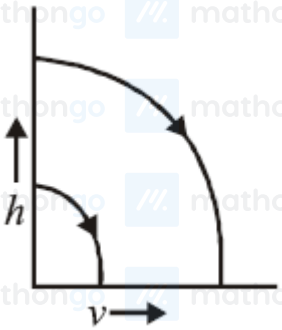
Q1. The electrical resistance R of a conductor of length l and area of cross section a is given by $R = \frac{\rho l}{a}$ where ' ρ ' is the electrical resistivity. What is the dimensional formula for electrical conductivity ' σ ' which is reciprocal of resistivity?

(1) $\left[M^{-1}L^{-3}T^{3}A^{2}\right]$ (2) $\left[ML^{-3}T^{-3}A^{2}\right]$

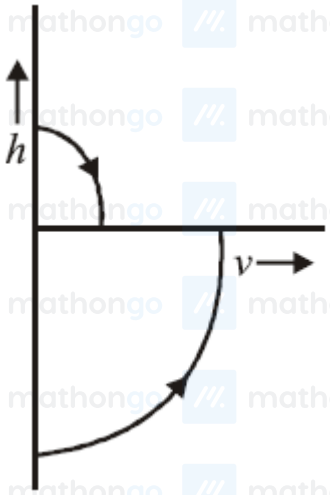
(3) $\left[ML^{3}T^{-3}A^{-2}\right]$ (4) $\left[M^{-2}L^{3}T^{2}A^{-1}\right]$

Q2. A ball is dropped vertically downwards from a height h above the ground. It hits the ground inelastically and bounces up vertically. Neglecting subsequent motion and air resistance, which of the following graph represents variation between speed (v) and height (h) correctly?

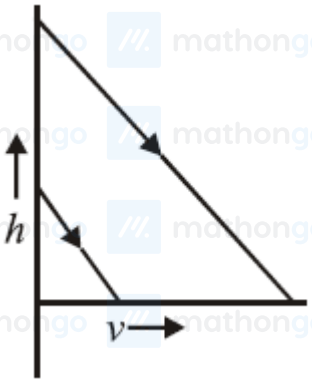
(1)



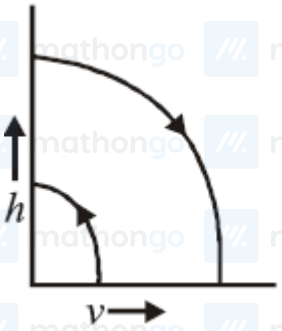
(2)



(3)



(4)



Q3. A satellite moving with velocity v in a force free space collects stationary interplanetary dust at a rate of $\frac{dM}{dt} = \alpha v$ where M is the mass (of satellite + dust) at that instant. The instantaneous acceleration of the satellite is

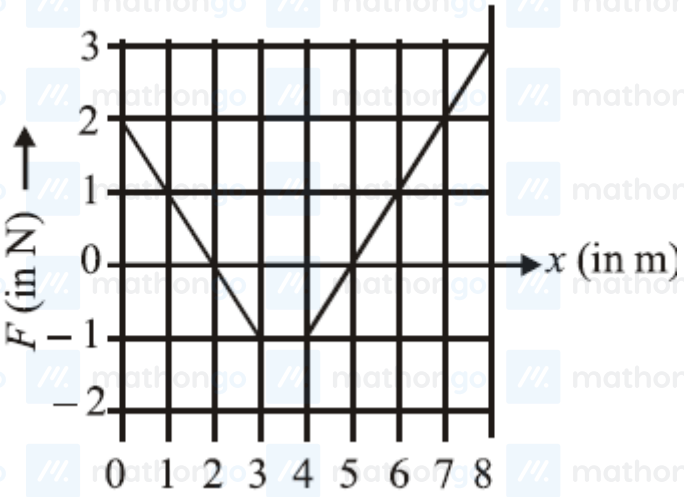
(1) $-\frac{\alpha v^{2}}{2M}$ (2) $-\frac{\alpha v^{2}}{M}$

(3) $-\alpha v^{2}$ (4) $-\frac{2\alpha v^{2}}{M}$

Q4. This question has Statement 1 and Statement 2 . Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: If you push on a cart being pulled by a horse so that it does not move, the cart pushes you back with an equal and opposite force. Statement 2: The cart does not move because the force described in statement 1 cancel each other.

(1) Statement 1 is true, Statement 2 is true, Statement 2 is the correct explanation of Statement 1.
(2) Statement 1 is false, Statement 2 is true.
(3) Statement 1 is true, Statement 2 is false.
(4) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1.

Q5. The force $\vec{F} = F\hat{i}$ on a particle of mass 2 kg, moving along the x-axis is given in the figure as a function of its position x. The particle is moving with a velocity of 5 m/s along the x-axis at $x = 0$. What is the kinetic energy of the particle at $x = 8$ m?



(1) 34 J
(2) 34.5 J
(3) 4.5 J
(4) 29.4 J

Q6. A stone of mass m, tied to the end of a string, is whirled around in a circle on a horizontal frictionless table. The length of the string is reduced gradually keeping the angular momentum of the stone about the centre of the circle constant. Then, the tension in the string is given by $T = Ar^n$, where A is a constant, r is the instantaneous radius of the circle. The value of n is equal to

(1) -1
(2) -2
(3) -4
(4) -3

Q7. A thick-walled hollow sphere has outside radius R_0. It rolls down an incline without slipping and its speed at the bottom is v_0. Now the incline is waxed, so that it is practically frictionless and the sphere is observed to slide down (without any rolling). Its speed at the bottom is observed to be $5v_0/4$. The radius of gyration of the hollow sphere about an axis through its centre is

(1) $3R_0/2$
(2) $3R_0/4$
(3) $9R_0/16$
(4) $3R_0$

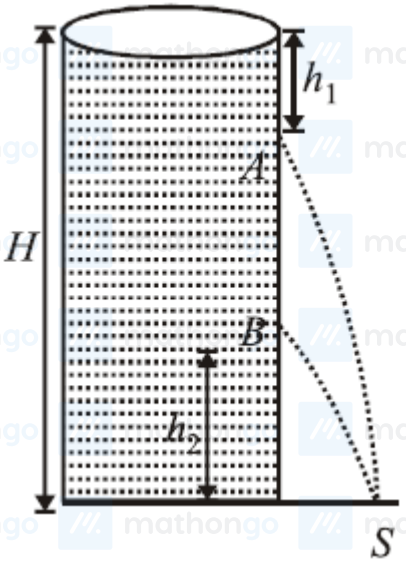
Q8. A point particle is held on the axis of a ring of mass m and radius r at a distance r from its centre C. When released, it reaches C under the gravitational attraction of the ring. Its speed at C will be

(1) $\sqrt{\frac{2Gm}{r}(\sqrt{2}-1}$
(2) $\sqrt{\frac{Gm}{r}}$
(3) $\sqrt{\frac{2Gm}{r}\left(1-\frac{1}{\sqrt{2}}\right)}$
(4) $\sqrt{\frac{2Gm}{r}}$

Q9. The terminal velocity of a small sphere of radius a in a viscous liquid is proportional to

(1) a^2 (2) a^3
(3) a (4) a^{-1}

Q10. In a cylindrical water tank, there are two small holes A and B on the wall at a depth of h_1, from the surface of water and at a height of h_2 from the bottom of water tank. Surface of water is at height of h_2 from the bottom of water tank. Surface of water is at heigh H from the bottom of water tank. Water coming out from both holes



strikes the ground at the same point S. Find the ratio of h_1 and h_2

(1) Depends on H (2) 1 : 1
(3) 2 : 2 (4) 1 : 2

Q11. The door of a working refrigerator is left open in a well insulated room. The temperature of air in the room will

(1) decrease (2) increase in winters and decrease in summers
(3) remain the same (4) increase

Q12. An ideal monatomic gas with pressure P, volume V and temperature T is expanded isothermally to a volume $2V$ and a final pressure P_i. If the same gas is expanded adiabatically to a volume 2 V, the final pressure is P_a. The ratio $\frac{P_a}{P_i}$ is

(1) $2^{-1/3}$ (2) $2^{1/3^6}$
(3) $2^{2/3}$ (4) $2^{-2/3}$

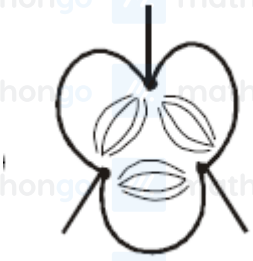
Q13. An air column in a pipe, which is closed at one end, will be in resonance wtih a vibrating tuning fork of frequency 264 Hz if the length of the column in cm is (velocity of sound $= 330$ m/s)

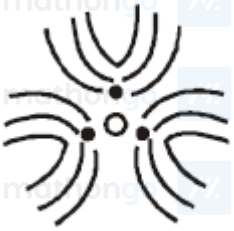
(1) 125.00 (2) 93.75
(3) 62.50 (4) 187.50

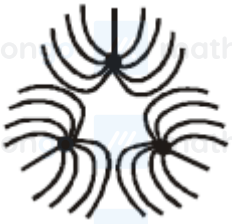
Q14. The disturbance $y(x,t)$ of a wave propagating in the positive x-direction is given by $y = \frac{1}{1+x^2}$ at time $t = 0$ and by $y = \frac{1}{[1+(x-1^2)]}$ at $t = 2$ s, where x and y are in meters. The shape of the wave disturbance does not change during the propagation. The velocity of wave in m/s is

(1) 2.0 (2) 4.0
(3) 0.5 (4) 1.0

Q15. Three positive charges of equal value q are placed at vertices of an equilateral triangle. The resulting lines of force should be sketched as in

(1) 

(2) 

(3) 

(4) 

Q16. This question has Statement 1 and Statement 2 . Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: It is not possible to make a sphere of capacity 1 farad using a conducting material. Statement 2: It is possible for earth as its radius is 6.4×10^6 m.

(1) Statement 1 is true, Statement 2 is true, Statement 2 is the correct explanation of Statement 1.

(2) Statement 1 is false, Statement 2 is true.

(3) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1.

(4) Statement 1 is true, Statement 2 is false.

Q17. The capacitor of an oscillatory circuit is enclosed in a container. When the container is evacuated, the resonance frequency of the circuit is 10kHz. When the container is filled with a gas, the resonance frequency changes by 50 Hz. The dielectric constant of the gas is

(1) 1.001

(2) 2.001

(3) 1.01

(4) 3.01

Q18. The resistance of a wire is R. It is bent at the middle by 180° and both the ends are twisted together to make a shorter wire. The resistance of the new wire is

(1) $2R$

(2) $R/2$

(3) $R/4$

(4) $R/8$

Q19. In an experiment of potentiometer for measuring the internal resistance of primary cell a balancing length ℓ is obtained on the potentiometer wire when the cell is open circuit. Now the cell is short circuited by a resistance R. If R is to be equal to the internal resistance of the cell the balancing length on the potentiometer wire will be

(1) ℓ

(2) 2ℓ

(3) $\ell/2$

(4) $\ell/4$

Q20. Currents of a 10 ampere and 2 ampere are passed through two parallel thin wires A and B respectively in opposite directions. Wire A is infinitely long and the length of the wire B is 2 m. The force acting on the conductor B, which is situated at 10 cm distance from A will be

(1) 8×10^{-5} N
(2) 5×10^{-5} N
(3) $8\pi \times 10^{-7}$ N
(4) $4\pi \times 10^{-7}$ N

Q21. This question has Statement 1 and Statement 2. Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: A charged particle is moving at right angle to a static magnetic field. During the motion the kinetic energy of the charge remains unchanged. Statement 2: Static magnetic field exert force on a moving charge in the direction perpendicular to the magnetic field.

(1) Statement 1 is false, Statement 2 is true.
(2) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1.
(3) Statement 1 is true, Statement 2 is false.
(4) Statement 1 is true, Statement 2 is true, Statement 2 is the correct explanation of Statement 1.

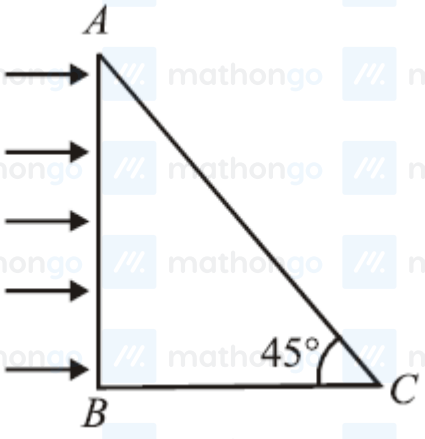
Q22. A radio transmitter transmits at 830kHz. At a certain distance from the transmitter magnetic field has amplitude 4.82×10^{-11} T. The electric field and the wavelength are respectively

(1) $0.014\ \mathrm{N/C}, 36$ m
(2) $0.14\ \mathrm{N/C}, 36$ m
(3) $0.14\ \mathrm{N/C}, 360$ m
(4) $0.014\ \mathrm{N/C}, 360$ m

Q23. The frequency of X-rays; γ-rays and ultraviolet rays are respectively a, b and c then

(1) $a < b; b > c$
(2) $a > b; b > c$
(3) $a < b < c$
(4) $a = b = c$

Q24. A beam of light consisting of red, green and blue colours is incident on a right-angled prism on face AB. The refractive indices of the material for the above red, green and blue colours are $1.39, 1.44$ and 1.47 respectively.



A person looking on surface AC of the prism will see

(1) no light
(2) green and blue colours
(3) red and green colours
(4) red colour only

Q25. A telescope of aperture 3×10^{-2} m diameter is focused on a window at 80 m distance fitted with a wire mesh of spacing 2×10^{-3} m. Given: $\lambda = 5.5 \times 10^{-7}$ m, which of the following is true for observing the mesh

through the telescope?

(1) Yes, it is possible with the same aperture size.

(2) Possible also with an aperture half the present diameter.

(3) No, it is not possible.

(4) Given data is not sufficient.

Q26. In Young's double slit interference experiment, the slit widths are in the ratio $1:25$. Then the ratio of intensity at the maxima and minima in the interference pattern is

(1) $3:2$

(2) $1:25$

(3) $9:4$

(4) $1:5$

Q27. Photoelectrons are ejected from a metal when light of frequency v falls on it. Pick out the wrong statement from the following.

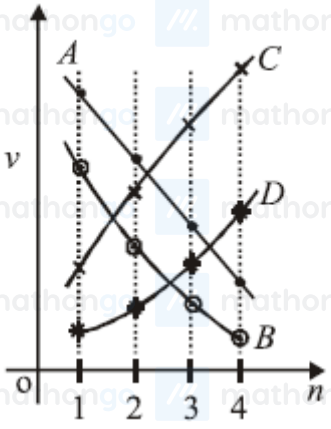
(1) No electrons are emitted if v is less than W/h, where W is the work function of the metal

(2) The ejection of the photoelectrons is instantaneous.

(3) The maximum energy of the photoelectrons is hu.

(4) The maximum energy of the photoelectrons is independent of the intensity of the light.

Q28. Which of the plots shown in the figure represents speed (v) of the electron in a hydrogen atom as a function of the principal quantum number (n) ?



(1) B

(2) D

(3) C

(4) A

Q29. The counting rate observed from a radioactive source at $t = 0$ was 1600 counts s^{-1}, and $t = 8$ s, it was 100 counts s^{-1}. The counting rate observed as counts s^{-1} at $t = 6$ s will be

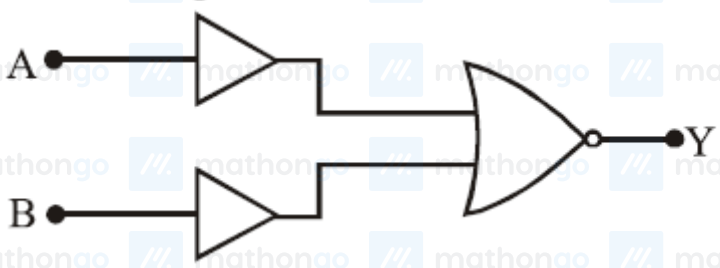
(1) 250

(2) 400

(3) 300

(4) 200

Q30. The figure shows a combination of two NOT gates and a NOR gate.



The combination is equivalent to a

(1) NAND gate (2) NOR gate

(3) AND gate (4) OR gate

Q31. A transition metal M forms a volatile chloride which has a vapour density of 94.8. If it contains 74.75% of chlorine the formula of the metal chloride will be

(1) MCl_3 (2) MCl_2

(3) MCl_4 (4) MCl_5

Q32. The following sets of quantum numbers represent four electrons in an atom. (i) $n = 4, l = 1$ (ii) $n = 4, l = 0$ (iii) $n = 3, l = 2$ (iv) $n = 3, l = 1$ The sequence representing increasing order of energy, is

(1) (iii) < (i) < (iv) < (ii) (2) (iv) < (ii) < (iii) < (i)

(3) (i) < (iii) < (ii) < (iv) (4) (ii) < (iv) < (i) < (iii)

Q33. Which of the following presents the correct order of second ionization enthalpies of C, N, O and F ?

(1) F > O > N > C (2) O > N > F > C

(3) C > N > O > F (4) O > F > N > C

Q34. Among the following species which two have trigonal pyramidal shape? (I) NI_3 (II) I_3^- (III) SO_3^{2-} (IV) NO_3^-

(1) I and III (2) III and IV

(3) I and IV (4) II and III

Q35. Dipole moment is shown by

(1) 1,2-dichlorobenzene (2) trans 2, 3-dichloro-2-butene

(3) 1,4-chlorobenzene (4) trans-1,2-dinitroethene

Q36. The relationship among most probable velocity, average velocity and root mean square velocity is respectively

(1) $\sqrt{2} : \sqrt{3} : \sqrt{8/\pi}$ (2) $\sqrt{2} : \sqrt{8/\pi} : \sqrt{3}$

(3) $\sqrt{8/\pi} : \sqrt{3} : \sqrt{2}$ (4) $\sqrt{3} : \sqrt{8/\pi} : \sqrt{2}$

Q37. One mole of an ideal gas is expanded isothermally and reversibly to half of its initial pressure. ΔS for the process in $JK^{-1}\ mol^{-1}$ is $[\ln 2 = 0.693$ and $R = 8.314,\ J/(molK)]$

(1) 6.76 (2) 5.76

(3) 10.76 (4) 8.03

Q38. One mole of $O_{2(g)}$ and two moles of $SO_{2(g)}$ were heated in a closed vessel of one-litre capacity at 1098 K. At equilibrium 1.6 moles of $SO_{3(g)}$ were found. The equilibrium constant K_c of the reaction would be

(1) 30 (2) 40

(3) 80 (4) 60

Q39. The solubility of PbI_2 at 25°C is 0.7 g L^{-1}. The solubility product of PbI_2 at this temperature is (molar mass of $PbI_2 = 461.2$ g mol^{-1})

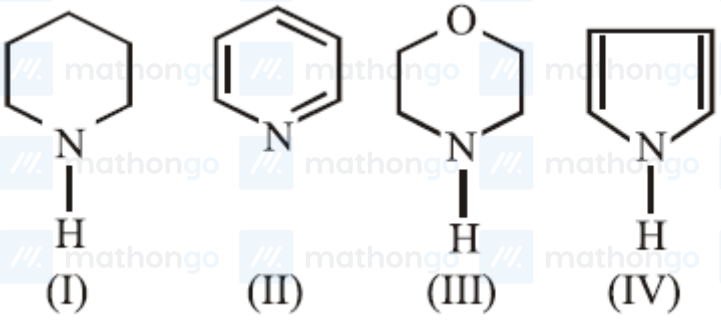
(1) 1.40×10^{-9} (2) 0.14×10^{-9}

(3) 140×10^{-9} (4) 14.0×10^{-9}

Q40. Fire extinguishers contain H_2SO_4 and which one of the following?

(1) $NaHCO_3$ and Na_2CO_3
(2) Na_2CO_3
(3) $NaHCO_3$
(4) $CaCO_3^2$

Q41.

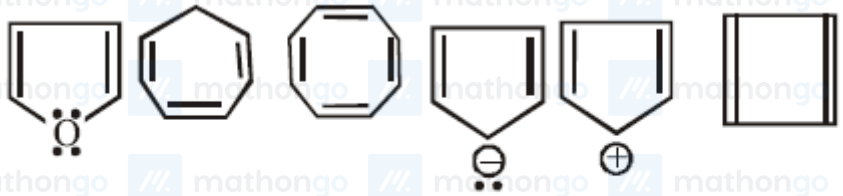


(I) (II) (III) (IV)

In the following compounds:
the order of basicity is as follows
(1) IV > III > II > I
(2) III > I > II > IV
(3) II > III > I > IV
(4) I > III > II > IV

Q42. Maleic acid and fumaric acids are
(1) Chain isomers
(2) Functional isomers
(3) Tautomers
(4) Geometrical isomers

Q43. Which of the following compounds are antiaromatic



(I) (II) (III) (IV) (V) (VI)

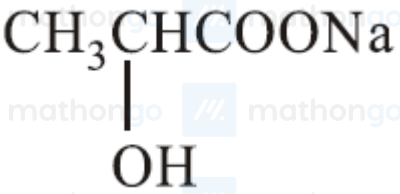
(1) (I) and (V)
(2) (II) and (V)
(3) (I) and (IV)
(4) (V) and (VI)

Q44. Consider the following sequence of reactions

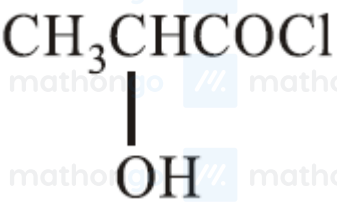
$$CH_3CH=CH_2 \xrightarrow[700K]{Cl_2} A \xrightarrow[420K,12atm]{Na_2CO_3} B \xrightarrow[(ii)\ NaOH]{(i)\ HOCl} C$$

Compound 'C' is

(1) 

(2) 

(3) $HOCH_2 - CH = CH_2$

(4) 

Q45. Which one of the following depletes ozone layer?

(1) CO
(2) NO and freons
(3) SO_2
(4) CO_2

Q46. Among the following the incorrect statement is

(1) Density of crystals remains unaffected due to Frenkel defect.
(2) In BCC unit cell the void space is 32%.
(3) Density of crystals decreases due to Schottky defect.
(4) Electrical conductivity of semiconductors and metals increases with increase in temperature.

Q47. The freezing point of a 1.00 m aqueous solution of HF is found to be $-1.91^{\circ}C$. The freezing point constant of water, K_f is 1.86 K kg mol^{-1}. The percentage dissociation of HF at this concentration is

(1) 30%
(2) 10%
(3) 5.2%
(4) 2.7%

Q48. Given

$$E^{\circ}_{Cu^{2+}/Cu} = 0.34\ V, E^{\circ}_{Cu^{2+}/Cu} = 0.15\ V$$

Standard electrode potential for the half cell Cu^{+}/Cu is

(1) 0.38 V
(2) 0.53 V
(3) 0.19 V
(4) 0.49 V

Q49. The activation energy for a reaction which doubles the rate when the temperature is raised from 298 K to 308 K is

(1) 59.2 kJ mol^{-1}
(2) 39.2 kJ mol^{-1}
(3) 52.9 kJ mol^{-1}
(4) 29.5 kJ mol^{-1}

Q50. Colloidal solutions can be purified by

(1) emulsification (2) electrodialysis
(3) peptization (4) using Tyndall effect

Q51. The substance used as froth stabilisers in forth-floatation process is
(1) Potassium ethyl xanthate (2) Aniline
(3) Sodium cyanide (4) Copper sulphate

Q52. The number of S − S bonds in SO_3, $S_2O_3^{2-}$ $S_2O_6^{2-}$ and $S_2O_8^{2-}$ respectively are
(1) $1, 0, 0, 1$ (2) 1,0,1,0
(3) $0, 1, 1, 0$ (4) $0, 1, 0, 1$

Q53. Which of the following forms stable +4 oxidation state?
(1) La$(Z = 57)$ (2) Eu$(Z = 63)$
(3) Ce$(Z = 58)$ (4) Gd$(Z = 64)$

Q54. The number of unpaired electrons in Gadolinium $[Z = 64]$ is
(1) 3 (2) 8
(3) 6 (4) 2

Q55. The complex ion $[Pt\,(NO_2)(Py)\,(NH_3)\,(NH_2OH)]^+$ will give
(1) 2 isomers (Geometrical) (2) 3 isomers (Geometrical)
(3) 6 isomers (Geometrical) (4) 4 isomers (Geometrical)

Q56. The hydration of propyne results in formation of
(1) Acetone (2) Propanol-1
(3) Propene (4) Propanal

Q57. Tollen's reagent and Fehling solutions are used to distinguish between
(1) acids and alcohols (2) alkanes and alcohols
(3) ketones and aldehydes (4) n-alkaens and branched alkanes

Q58. Bakelite is obtained from phenol by reacting it with
(1) Acetaldehyde (2) Chlorobenzene
(3) Formaldehyde (4) Acetamide

Q59. Sulphonamides act as
(1) Antiseptic (2) Analgesic
(3) Antimicrobials (4) Antipyretic

Q60. Which of the following statements is correct?
(1) RNA controls the synthesis of proteins. (2) The sugar present in DNA is D-(-)-ribose.
(3) RNA has double stranded α-helix structure. (4) DNA mainly occurs in the cytoplasm of the cell.

Q61. If $a, b, c \in$ R and 1 is a root of equation $ax^2 + bx + c = 0$, then the curve $y = 4ax^2 + 3bx + 2c, a \neq 0$ intersect x-axis at

(1) two distinct points whose coordinates are always rational numbers
(2) no point
(3) exactly two distinct points
(4) exactly one point

Q62. $|z_1+z_2|^2+|z_1-z_2|^2$ is equal to
(1) $2\left(|z_1|+|z_2|\right.$
(2) $2\left(|z_1|^2+|z_2|^2\right)$
(3) $|z_1|\,|z_2|$
(4) $|z_1|^2+|z_2|^2$

Q63. If seven women and seven men are to be seated around a circular table such that there is a man on either side of every woman, then the number of seating arrangements is
(1) 6!7!
(2) $(6!)^2$
(3) $(7!)^2$
(4) 7 !

Q64. If the A.M. between p^{th} and q^{th} terms of an A.P. is equal to the A.M. between r^{th} and s^{th} terms of the same A.P., then $p+q$ is equal to
(1) $r+s-1$
(2) $r+s-2$
(3) $r+s+1$
(4) $r+s$

Q65. If the sum of the series $1^2+2\cdot 2^2+3^2+2\cdot 4^2+5^2+\ldots 2.6^2+\ldots$ upto n terms, when n is even, is $\frac{n(n+1)^2}{2}$, then the sum of the series, when n is odd, is
(1) $n^2(n+1)$
(2) $\frac{n^2(n-1)}{2}$
(3) $\frac{n^2(n+1)}{2}$
(4) $n^2(n-1)$

Q66. The middle term in the expansion of $\left(1-\frac{1}{x}\right)^n(1-x^n)$ in powers of x is
(1) $-{}^{2n}\mathrm{C}_{n-1}$
(2) $-{}^{2n}\mathrm{C}_n$
(3) ${}^{2n}\mathrm{C}_{n-1}$
(4) ${}^{2n}\mathrm{C}_n$

Q67. The value of $\cos 255^\circ+\sin 195^\circ$ is
(1) $\frac{\sqrt{3}-1}{2\sqrt{2}}$
(2) $\frac{\sqrt{3}-1}{\sqrt{2}}$
(3) $-\frac{\sqrt{3}-1}{\sqrt{2}}$
(4) $\frac{\sqrt{3}+1}{\sqrt{2}}$

Q68. The line parallel to x-axis and passing through the point of intersection of lines $ax+2by+3b=0$ and $bx-2ay-3a=0$, where $(a,b)\neq(0,0)$ is
(1) above x-axis at a distance $2/3$ from it
(2) above x-axis at a distance $3/2$ from it
(3) below x-axis at a distance $3/2$ from it
(4) below x-axis at a distance $2/3$ from it

Q69. Consider the straight lines

$$L_1: x-y=1$$
$$L_2: x+y=1$$
$$L_3: 2x+2y=5$$
$$L_4: 2x-2y=7$$

The correct statement is

(1) $L_1 \| L_4, L_2 \| L_3, L_1$ intersect L_4.
(2) $L_1 \perp L_2, L_1 \| L_3, L_1$ intersect L_2.
(3) $L_1 \perp L_2, L_2 \| L_3, L_1$ intersect L_4.
(4) $L_1 \perp L_2, L_1 \perp L_3, L_2$ intersect L_4.

Q70. The number of common tangents of the circles given by $x^2 + y^2 - 8x - 2y + 1 = 0$ and $x^2 + y^2 + 6x + 8y = 0$ is
(1) one
(2) four
(3) two
(4) three

Q71. The chord PQ of the parabola $y^2 = x$, where one end P of the chord is at point $(4, -2)$, is perpendicular to the axis of the parabola. Then the slope of the normal at Q is
(1) -4
(2) $-\frac{1}{4}$
(3) 4
(4) $\frac{1}{4}$

Q72. The normal at $\left(2, \frac{3}{2}\right)$ to the ellipse, $\frac{x^2}{16} + \frac{y^2}{3} = 1$ touches a parabola, whose equation is
(1) $y^2 = -104x$
(2) $y^2 = 14x$
(3) $y^2 = 26x$
(4) $y^2 = -14x$

Q73. $\lim_{x \to 0} \frac{\sin(\pi \cos^2 x)}{x^2}$ equals
(1) $-\pi$
(2) 1
(3) -1
(4) π

Q74. Let p and q denote the following statements p : The sun is shining q : I shall play tennis in the afternoon The negation of the statement "If the sun is shining then I shall play tennis in the afternoon", is
(1) $q \Rightarrow \sim p$
(2) $q \wedge \sim p$
(3) $p \wedge \sim q$
(4) $\sim q \Rightarrow \sim p$

Q75. Statement 1: The variance of first n odd natural numbers is $\frac{n^2-1}{3}$ Statement 2: The sum of first n odd natural number is n^2 and the sum of square of first n odd natural numbers is $\frac{n(4n^2+1)}{3}$.
(1) Statement 1 is true, Statement 2 is false.
(2) Statement 1 is true, Statement 2 is true; Statement 2 is not a correct explanation for Statement 1.
(3) Statement 1 is false, Statement 2 is true.
(4) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.

Q76. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -3 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 7 & -2 & 1 \end{bmatrix}$ then AB equals
(1) I
(2) A
(3) B
(4) 0

Q77. Statement 1: If the system of equations $x + ky + 3z = 0, 3x + ky - 2z = 0, 2x + 3y - 4z = 0$ has a nontrivial solution, then the value of k is $\frac{31}{2}$. Statement 2: A system of three homogeneous equations in three variables has a non trivial solution if the determinant of the coefficient matrix is zero.

(1) Statement 1 is false, Statement 2 is true.
(2) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.
(3) Statement 1 is true, Statement 2 is true,, Statement 2 is not a correct explanation for Statement 1.
(4) Statement 1 is true, Statement 2 is false.

Q78. Let A and B be non empty sets in R and $f : A \to B$ is a bijective function. Statement 1: f is an onto function. Statement 2: There exists a function $g : B \to A$ such that fog $= I_B$.
(1) Statement 1 is true, Statement 2 is false.
(2) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1.
(3) Statement 1 is false, Statement 2 is true.
(4) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation for Statement 1.

Q79. If $f(x) = a|\sin x| + be^{|x|} + c|x|^3$, where $a, b, c \in R$, is differentiable at $x = 0$, then
(1) $a = 0, b$ and c are any real numbers
(2) $c = 0, a = 0, b$ is any real number
(3) $b = 0, c = 0, a$ is any real number
(4) $a = 0, b = 0, c$ is any real number

Q80. Let $f : (-\infty, \infty) \to (-\infty, \infty)$ be defined by $f(x) = x^3 + 1$ Statement 1: The function fhas a local extremum at $x = 0$ Statement 2: The function f is continuous and differentiable on $(-\infty, \infty)$ and $f'(0) = 0$
(1) Statement 1 is true, Statement 2 is false.
(2) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation for Statement 1.
(3) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation for Statement 1.
(4) Statement 1 is false, Statement 2 is true.

Q81. If a metallic circular plate of radius 50 cm is heated so that its radius increases at the rate of 1 mm per hour, then the rate at which, the area of the plate increases (in $\text{cm}^2/$ hour) is
(1) 5π
(2) 10π
(3) 100π
(4) 50π

Q82. $f(x) = \int \frac{dx}{\sin^6 x}$ is a polynomial of degree
(1) 5 in $\cot x$
(2) 5 in $\tan x$
(3) 3 in $\tan x$
(4) 3 in $\cot x$

Q83. If $[x]$ is the greatest integer $\le x$, then the value of the integral $\int_{-0.9}^{0.9} \left([x^2] + \log\left(\frac{2-x}{2+x}\right)\right) dx$ is
(1) 0.486
(2) 0.243
(3) 1.8
(4) 0

Q84. The area bounded by the parabola $y^2 = 4x$ and the line $2x - 3y + 4 = 0$, in square unit, is
(1) $\frac{2}{5}$
(2) $\frac{1}{3}$
(3) 1
(4) $\frac{1}{2}$

Q85. The integrating factor of the differential equation $\left(x^2-1\frac{dy}{dx}+2\right)xy=x$ is

(1) $\frac{1}{x^2-1}$ (2) x^2-1

(3) $\frac{x^2-1}{x}$ (4) $\frac{x}{x^2-1}$

Q86. Statement 1: The vectors $\vec{a},\vec{b}$ and $\vec{c}$ lie in the same plane if and only if $\vec{a}\cdot(\vec{b}\times\vec{c})=0$ Statement 2: The vectors $\vec{u}$ and $\vec{v}$ are perpendicular if and only if $\vec{u}\cdot\vec{v}=0$ where $\vec{u}\times\vec{v}$ is a vector perpendicular to the plane of $\vec{u}$ and $\vec{v}$

(1) Statement 1 is false, Statement 2 is true.

(2) Statement 1 is true, Statement 2 is true, Statement 2 is correct explanation for Statement 1.

(3) Statement 1 is true, Statement 2 is false.

(4) Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation for Statement 1.

Q87. The distance of the point $-\hat{i}+2\hat{j}+6\hat{k}$ from the straight line that passes through the point $2\hat{i}+3\hat{j}-4\hat{k}$ and is parallel to the vector $6\hat{i}+3\hat{j}-4\hat{k}$ is

(1) 9 (2) 8

(3) 7 (4) 10

Q88. Consider the following planes

$$P: x+y-2z+7=0$$
$$Q: x+y+2z+2=0$$
$$R: 3x+3y-6z-11=0$$

(1) P and R are perpendicular (2) Q and R are perpendicular

(3) P and Q are parallel (4) P and R are parallel

Q89. The equation of a plane containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$ and the point $(0,7,-7)$ is

(1) $x+y+z=0$ (2) $x+2y+z=21$

(3) $3x-2y+5z+35=0$ (4) $3x+2y+5z+21=0$

Q90. There are two balls in an urn. Each ball can be either white or black. If a white ball is put into the urn and there after a ball is drawn at random from the urn, then the probability that it is white is

(1) $\frac{1}{4}$ (2) $\frac{2}{3}$

(3) $\frac{1}{5}$ (4) $\frac{1}{3}$

ANSWER KEYS

1. (1)	**2.** (4)	**3.** (2)	**4.** (1)	**5.** (4)	**6.** (4)	**7.** (2)	**8.** (3)
9. (1)	**10.** (1)	**11.** (4)	**12.** (4)	**13.** (2)	**14.** (3)	**15.** (3)	**16.** (4)
17. (3)	**18.** (3)	**19.** (3)	**20.** (1)	**21.** (4)	**22.** (4)	**23.** (1)	**24.** (4)
25. (1)	**26.** (3)	**27.** (3)	**28.** (1)	**29.** (4)	**30.** (3)	**31.** (3)	**32.** (2)
33. (4)	**34.** (1)	**35.** (1)	**36.** (2)	**37.** (2)	**38.** (3)	**39.** (4)	**40.** (1)
41. (4)	**42.** (4)	**43.** (4)	**44.** (1)	**45.** (2)	**46.** (4)	**47.** (4)	**48.** (2)
49. (3)	**50.** (2)	**51.** (2)	**52.** (3)	**53.** (3)	**54.** (2)	**55.** (2)	**56.** (1)
57. (3)	**58.** (3)	**59.** (3)	**60.** (2)	**61.** (4)	**62.** (2)	**63.** (1)	**64.** (4)
65. (3)	**66.** (4)	**67.** (3)	**68.** (3)	**69.** (4)	**70.** (3)	**71.** (1)	**72.** (1)
73. (4)	**74.** (3)	**75.** (1)	**76.** (1)	**77.** (1)	**78.** (4)	**79.** (4)	**80.** (4)
81. (2)	**82.** (1)	**83.** (4)	**84.** (2)	**85.** (2)	**86.** (3)	**87.** (3)	**88.** (4)
89. (1)	**90.** (2)						