4 K . When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16 K , the magnetization will be

- (a) $\frac{32}{3}\text{Am}^{-1}$ (b) $\frac{2}{3}\text{Am}^{-1}$
 (c) 6Am^{-1} (d) 2.4Am^{-1}

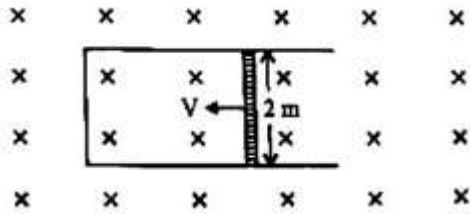
29. The ratio of magnetic field at the centre of a current carrying circular coil to its magnetic moment is ' x ' if the current and the radius both are doubled. The new ratio will become

- (a) $2x$ (b) $4x$
 (c) $\frac{x}{4}$ (d) $\frac{x}{8}$

30. In a permanent magnet at room temperature

- (a) Magnetic moment of each molecule is zero
 (b) The individual molecules have non-zero magnetic moment which are all perfectly aligned
 (c) Domains are partially aligned
 (d) Domains are all perfectly aligned

31. A rod of length 2 m slides with a speed of 5 ms^{-1} on a rectangular conducting frame as shown in figure. There exists a uniform magnetic field of 0.04 T perpendicular to the plane of the figure. If the resistance of the rod is 3Ω . The current through the rod is

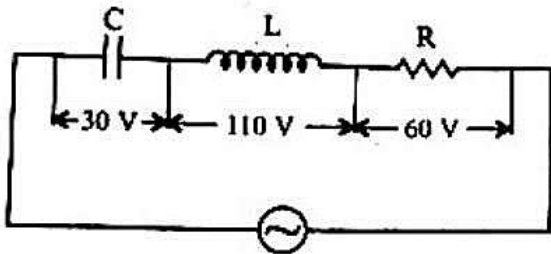


- (a) 75 mA (b) 133 mA
(c) 0.75 A (d) 1.33 A

32. The current in a coil of inductance 0.2 H changes from 5 A to 2 A in 0.5 sec. The magnitude of the average induced emf in the coil is

- (a) 0.6 V (b) 1.2 V
(c) 30 V (d) 0.3 V

33. In the given circuit the peak voltage across C, L and R are 30 V, 110 V and 60 V respectively. The rms value of the applied voltage is

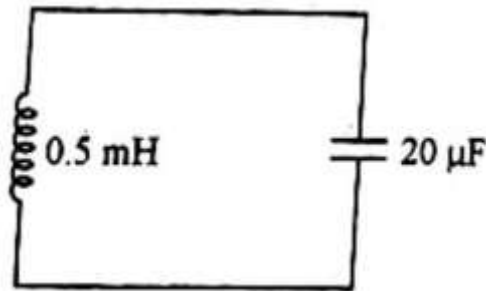


- (a) 100 V (b) 200 V
(c) 70.7 V (d) 141 V

34. The power factor of R-L circuit is $\frac{1}{\sqrt{3}}$. If the inductive reactance is 2Ω . The value of resistance is

- (a) 2Ω (b) $\sqrt{2}\Omega$
(c) 0.5Ω (d) $\frac{1}{\sqrt{2}}\Omega$

35. In the given circuit, the resonant frequency is



- (a) 15.92 Hz (b) 159.2 Hz
(c) 1592 Hz (d) 15910 Hz

36. A light beam of intensity 20 W/cm^2 is incident normally on a perfectly reflecting surface of sides $25 \text{ cm} \times 15 \text{ cm}$. The momentum imparted to the surface by the light per second is

- (a) $2 \times 10^{-5} \text{ kg ms}^{-1}$
(b) $1 \times 10^{-5} \text{ kg ms}^{-1}$
(c) $5 \times 10^{-5} \text{ kg ms}^{-1}$
(d) $1.2 \times 10^{-5} \text{ kg ms}^{-1}$

37. An object approaches a convergent lens from the left of the lens with a uniform speed 5 m/s and stops at the focus, the image

- (a) Moves away from the lens with an uniform speed 5 m/s

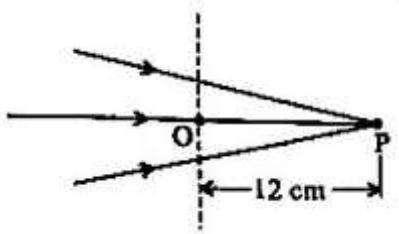
- (b) Moves away from the lens with an uniform acceleration
- (c) Moves away from the lens with a nonuniform acceleration
- (d) Moves towards the lens with a non-uniform acceleration

38. The refracting angle of prism is A and refractive index of material of prism is $\cot \frac{A}{2}$.

The angle of minimum deviation is

- (a) $180^\circ - 3A$
- (b) $180^\circ + 2A$
- (c) $90^\circ - A$
- (d) $180^\circ - 2A$

39. The following figure shows a beam of light converging at point P. When a concave lens of focal length 16 cm is introduced in the path of the beam at a place shown by dotted line such that OP becomes the axis of the lens, the beam converges at a distance x from the lens. The value of x will be equal to



- (a) 12 cm
- (b) 24 cm
- (c) 36 cm
- (d) 48 cm

40. Three polaroid sheets P_1 , P_2 and P_3 are kept parallel to each other such that the angle between pass axes of P_1 and P_2 is 45° and that between P_2 and P_3 is 45° . If unpolarised beam of light of intensity 128 Wm^{-2} is incident on P_1 . What is the intensity of light coming out of P_3 ?

- (a) 128 Wm^{-2}
- (b) 0
- (c) 16 Wm^{-2}
- (d) 64 Wm^{-2}

41. Two poles are separated by a distance of 3.14 m. The resolving power of human eye is 1 minute of an arc. The maximum distance from which he can identify the two poles distinctly is

- (a) 10.8 km
- (b) 5.4 km
- (c) 188 m
- (d) 376 m

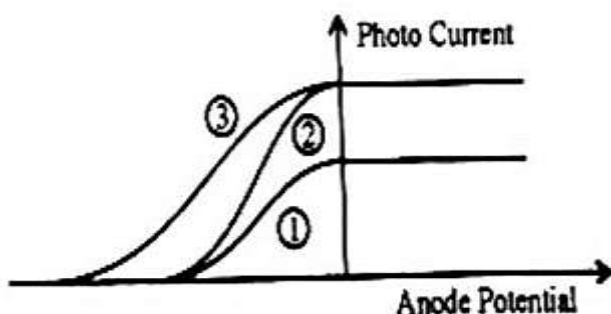
42. In young's Double Slit Experiment, the distance between the slits and the screen is 1.2 m and the distance between the two slits is 2.4 mm. If a thin transparent mica sheet of thickness $1 \mu\text{m}$ and R.I. 1.5 is introduced between one of the interfering beams, the shift in the position of central bright fringe is

- (a) 2 mm
- (b) 0.5 mm
- (c) 0.125 mm
- (d) 0.25 mm

43. The de-Broglie wavelength associated with electron of hydrogen atom in this ground state is

- (a) $0.3 \text{ \AA}$
- (b) $3.3 \text{ \AA}$
- (c) $6.26 \text{ \AA}$
- (d) $10 \text{ \AA}$

44. The following graph represents the variation of photo current with anode potential for a metal surface. Here I_1 , I_2 and I_3 represents intensities and γ_1 , γ_2 , γ_3 represent frequency for curves 1, 2 and 3 respectively, then



- (a) $\gamma_1 = \gamma_2$ and $I_1 \neq I_2$ (b) $\gamma_1 = \gamma_3$ and $I_1 \neq I_3$
 (c) $\gamma_1 = \gamma_2$ and $I_1 = I_2$ (d) $\gamma_2 = \gamma_3$ and $I_1 = I_3$

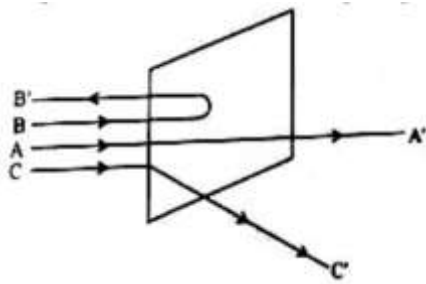
45. The period of revolution of an electron revolving in n^{th} orbit of H -atom is proportional to

- (a) n^2 (b) $\frac{1}{n}$
 (c) n^3 (d) Independent of n

46. Angular momentum of an electron in hydrogen atom is $\frac{3h}{2\pi}$ (h is the Planck's constant). The K.E. of the electron is

- (a) 4.35 eV (b) 1.51 eV
 (c) 3.4 eV (d) 6.8 eV

47. A beam of fast- moving alpha particles were directed towards a thin film of gold. The parts A, B and C of the transmitted and reflected beams corresponding to the incident parts A, B and C of the beam are shown in the adjoining diagram. The number of alpha particles in



- (a) B' will be minimum and in C' maximum
 (b) A' will be maximum and in C' minimum
 (c) A' will be minimum and in B' maximum
 (d) C' will be minimum and in B' maximum

48. Two protons are kept at a separation of 10 nm. Let F_n and F_e the nuclear force and the electromagnetic force between them

- (a) $F_e = F_n$
 (b) $F_e \gg F_n$
 (c) $F_e \ll F_n$
 (d) F_e and F_n differ only slightly

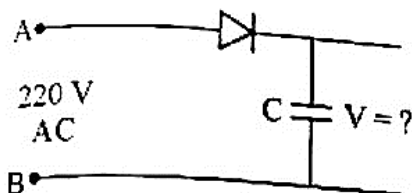
49. During a β^- decay

- (a) An atomic electron is ejected
 (b) An electron which is already present within the nucleus is ejected
 (c) A neutron in the nucleus decays emitting an electron
 (d) A proton in the nucleus decays emitting an electron

50. A radio-active- elements has half-life of 15 years. What is the fraction that will decay in 30 years?

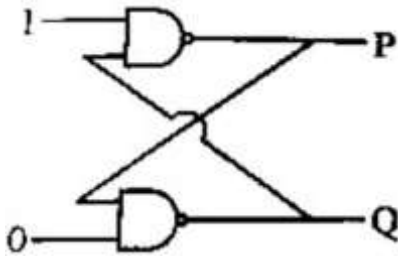
- (a) 0.25 (b) 0.5
 (c) 0.75 (d) 0.85

51. A 220 V A.C supply is connected between points A and B as shown in figure what will be the potential difference V across the capacitor?



- (a) 220 V (b) 110 V
(c) 0 (d) $220\sqrt{2}$ V

52. In the following circuit what are P and Q:

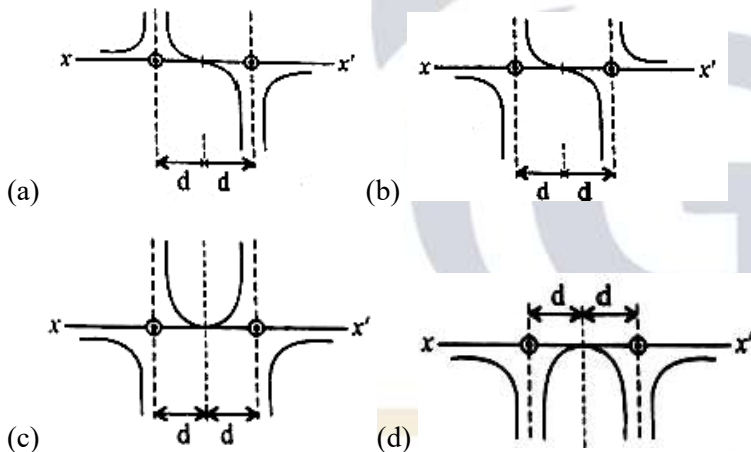


- (a) $P = 1, Q = 0$ (b) $P = 0, Q = 1$
(c) $P = 0, Q = 0$ (d) $P = 1, Q = 1$

53. A positive hole in a semiconductor is

- (a) An anti-particle of electron
(b) A vacancy created when an electron leaves a covalent bond
(c) Absence of free electrons
(d) An artificially created particle

54. Two long straight parallel wires are a distance $2d$ apart. They carry steady equal currents flowing out of the plane of the paper. The variation of magnetic field B along the line xx' is given by



55. A cylindrical wire has a mass (0.3 ± 0.003) g, radius (0.5 ± 0.005) mm and length (6 ± 0.06) cm. The maximum percentage error in the measurement of its density is

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

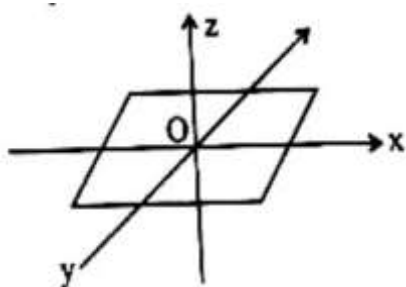
56. At a metro station, a girl walks up a stationary escalator in 20 sec. If she remains stationary on the escalator, then the escalator take her up in 30 sec. The time taken by her to walk up on the moving escalator will be

- (a) 25 sec (b) 60 sec
(c) 12 sec (d) 10 sec

57. Rain is falling vertically with a speed of 12 ms^{-1} . A woman rides a bicycles with a speed of 12 ms^{-1} in east to west direction. What is the direction in which she should hold her umbrella?

- (a) 30° towards East (b) 45° towards East
(c) 30° towards West (d) 45° towards West

58. One end of a string of length 'l' is connected to a particle of mass 'm' and the other to a small peg on a smooth horizontal table. If the particle moves in a circle with speed 'v', the net force on the particle (directed towards the centre) is : (T is the tension in the string)
- (a) T (b) $T - \frac{mv^2}{l}$
(c) $T + \frac{mv^2}{l}$ (d) 0
59. A body is initially at rest. It undergoes one dimensional motion with constant acceleration. The power delivered to it at time 't' is proportional to
- (a) $t^{1/2}$ (b) t
(c) $t^{3/2}$ (d) t^2
60. A thin uniform rectangular plate of mass 2 kg is placed in X – Y plane as shown in figure. The moment of inertial about x-axis is $I_x = 0.2 \text{ kg m}^2$ and the moment of inertia about y-axis is $I_y = 0.3 \text{ kg m}^2$. The radius of gyration of the plate about the axis passing through O and perpendicular to the plane of the plate is



- (a) 50 cm (b) 5 cm
(c) 38.7 cm (d) 31.6 cm

Chemistry

61. Copper is extracted from copper pyrites by
- (a) Thermal decomposition (b) Reduction by coke
(c) Electrometallurgy (d) Auto reduction
62. Function of potassium ethyl xanthate in froth floatation process is to make the ore
- (a) Lighter (b) Hydrophobic
(c) Hydrophilic (d) Heavier
63. Sulphide ore on roasting gives a gas X. X reacts with Cl_2 in the presence of activated charcoal to give Y. Y is:
- (a) SO_2Cl_2 (b) S_2Cl_2
(c) SCl_6 (d) SOCl_2
64. Aqueous solution of a salt ((A) forms a dense white precipitate with BaCl_2 solution. The precipitate dissolves in dilute HCl to produce a gas ((B) which decolourises acidified KMnO_4 solution
- A and B respectively are:
- (a) $\text{BaSO}_3, \text{SO}_2$ (b) $\text{BaSO}_4, \text{H}_2\text{S}$
(c) $\text{BaSO}_3, \text{H}_2\text{S}$ (d) $\text{BaSO}_4, \text{SO}_2$
65. Bond angle in PH_4^+ is more than that of PH_3 . This is because
- (a) Lone pair - bond pair repulsion exists in PH_3
(b) PH_4^+ has square planar structure
(c) PH_3 has planar trigonal structure
(d) Hybridization of P changes when PH_3 is converted to PH_4^+

66. Incorrectly matched pair is:

- (a) XeO_3 - pyramidal
- (b) XeF_4 - tetrahedral
- (c) XeF_6 - distorted octahedral
- (d) XeOF_4 - square pyramidal

67. Phosphorus pentachloride

- (a) On hydrolysis gives an oxo acid of phosphorus which is tribasic
- (b) On hydrolysis gives an oxo acid of phosphorus which is a good reducing agent
- (c) Has all the five equivalent bonds
- (d) Exists as an ionic solid in which cation has octahedral structure and anion has tetrahedral structure

68. Identify the set of paramagnetic ions among the following:

- (a) V^{2+} , Co^{2+} , Ti^{4+} (b) Ni^{2+} , Cu^{2+} , Zn^{2+}
- (c) Ti^{3+} , Cu^{2+} , Mn^{3+} (d) Sc^{3+} , Ti^{3+} , V^{3+}

69. How many moles of acidified $\text{K}_2\text{Cr}_2\text{O}_7$ is required to liberate 6 moles of I_2 from an aqueous solution of I^- ?

- (a) 2 (b) 1
- (c) 0.25 (d) 0.5

70. Cu_2Cl_2 and CuCl_2 in aqueous medium

- (a) CuCl_2 is more stable than Cu_2Cl_2
- (b) Stability of Cu_2Cl_2 is equal to stability of CuCl_2
- (c) Both are unstable
- (d) Cu_2Cl_2 is more stable than CuCl_2

71. The Co-ordination number of Fe and Co in the complex ions, $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$ and $[\text{Co}(\text{SCN})_4]^{2-}$ are respectively:

- (a) 3 and 4 (b) 6 and 8
- (c) 4 and 6 (d) 6 and 4

72. Number of stereoisomers exhibited by $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ is

- (a) 4 (b) 2
- (c) 5 (d) 3

73. Give the IUPAC name of $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_4]$ is

- (a) Tetra ammine platinum (o) tetra chlorido platinum (IV)
- (b) Tetra ammine palatinate (II) tetra chlorido platinum (II)
- (c) Tetra ammine palatinate (o) tetra chlorido platinum (IV)
- (d) Tetra ammine platinum (II) tetra chlorido palatinate (II)

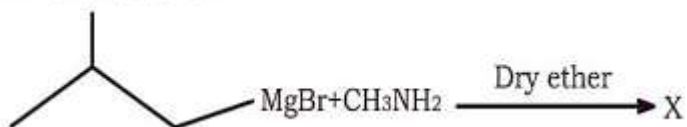
74. Prolonged exposure of chloroform in humans may cause damage to liver. It is due to the formation of the following compound

- (a) CCl_4 (b) COCl_2
- (c) CH_2Cl_2 (d) Cl_2

75. Which of the following halide shows highest reactivity towards $\text{S}_\text{N}1$ reaction?

- (a) $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$
- (b) $\text{CH}_3 - \text{CH}_2\text{Cl}$
- (c) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2\text{I}$
- (d) $\text{C}_6\text{H}_5\text{Cl}$

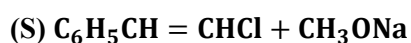
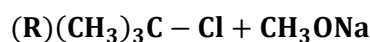
76. In the reaction



The number of possible isomers for the organic compound X is

- (a) 4 (b) 5
(c) 3 (d) 2

77. Which of the following on heating gives an ether as major products?



- (a) Both R and S (b) Both P and R
(c) Both Q and S (d) Both P and Q

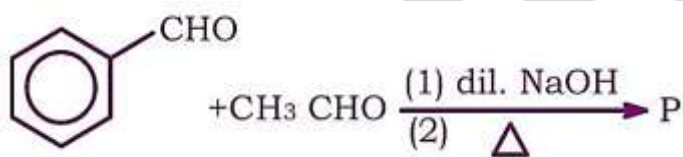
78. The steps involved in the conversion of propan -2-ol to propan -1-ol are in the order

- (a) Dehydration, addition of HBr, heating with aq. KOH
(b) Heating with PCl_5 , heating with alc. KOH, acid catalysed addition of water
(c) Heating with PCl_5 , heating with alc. KOH, hydroboration oxidation
(d) Dehydration, addition of HBr in presence of peroxide, heating with alc. KOH

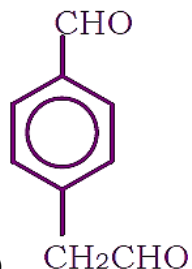
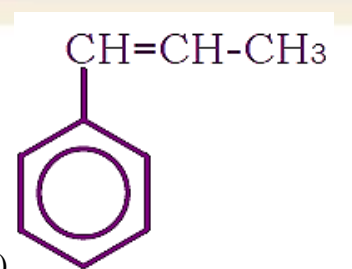
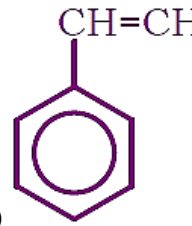
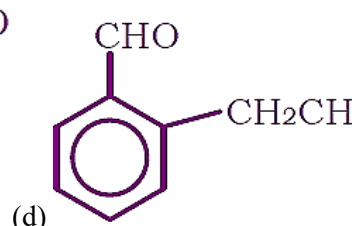
79. Which of the following is the strongest base?

- (a) CH_3COO^- (b) Cl^-
(c) OH^- (d) CH_3O^-

80.



The product 'P' is

- (a)  (b) 
(c)  (d) 

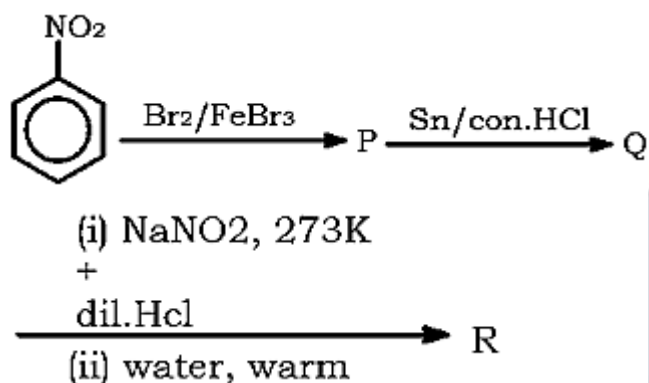
81. Which of the following has the lowest boiling point?

- (a) $\text{CH}_3\text{CH}_2\text{OH}$ (b) $\text{CH}_3 - \text{CH}_2 - \text{NH}_2$
(c) $\text{CH}_3 - \text{O} - \text{CH}_3$ (d) HCOOH

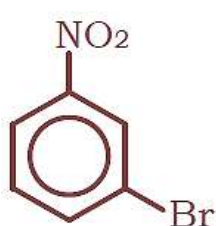
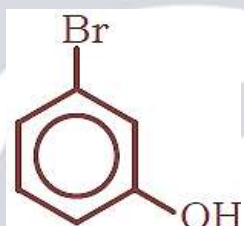
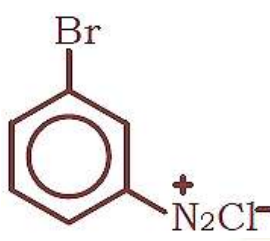
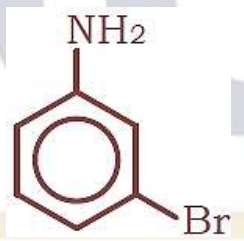
82. The carbonyl compound that does not undergo aldol condensation is

- (a) Acetone
(b) Di chloro acetaldehyde
(c) Tri chloro acetaldehyde
(d) Acetaldehyde

83.



The final product is

- (a)  (b) 
(c)  (d) 

84. Hinsberg's reagent is

- (a) $(\text{CH}_3\text{CO})_2\text{O}$ / pyridine
(b) $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$
(c) $\text{C}_6\text{H}_5\text{SO}_2\text{NH}_2$
(d) CH_3COCl / pyridine

85. Which one of the following vitamins is not stored in adipose tissue?

- (a) A (b) B_6
(c) D (d) E

86. Hypothyroidism is caused by the deficiency of

- (a) Vitamin B-12 (b) Adrenalin
(c) Thyroxine (d) Glucocorticoid

87. $C_1 - C_4$ glycosidic bond is NOT found in
 (a) Maltose (b) Sucrose
 (c) Lactose (d) Starch
88. Which of the following polymer has strongest intermolecular forces of attraction?
 (a) Neoprene (b) Terylene
 (c) Polythene (d) Polystyrene
89. Which of the following monomers can undergo condensation polymerization?
 (a) Styrene (b) Glycine
 (c) Isoprene (d) Propene
90. A food additive that acts as an antioxidant is
 (a) BHA (b) Saccharin
 (c) Sugar syrup (d) Salt
91. Which of the following is not related to drug-enzyme interaction?
 (a) Allosteric site (b) Antagonist
 (c) Co-enzymes (d) Enzyme inhibitor
92. 0.4 g of dihydrogen is made to react with 7.1 g of dichlorine to form hydrogen chloride. The volume of hydrogen formed at 273 K and 1 bar pressure is
 (a) 9.08 L (b) 4.54 L
 (c) 90.8 L (d) 45.4 L
93. With regard to photoelectric effect, identify the correct statement among the following
 (a) Energy of e^- ejected increases with the increase in the intensity of incident light
 (b) Number of e^- ejected increases with the increase in the frequency of incident light
 (c) Number of e^- ejected increases with the increase in work function
 (d) Number of e^- ejected increases with the increase in the intensity of incident light
94. The last element of the p-block in 6th period is represented by the outer most electronic configuration
 (a) $7s^2 7p^6$
 (b) $5f^{14} 6d^{10} 7s^2 7p^5$
 (c) $4f^{14} 5d^{10} 6s^2 6p^4$
 (d) $4f^{14} 5d^{10} 6s^2 6p^6$
95. The conjugate base of NH_3 is
 (a) NH_4^+ (b) NH_4OH
 (c) NH_2OH (d) NH_2^-
96. A gas mixture contains 25% He and 75% CH_4 by volume at a given temperature and pressure. The percentage by mass of methane in the mixture is approximately ____
 (a) 75% (b) 25%
 (c) 92% (d) 8%
97. The percentage of s-character in the hybrid orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ respectively are
 (a) 33.3%, 50%, 25% (b) 33.3%, 25%, 50%
 (c) 50%, 33.3%, 25% (d) 25%, 50%, 33.3%
98. The formal charge on central oxygen atom in ozone is
 (a) -1 (b) 0
 (c) +2 (d) +1
99. When the same quantity of heat is absorbed by a system at two different temperatures T_1 and T_2 , such that $T_1 > T_2$, change in entropies are ΔS_1 and ΔS_2 respectively. Then
 (a) $\Delta S_1 < \Delta S_2$ (b) $\Delta S_1 = \Delta S_2$
 (c) $S_2 > S_1$ (d) $\Delta S_2 < \Delta S_1$
100. The oxidation number of nitrogen atoms in NH_4NO_3 are
 (a) +5, +5 (b) -3, +5
 (c) +3, -5 (d) -3, -3
101. A Lewis acid 'X' reacts with $LiAlH_4$ in ether medium to give a highly toxic gas. This gas when heated with NH_3 gives a compound commonly known as inorganic benzene. The gas is

- (a) B_2O_3 (b) B_2H_6
(c) $B_3N_3H_6$ (d) BF_3

102. The oxide of potassium that does not exist is

- (a) K_2O (b) KO_2
(c) K_2O_2 (d) K_2O_3

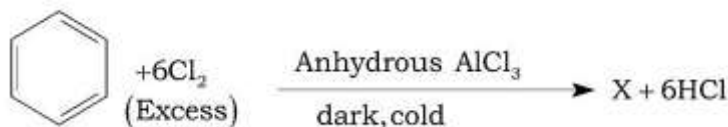
103. The metal that products H_2 with both dil HCl and $NaOH(aq)$ is

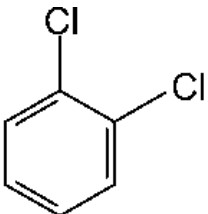
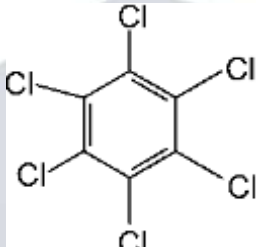
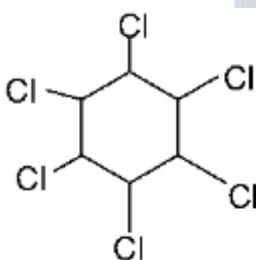
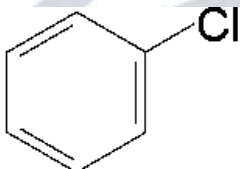
- (a) Zn (b) Mg
(c) Ca (d) Fe

104. Which of the following is NOT a pair of functional isomers?

- (a) $C_2H_5OC_2H_5$ and $C_3H_7OCH_3$
(b) CH_3CH_2OH and CH_3OCH_3
(c) $CH_3CH_2NO_2$ and H_2NCH_2COOH
(d) CH_3COOH and $HCOOCH_3$

105. Identify 'X' in the following reaction



- (a)  (b) 
(c)  (d) 

106. Which of the following is NOT a green- house gas?

- (a) CFC (b) CO_2
(c) O_2 (d) NO_2

107. A metal exists as an oxide with formula $M_{0.96}O$. Metal M can exist as M^{+2} and M^{+3} in its oxide $M_{0.96}O$.

The percentage of M^{+3} in the oxide is nearly

- (a) 8.3% (b) 4.6%
(c) 5% (d) 9.6%

108. A metal crystallises in face centred cubic structure with metallic radius $\sqrt{2} A^\circ$. The volume of the unit cell (in m^3) is

- (a) 4×10^{-10} (b) 6.4×10^{-29}
(c) 4×10^{-9} (d) 6.4×10^{-30}

109. Silicon doped with gallium forms

- (a) n-type semiconductor
(b) both n and p type semiconductor
(c) an intrinsic semiconductor
(d) p-type semiconductor

110. The pair of electrolytes that posses same value for the constant ((A) in the Debye - Huckel Onsagar equation, $\lambda_m = \lambda_m^e - A\sqrt{C}$ is
 (a) $\text{MgSO}_4, \text{NaSO}_4$ (b) $\text{NH}_4\text{Cl}, \text{NaBr}$
 (c) $\text{NaBr}, \text{MgSO}_4$ (d) $\text{NaCl}, \text{CaCl}_2$
111. Which of the following pair of solutions is isotonic?
 (a) 0.01M BaCl_2 and 0.015 M NaCl
 (b) $0.001\text{M Al}_2(\text{SO}_4)_3$ and 0.01M BaCl_2
 (c) 0.001M CaCl_2 and $0.001\text{M Al}_2(\text{SO}_4)_3$
 (d) 0.01M BaCl_2 and 0.001M CaCl_2
112. Solute 'X' dimerises in water to the extent of 80%. 2.5 g of 'X' in 100 g of water increases the boiling point by 0.3°C . The molar mass of 'X' is $[K_b = 0.52\text{ K kg mol}^{-1}]$
 (a) 13 (b) 52
 (c) 65 (d) 26
113. Given $E_{\text{Fe}^{3+}/\text{Fe}^{+2}}^0 = +0.76\text{ V}$ and $E_{\text{I}_2/\text{T}}^0 = +0.55\text{ V}$. The equilibrium constant for the reaction taking place in galvanic cell consisting of above two electrodes is $\left[\frac{2.303RT}{F} = 0.06\right]$
 (a) 1×10^7 (b) 1×10^9
 (c) 3×10^8 (d) 5×10^{12}
114. If an aqueous solution of NaF is electrolyzed between inert electrodes, the product obtained at anode is
 (a) F_2 (b) H_2
 (c) Na (d) O_2
115. In which of the following cases a chemical reaction is possible?
 (a) $\text{ZnSO}_4(\text{aq})$ is placed in a copper vessel
 (b) AgNO_3 solution is stirred with a copper spoon
 (c) Conc. HNO_3 is stored in a platinum vessel
 (d) gold ornaments are washed with dil HCl
116. The time required for 60% completion of a first order reaction is 50 min. The time required for 93.6% completion of the same reaction will be
 (a) 100 min (b) 83.8 min
 (c) 50 min (d) 150 min
117. For an elementary reaction $2\text{A} + 3\text{B} \rightarrow 4\text{C} + \text{D}$ the rate of appearance of C at time 't' is $2.8 \times 10^{-3}\text{ mol L}^{-1}\text{ S}^{-1}$. Rate of disappearance of B at 't' will be
 (a) $\frac{4}{3}(2.8 \times 10^{-3})\text{molL}^{-1}\text{ S}^{-1}$
 (b) $\frac{3}{4}(2.8 \times 10^{-3})\text{molL}^{-1}\text{ S}^{-1}$
 (c) $2(2.8 \times 10^{-3})\text{molL}^{-1}\text{ S}^{-1}$
 (d) $\frac{1}{4}(2.8 \times 10^{-3})\text{molL}^{-1}\text{ S}^{-1}$
118. The rate constant of a reaction is given by $k = PZe^{-E_a/RT}$ under standard notation. In order to speed up the reaction, which of the following factors has to be decreased?
 (a) Z (b) Both Z and T
 (c) E_a (d) T
119. A sol of AgI is prepared by mixing equal volumes of 0.1M AgNO_3 and 0.2 M KI , which of the following statement is correct?
 (a) Sol obtained is a negative sol with NO_3^- adsorbed on AgI
 (b) Sol obtained is a positive sol with Ag^+ adsorbed on AgI
 (c) Sol obtained is a positive sol with K^+ adsorbed on AgI
 (d) Sol obtained is a negative sol with I^- adsorbed on AgI

120. During Adsorption of a gas on a solid

- (a) $\Delta G < 0, \Delta H < 0, \Delta S < 0$
- (b) $\Delta G > 0, \Delta H > 0, \Delta S > 0$
- (c) $\Delta G < 0, \Delta H < 0, \Delta S > 0$
- (d) $\Delta G < 0, \Delta H > 0, \Delta S > 0$

Mathematics

121. If $2^x + 2^y = 2^{x+y}$, then $\frac{dy}{dx}$ is

- (a) 2^{y-x}
- (b) -2^{y-x}
- (c) 2^{x-y}
- (d) $\frac{2^y-1}{2^x-1}$

122. If $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then $f'(\sqrt{3})$ is

- (a) $-\frac{1}{2}$
- (b) $\frac{1}{2}$
- (c) $\frac{1}{\sqrt{3}}$
- (d) $-\frac{1}{\sqrt{3}}$

123. The right hand and left- hand limit of the function

$$f(x) = \begin{cases} \frac{e^{1/x} - 1}{e^{1/x} + 1}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$$

are respectively

- (a) 1 and 1
- (b) 1 and -1
- (c) -1 and -1
- (d) -1 and 1

124. If $y = 2x^{n+1} + \frac{3}{x^n}$, then $x^2 \frac{d^2y}{dx^2}$ is

- (a) $6n(n+1)y$
- (b) $n(n+1)y$
- (c) $x \frac{dy}{dx} + y$
- (d) y

125. If the curves $2x = y^2$ and $2xy = K$ intersect perpendicularly, then the value of K^2 is

- (a) 4
- (b) $2\sqrt{2}$
- (c) 2
- (d) 8

126. if $(xe)^{y=e}e^y$, then $\frac{dy}{dx}$ is

- (a) $\frac{\log x}{(1+\log x)^2}$
- (b) $\frac{1}{(1+\log x)^2}$
- (c) $\frac{\log x}{(1+\log x)}$
- (d) $\frac{e^x}{x(y-1)}$

127. If the side of a cube is increased by 5%, then the surface area of a cube is increased by

- (a) 10%
- (b) 60%
- (c) 6%
- (d) 20%

128. The value of $\int \frac{1+x^4}{1+x^6} dx$ is

- (a) $\tan^{-1} x + \tan^{-1} x^3 + C$
- (b) $\tan^{-1} x + \frac{1}{3} \tan^{-1} x^3 + C$
- (c) $\tan^{-1} x - \frac{1}{3} \tan^{-1} x^3 + C$
- (d) $\tan^{-1} x + \frac{1}{3} \tan^{-1} x^2 + C$

129. The maximum value of $\frac{\log_e x}{x}$, if $x > 0$ is

- (a) e
- (b) 1
- (c) $\frac{1}{e}$
- (d) $-\frac{1}{e}$

130. The value of $\int e^{\sin x} \sin 2x dx$ is

- (a) $2e^{\sin x}(\sin x - 1) + C$
- (b) $2e^{\sin x}(\sin x + 1) + C$

(c) $2e^{\sin x}(\cos x + 1) + C$

(d) $2e^{\sin x}(\cos x - 1) + C$

131. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^{-1} x dx$ is

(a) π (b) $\frac{\pi}{2}$

(c) 1 (d) $\frac{\pi^2}{2}$

132. If $\int \frac{3x+1}{(x-1)(x-2)(x-3)} dx$

= $A \log |x-1| + B \log |x-2| + C \log |x-3| + C$, then the values of A, B and C are respectively.

(a) 5, -7, -5 (b) 2, -7, -5

(c) 5, -7, 5 (d) 2, -7, 5

133. The value of $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ is

(a) $\frac{\pi}{2} \log 2$ (b) $\frac{\pi}{4} \log 2$

(c) $\frac{1}{2}$ (d) $\frac{\pi}{8} \log 2$

134. The area of the region bounded by the curve $y^2 = 8x$ and the line $y = 2x$ is

(a) $\frac{16}{3}$ sq.units (b) $\frac{4}{3}$ sq.units

(c) $\frac{3}{4}$ sq.units (d) $\frac{8}{3}$ sq.units

135. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1+e^x} dx$ is

(a) 2 (b) 0

(c) 1 (d) -2

136. The order of the differential equation obtained by eliminating arbitrary constants in the family of curves $c_1 y = (c_2 + c_3) e^{x+c_4}$ is

(a) 1 (b) 2

(c) 3 (d) 4

137. The general solution of the differential equation $x^2 dy - 2xy dx = x^4 \cos x dx$ is

(a) $y = x^2 \sin x + cx^2$ (b) $y = x^2 \sin x + c$

(c) $y = \sin x + cx^2$ (d) $y = \cos x + cx^2$

138. The area of the region bounded by the line $y = 2x + 1$, x-axis and the ordinates $x = -1$ and $x = 1$ is

(a) $\frac{9}{4}$ (b) 2

(c) $\frac{5}{2}$ (d) 5

139. The two vectors $\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} + 3\hat{j} + 5\hat{k}$ represent the two sides $\overrightarrow{AB}$ and $\overrightarrow{AC}$ respectively of a $\triangle ABC$. The length of the median through A is

(a) $\frac{\sqrt{14}}{2}$ (b) 14

(c) 7 (d) $\sqrt{14}$

140. If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between $\vec{a}$ and $\vec{b}$, then $\sin \frac{\theta}{2}$ is

(a) $|\vec{a} + \vec{b}|$ (b) $\frac{|\vec{a} + \vec{b}|}{2}$

(c) $\frac{|\vec{a} - \vec{b}|}{2}$ (d) $|\vec{a} - \vec{b}|$

141. The curve passing through the point (1, 2) given that the slope of the tangent at any point (x, y) is $\frac{3x}{y}$ represents

(a) Circle (b) Parabola

(c) Ellipse (d) Hyperbola

142. If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 144$ and $|\vec{a}| = 4$ then $|\vec{b}|$ is equal to

(a) 6 (b) 3

(c) 2 (d) 4

143. The point $(1, -3, 4)$ lies in the octant

- (a) Second (b) Third
(c) Fourth (d) Eighth

144. If the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$, $2\hat{i} + \hat{j} - \hat{k}$ and $\lambda\hat{i} - \hat{j} + 2\hat{k}$ are coplanar, then the value of λ is

- (a) 6 (b) -5
(c) -6 (d) 5

145. The distance of the point $(1, 2, -4)$ from the line $\frac{x-3}{2} = \frac{y-3}{3} = \frac{z+5}{6}$ is

- (a) $\frac{293}{7}$ (b) $\frac{\sqrt{293}}{7}$
(c) $\frac{293}{49}$ (d) $\frac{\sqrt{293}}{49}$

146. The sine of the angle between the straight line $\frac{x-2}{3} = \frac{3-y}{-4} = \frac{z-4}{5}$ and the plane $2x - 2y + z = 5$ is

- (a) $\frac{3}{\sqrt{50}}$ (b) $\frac{3}{50}$
(c) $\frac{4}{5\sqrt{2}}$ (d) $\frac{\sqrt{2}}{10}$

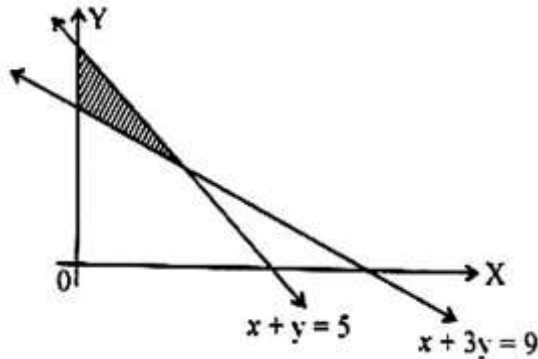
147. If a line makes an angle of $\frac{\pi}{3}$ with each of x and y-axis, then the acute angle made by z-axis is

- (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$
(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

148. Corner points of the feasible region determined by the system of linear constraints are $(0, 3)$, $(1, 1)$ and $(3, 0)$. Let $z = px + qy$, where $p, q > 0$. Condition on p and q so that the minimum of z occurs at $(3, 0)$ and $(1, 1)$ is

- (a) $p = 2q$ (b) $p = \frac{q}{2}$
(c) $p = 3q$ (d) $p = q$

149. The feasible region of an LPP is shown in the figure. If $Z = 11x + 7y$, then the maximum value of Z occurs at



- (a) $(0, 5)$ (b) $(3, 3)$
(c) $(5, 0)$ (d) $(3, 2)$

150. A die is thrown 10 times, the probability that an odd number will come up atleast one time is

- (a) $\frac{1}{1024}$ (b) $\frac{1023}{1024}$
(c) $\frac{11}{1024}$ (d) $\frac{1013}{1024}$

151. If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{6}$, then $P(A'/B)$ is

- (a) $\frac{2}{3}$ (b) $\frac{1}{3}$
(c) $\frac{1}{2}$ (d) $\frac{1}{12}$

152. Events E_1 and E_2 from a partition of the sample space S. A is any event such that

$$P(E_1) = P(E_2) = \frac{1}{2}, P(E_2/A) = \frac{1}{2} \text{ and}$$

$P(A/E_2) = \frac{2}{3}$, then $P(E_1/A)$ is

- (a) $\frac{1}{2}$ (b) $\frac{2}{3}$
(c) 1 (d) $\frac{1}{4}$

153. The probability of solving a problem by three persons A, B and C independently is $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{3}$ respectively. Then the probability of the problem is solved by any two of them is

- (a) $\frac{1}{12}$ (b) $\frac{1}{4}$
(c) $\frac{1}{24}$ (d) $\frac{1}{8}$

154. If $n(A) = 2$ and total number of possible relations from Set A to set B is 1024, then $n(B)$ is

- (a) 512 (b) 20
(c) 10 (d) 5

155. The value of $\sin^2 51^\circ + \sin^2 39^\circ$ is

- (a) 1 (b) 0
(c) $\sin 12^\circ$ (d) $\cos 12^\circ$

156. If $\tan A + \cot A = 2$, then the value of $\tan^4 A + \cot^4 A =$

- (a) 2 (b) 1
(c) 4 (d) 5

157. If $A = \{1, 2, 3, 4, 5, 6\}$, then the number of subsets of A which contain atleast two elements is

- (a) 64 (b) 63
(c) 57 (d) 58

158. If $z = x + iy$, then the equation $|z + 1| = |z - 1|$ represents

- (a) a circle (b) a parabola
(c) x-axis (d) y-axis

159. The value of ${}^{16}C_9 + {}^{16}C_{10} - {}^{16}C_6 - {}^{16}C_7$ is

- (a) 0 (b) 1
(c) ${}^{17}C_{10}$ (d) ${}^{17}C_3$

160. The number of terms in the expansion of $(x + y + z)^{10}$ is

- (a) 66 (b) 142
(c) 11 (d) 110

161. If $P(n): 2^n < n!$

Then the smallest positive integer for which $P(n)$ is true if

- (a) 2 (b) 3
(c) 4 (d) 5

162. The two lines $lx + my = n$ and $l'x + m'y = n'$ are perpendicular if

- (a) $ll' + mm' = 0$ (b) $lm' = ml'$
(c) $lm + l'm' = 0$ (d) $lm' + ml' = 0$

163. If the parabola $x^2 = 4ay$ passes through the point (2, 1), then the length of the latus rectum is

- (a) 1 (b) 4
(c) 2 (d) 8

164. If the sum of n terms of an A.P is given by $S_n = n^2 + n$, then the common difference of the A.P is

- (a) 4 (b) 1
(c) 2 (d) 6

165. The negation of the statement "For all real numbers x and y , $x + y = y + x$ " is

- (a) For all real numbers x and y , $x + y \neq y + x$
(b) For some real numbers x and y , $x + y = y + x$
(c) For some real number x and y , $x + y \neq y + x$
(d) for some real numbers x and y , $x - y = y - x$

166. The standard deviation of the data 6, 7, 8, 9, 10 is

- (a) $\sqrt{2}$ (b) $\sqrt{10}$
(c) 2 (d) 10

167. $\lim_{x \rightarrow 0} \left(\frac{\tan x}{\sqrt{2x+4}-2} \right)$ is equal to

- (a) 2 (b) 3
(c) 4 (d) 6

168. If a relation R on the set $\{1, 2, 3\}$ be defined by $R = \{(1, 1)\}$, then R is

- (a) Reflexive and symmetric
(b) Reflexive and transitive
(c) symmetric and transitive
(d) Only symmetric

169. Let $f: [2, \infty) \rightarrow \mathbb{R}$ be the function defined $f(x) = x^2 - 4x + 5$, then the range of f is

- (a) $(-\infty, \infty)$ (b) $[1, \infty)$
(c) $(1, \infty)$ (d) $[5, \infty)$

170. If A, B, C are three mutually exclusive and exhaustive events of an experiment such that $P(A) = 2P(B) = 3P(C)$, then $P(B)$ is equal to

- (a) $\frac{1}{11}$ (b) $\frac{2}{11}$
(c) $\frac{3}{11}$ (d) $\frac{4}{11}$

171. The domain of the function defined by $f(x) = \cos^{-1} \sqrt{x-1}$ is

- (a) $[1, 2]$ (b) $[0, 2]$
(c) $[-1, 1]$ (d) $[0, 1]$

172. The value of $\cos \left(\sin^{-1} \frac{\pi}{3} + \cos^{-1} \frac{\pi}{3} \right)$ is

- (a) 0 (b) 1
(c) -0 (d) Does not exist

173. If $A = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$, then A^4 is equal to

- (a) A (b) 2 A
(c) I (d) 4 A

174. If $A = \{a, b, c\}$, then the number of binary operations on A is

- (a) 3 (b) 3^6
(c) 3^3 (d) 3^9

175. If $\begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix} A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then the matrix a is

- (a) $\begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & -1 \\ -3 & 2 \end{pmatrix}$
(c) $\begin{pmatrix} -2 & 1 \\ 3 & -2 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & -1 \\ 3 & 2 \end{pmatrix}$

176. If $f(x) = \begin{vmatrix} x^3 - x & a + x & b + x \\ x - a & x^2 - x & c + x \\ x - b & x - c & 0 \end{vmatrix}$ then

- (a) $f(1) = 0$ (b) $f(2) = 0$
(c) $f(0) = 0$ (d) $f(-1) = 0$

177. If A and B are square matrices of same order and B is a skew symmetric matrix, then $A'BA$ is

- (a) Symmetric matrix (b) Null matrix
(c) Diagonal matrix (d) Skew symmetric matrix

178. If A is a square matrix of order 3 and $|A| = 5$, then $|A \text{ adj. } A|$ is

- (a) 5 (b) 125
(c) 25 (d) 625

179. If $f(x) = \begin{cases} \frac{1 - \cos Kx}{x \sin x}, & \text{If } x \neq 0 \\ \frac{1}{2}, & \text{If } x = 0 \end{cases}$ is continuous at $x = 0$, then the value of K is

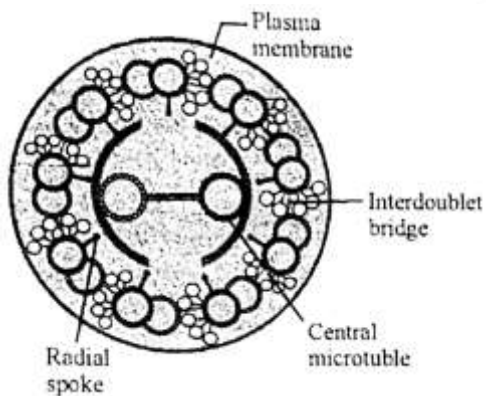
- (a) $\pm \frac{1}{2}$ (b) 0
(c) ± 2 (d) ± 1

180. If $a_1, a_2, a_3, \dots, a_9$ are in A.P. then the value of $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is

- (a) $\frac{9}{2}(a_1 + a_9)$ (b) $a_1 + a_9$
(c) $\log_e(\log_e e)$ (d) 1

Biology

181. In the below diagram, identify the part which connects the peripheral microtubules to the central sheath.



- (a) Plasma membrane (b) Interdoublet bridge
(c) Central microtubule (d) Radial spoke

182. The element whose percentage weight is highest in both earth's crust and human body is

- (a) Hydrogen (b) Carbon
(c) Oxygen (d) Calcium

183. Identify the event in meiosis mediated by the enzyme recombinase.

- (a) Synaptic pairing (b) Terminalization
(c) Crossing Over (d) Interkinesis

184. The deficiency of which of these elements interrupts photolysis of water during photosynthesis?

- (a) Mn and Cl (b) Zn and Cu
(c) Ca and K (d) N and P

185. In C_4 plants, C_3 cycle takes place in

- (a) Mesophyll cells (b) Bulliform cells
(c) Companion cells (d) Bundle sheath cells

186. During Citric Acid cycle, the various organic acid undergo decarboxylation. Which of the following organic acids of the above cycle have 4C, 5C and 6 C respectively?

- (a) Oxaloacetic acid, Citric acid and Succinic acid
(b) Succinic acid, α -Ketoglutaric acid and citric acid.
(c) Pyruvic acid, Malic acid and α -Ketoglutaric acid.
(d) Pyruvic acid, α -Ketogluetic acid and Cirtic acid

187. Consider the following statements regarding photosynthesis and respiration in plants and select the correct option

- (I) RuBisCO has high affinity to oxygen in low CO_2 concentration.
 (II) The Calvin pathway occurs in the chloroplast of bundle sheath cells of C_4 plants.
 (III) Yeast poison themselves when the concentration of alcohol reaches 7%.
 (IV) Oxygen is a final hydrogen acceptor during aerobic respiration.
- (a) Statements II & IV are correct, I is wrong.
 (b) Statements I & II are correct, IV is wrong.
 (c) Statements I & III are correct, II is wrong.
 (d) Statements I & IV are correct, III is wrong.

188. Match the digestive glands given in Column-I with their respective enzymes given in Column-II and choose the correct combination from the given options.

Column-I	Column-II
(1) Pancreas	(p) Pepsin
(2) Gastric glands	(q) Enterokinase
(3) Small intestine	(r) Ptyalin
(4) Salivary glands	(s) Trypsin

Choose the correct option :

- (a) (1) - (p), (2) - (q), (3) - (r), (4) - (s)
 (b) (1) - (s), (2) - (p), (3) - (q), (4) - (r)
 (c) (1) - (r), (2) - (q), (3) - (p), (4) - (s)
 (d) (1) - (q), (2) - (s), (3) - (r), (4) - (p)

189. Match the different types of Leucocytes (Column-I) with their percentage of occurrence (Column-II) in a healthy adult human and choose the correct answer.

Column-I	Column-II
(1) Neutrophils	(p) 6 – 8%
(2) Lymphocytes	(q) 60 – 65%
(3) Monocytes	(r) 0.5 – 1%
(4) Basophils	(s) 2 – 3%
(5) Eosinophils	(t) 20 – 25%

Choose the correct option :

- (a) (1) - (q), (2) - (r), (3) - (s), (4) - (t), (5) - (p)

- (b) (1) - (r), (2) - (s), (3) - (t), (4) - (q), (5) - (p)
 (c) (1) - (q), (2) - (t), (3) - (r), (4) - (s), (5) - (p)
 (d) (1) - (q), (2) - (t), (3) - (p), (4) - (r), (5) - (s)

190. In which part of the human brain corpora quadrigemina is located?

- (a) Forebrain (b) Hindbrain
 (c) Midbrain (d) Cerebral hemisphere

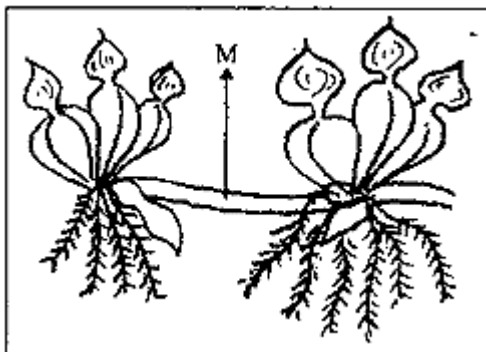
191. A girl after attaining sexual maturity shows development of growing ovarian follicles, development of mammary glands and high pitch of voice. These changes are attributed to _____ hormones.

- (a) Melatonin (b) Estrogens
 (c) Progesterone (d) Androgens

192. In apple, the chromosome number of gametes is 17. What is the chromosome number in its Primary Endosperm Nucleus (PEN)?

- (a) 34 (b) 68
 (c) 17 (d) 51

193. Identify the vegetative propagule ' M ' in the following diagram:



- (a) Bulbil (b) Offset
 (c) Rhizome (d) Runner

194. During an excavation of soil, Pollen fossils were retrieved from deepest layer of soil. The pollen grains remained as fossils because

- (a) The intine of pollen grains is made up of pectin.
 (b) Exine has spiny Ornamentation.
 (c) The exine of pollen grains is highly resistant to enzyme action.
 (d) Pollen grains are asexual reproductive structures.

195. Identify the mismatch.

- (a) Antipodals - Haploid
 (b) Zygote - Diploid
 (c) Synergids - Diploid
 (d) Primary Endosperm Nucleus Triploid

196. Identify the correct order of events in pollen-pistil interaction from the options given below:

- (I) Release of male gametes into the embryo sac.
 (II) Deposition of pollen grains on stigma.
 (III) Entry of pollen tube into embryo sac.
 (IV) Development of pollen tube
 (V) Entry of pollen tube into the Ovule.

- (a) IV → III → II → I → V
 (b) II → IV → V → III → I
 (c) II → IV → III → V → I
 (d) V → IV → III → II → I

197. Match the months listed in Column-I with the organogenesis of foetus in Column-II.

Column-I		Column-II
(i) First month	(a)	Separation of eye lids
(ii) Second month	(b)	Hairs on head
(iii) Fifth month	(c)	Heart
(iv) Six month	(d)	Limbs & digits

(i) (ii) (iii) (iv)

(a) (c) (d) (a) (b)

(b) (b) (c) (d) (a)

(c) (d) (b) (c) (a)

(d) (c) (d) (b) (a)

198. When the fallopian tube is blocked at ampullary region, the ovum fails to move from

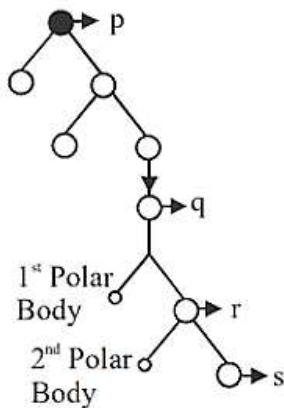
(a) Isthmus to infundibulum

(b) Ovary to ampulla

(c) Isthmus to Uterus

(d) Infundibulum to Isthmus

199. Identify the cells represented as p, q, r and s in the schematic representation of Oogenesis, shown below and choose the correct option.



(a) p - Ovum, q - Oogonia, r Primary oocyte, s - Secondary Oocyte

(b) p - Secondary Oocyte, q Primary Oocyte, r - Ovum, s Oogonia

(c) p - Ovum, q - Secondary Oocyte, r - Primary Oocyte, s - Ovum

(d) p - Oogonia, q - Primary Oocyte, r - Secondary Oocyte, s - Ovum

200. Which of the following contraceptives could be effective in avoiding pregnancy if used within 72 hours after casual unprotected intercourse?

(a) Androgen - FSH combination

(b) Testosterone - Relaxin combination

(c) Relaxin - Oxytocin combination

(d) Progestogen - Estrogen combination

201. Choose the correct statement regarding the GIFT (Gamete Intrafallopian Tube Transfer) procedure.
- (a) Ova collected from a female donor are transferred to the fallopian tube to facilitate zygote formation in the recipient.
 - (b) Zygote is collected from female donor and transferred to the fallopian tube of recipient.
 - (c) Zygote is collected from a female donor and transferred to the uterus of recipient.
 - (d) Ova are collected from a female donor and are transferred to the uterus of recipient.
202. Which of the following characters was not studied by Mendel in his Pea plant experiments?
- (a) Stem height
 - (b) Pod shape
 - (c) Seed shape
 - (d) Leaf shape
203. In an Organism, mutation in a single gene exhibits multiple phenotypic expressions. Identify the underlying genetic mechanism in the above instance.
- (a) Pleiotropy
 - (b) Incomplete dominance
 - (c) Polygenic inheritance
 - (d) Multiple allelism
204. A man with blood group A marries a woman having blood group B. The maximum possible blood groups among their progenies are
- (a) AB only
 - (b) A, B, AB
 - (c) A, B
 - (d) A, B, AB, O
205. A pure breeding pea plant with round yellow seeds was crossed with pea plant having wrinkled green seeds. On selfing of F_1 hybrid of his cross, 64 progenies were obtained in F_2 generation. Find out the number of F_2 progenies showing non-parental characters.
- (a) 36
 - (b) 4
 - (c) 12
 - (d) 24
206. The length of DNA helix in a typical nucleosome is
- (a) 200 bp
 - (b) 1000 bp
 - (c) 3.2×10^6 bp
 - (d) 6.6×10^9 bp
207. Which of the following types of RNA carries amino acids towards ribosome during translation?
- (a) rRNA
 - (b) dsRNA
 - (c) tRNA
 - (d) mRNA
208. In eukaryotes, the entire base sequence of a gene do not appear in mature RNA because
- (a) transcription in eukaryotes consumes more energy.
 - (b) coding sequences are removed during processing.
 - (c) introns are removed during processing.
 - (d) some gene sequences are removed by exonuclease.
209. Suppose DNA samples collected for DNA fingerprinting analysis are less than the required quantity. Which of the following techniques is helpful to make the samples sufficient for above analysis?
- (a) Electrophoresis
 - (b) Chromatography
 - (c) PCR
 - (d) DNA probing
210. When *Escherichia coli* cells are cultured in a medium where Lactose is absent, the '*i*' gene of Lac Operon continues to produce repressor mRNA, because it is
- (a) a non-coding gene.
 - (b) an operator gene.
 - (c) a constitutive gene.
 - (d) a structural gene.
211. For the given sequence of DNA, identify the complementary sequence of bases on its mRNA from the options given below :
- DNA 3'-ATGCATGCATGC -5'
- (a) 5' - UACGUACGUACG - 3'
 - (b) 5' - TACGTACGTACG-3'

(c) 3' - UACGUACGUACG - 5'

(d) 5'-GCATGCATGCAT - 3'

212. Which among the following was the biggest land dinosaur?

- (a) Stegosaurus (b) Tyrannosaurus rex
(c) Brachiosaurus (d) Triceratops

213. In a population of plants, some were extremely tall and the remaining were extremely dwarf. No plants of the population showed intermediate height. The type of operation of natural selection in the above case is

- (a) Balancing (b) Directional
(c) Stabilizing (d) Disruptive

214. Injection of an antidote against snakebite is an example of

- (a) Innate immunity (b) Active immunity
(c) Passive immunity (d) Auto immunity

215. Certain tumours are called malignant, because

- (a) They are confined to specific locations.
(b) They invade and damage surrounding tissues.
(c) They show contact inhibition.
(d) They are not neoplastic.

216. The transport of which neurotransmitter is interfered by cocaine?

- (a) Acetylcholine (b) Serotonin
(c) GABA (d) Dopamine

217. In the life cycle of plasmodium, fertilisation takes place in

- (a) Salivary glands of mosquito
(b) RBCs of humans
(c) Stomach of mosquito
(d) Liver cells

218. White rust resistant variety of Brassica is

- (a) Pusa Sadabahar (b) Pusa Swarnim
(c) Pusa Shubhra (d) Pusa Komal

219. Which of the following plant tissues cannot be used as explant in tissue culture?

- (a) Meristem (b) Parenchyma
(c) Sclerenchyma (d) Collenchyma

220. The hybridisation between naturally incompatible plants like Potato and Tomato can be achieved through

- (a) Artificial pollination
(b) Somatic hybridisation
(c) Conventional breeding
(d) Mutation breeding

221. A chilly plant was severely infected with Chilly Mosaic Virus (CMV). Identify the technique that helps to raise virus free plants in the next generation from the above virus infected plant.

- (a) Artificial hybridization (b) Meristem culture
(c) Self- pollination (d) Hydroponics

222. In sewage treatment, secondary treatment is considered highly significant, because

- (a) It helps to remove debris from the sewage.
(b) It reduces the BOD level of sewage.
(c) It helps in the production of biogas.
(d) It increases the organic content of sewage.

223. Ruminant animals can digest cellulose in their food, where as human beings are unable to do so. This is because

- (a) Methanogens are present in human gut.

- (b) Cellulose is a complex sugar.
- (c) Cellulose reduces the bulk of food.
- (d) Methanogens are absent in human gut.

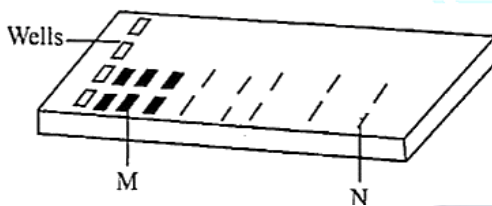
224. From the given combinations of steps in PCR, identify the enzyme dependent step/s.

- (a) Annealing and extension
- (b) Annealing and denaturation
- (c) Denaturation and extension
- (d) Extension only

225. Biolistics method is suitable for gene transfer into ____

- (a) Viruses
- (b) Animal cells
- (c) Bacteria
- (d) Plant cells

226. Identify the labels M and N in the following Agarose gel electrophoresis representation.



- (a) M - Digested DNA bands
- N - Undigested DNA bands
- (b) M - Hybridised DNA bands
- N - Unhybridised DNA band
- (c) M-Largest DNA bands
- N - Smallest DNA bands
- (d) M-Smallest DNA bands
- N - Largest DNA bands

227. In RNA interface, the dsRNA molecule prevents ____

- (a) transcription of mRNA
- (b) transport of RNA from nucleus to cytoplasm
- (c) translation of mRNA
- (d) aminoacylation

228. Now-a-days, the early diagnosis of bacterial or viral infection in humans is possible using

- (a) Serum analyser
- (b) DNA sequencer
- (c) PCR
- (d) CT Scan

229. Which of the following features of plants is not helpful in adapting to desert life?

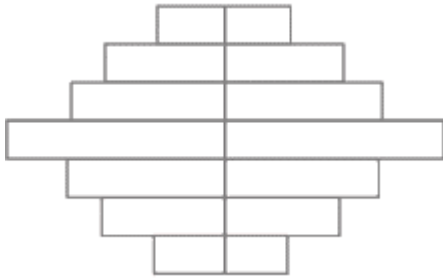
- (a) Presence of thick cuticle on the leaf surface
- (b) Leaves modified into spines
- (c) Presence of sunken stomata
- (d) Absence of trichomes on leaf surface

230. In the following equation of Verhulst Pearl logistic growth, the letter ' r ' denotes ____

$$\frac{dN}{dt} = rN \left(\frac{K - N}{K} \right)$$

- (a) Extrinsic rate of natural increase
- (b) Intrinsic rate of natural increase
- (c) Carrying capacity
- (d) Population density

231. The shape of the pyramids reflects the growth status of the population. Identify the type of age pyramid represented below for human population.



- (a) Ascending (b) Expanding
(c) Stable (d) Declining

232. Identify the possible link 'M' in the following food chain:

Plant → Insect → M → Snake → Eagle

- (a) Rabbit (b) Wolf
(c) Frog (d) Ichthyophis

233. The organisms which invade a bare area to initiate an ecological succession are known as

- (a) Key stone species (b) Climatic species
(c) Endemic species (d) Pioneer species

234. Which one of the following is not included under in-situ conservation?

- (a) National Park (b) Sanctuary
(c) Botanical Garden (d) Biosphere Reserve

235. Which one of the following is a wrong statement?

- (a) Most of the forests have been lost in tropical areas.
(b) Green -house effect is a natural phenomenon.
(c) Eutrophication is a natural phenomenon in fresh water lakes.
(d) Ozone in upper part of the atmosphere is harmful to animals.

236. According to Supreme Court of India, ruling with respect to 'Bharat Stage VI' Norms, from which date, these are supposed to be implemented in the country?

- (a) 1st April, 2020 (b) 1st June, 2021
(c) 1st January, 2021 (d) 10th December, 2020

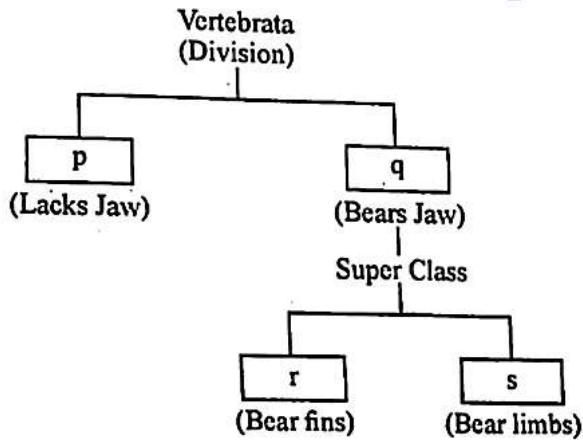
237. Match the following classes of Fungi (Column-I) with the examples (Column-II).

	Column-I		Column-II
(1)	Phycomycetes	(p)	Penicillium
(2)	Ascomycetes	(q)	Alternaria
(3)	Basidiomycetes	(r)	Albugo
(4)	Deuteromycetes	(s)	Puccinia

Choose the correct option :

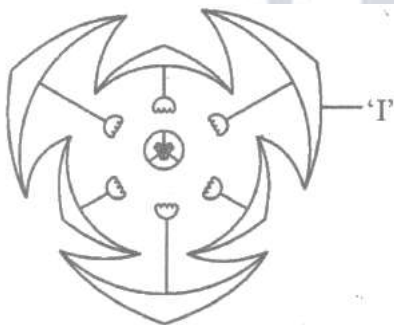
- (a) (1) - (p), (2) - (s), (3) - (r), (4) - (q)
(b) (1) - (q), (2) - (p), (3) - (s), (4) - (r)
(c) (1) - (r), (2) - (p), (3) - (q), (4) - (s)
(d) (1) - (r), (2) - (p), (3) - (s), (4) - (q)

238. Observe the following simplified scheme and choose the correct option that matches with the letters given in the boxes.



- (a) p - Agnatha, q - Gnathostomata,
r - Pisces, s - Tetrapoda
- (b) p - Gnathostomata, q - Agnatha,
r - Tetrapoda, s - Pisces
- (c) p - Tetrapoda, q - Pisces,
r - Gnathostomata, s - Agnatha
- (d) p - Agnatha, q - Gnathostomata,
r - Tetrapoda, s - Pisces

239. Identify the floral unit 'I' in the given floral diagram.



- (a) Sepal
- (b) Petal
- (c) Tepal
- (d) Perianth

240. A student observes grass and Hibiscus plants in his garden during noon. To his surprise, only the leaves of grass were found rolled inwards. The reason could be

- (a) presence of more number of stomata on the grass leaves.
- (b) undifferentiated mesophyll in grass leaves.
- (c) presence of Bulliform cells in the grass leaves.
- (d) due to higher rate of transpiration.