Q1. Group A consists of 7 boys and 3 girls, while group B consists of 6 boys and 5 girls. The number of ways, 4 boys and 4 girls can be invited for a picnic if 5 of them must be from group A and the remaining 3 from group B, is equal to :

(1) 8750 (2) 9100

(3) 8925 (4) 8575

Q2. If the system of equations $\begin{aligned} x+2y-3z&=2 \\ 2x+\lambda y+5z&=5 \\ 14x+3y+\mu z&=33 \end{aligned}$ has infinitely many solutions, then $\lambda+\mu$ is equal to :

(1) 13 (2) 10

(3) 12 (4) 11

Q3. Let $\mathrm{A}=\left\{x \in(0, \pi)-\left\{\frac{\pi}{2}\right\}: \log_{(2/\pi)}|\sin x|+\log_{(2/\pi)}|\cos x|=2\right\}$ and $\mathrm{B}=\{x \geqslant 0: \sqrt{x}(\sqrt{x}-4)-3|\sqrt{x}-2|+6=0\}$. Then $\mathrm{n}(\mathrm{A} \cup \mathrm{B})$ is equal to :

(1) 4 (2) 8

(3) 6 (4) 2

Q4. The area of the region enclosed by the curves $y=\mathrm{e}^x, y=|\mathrm{e}^x-1|$ and y-axis is:

(1) $1-\log_{\mathrm{e}} 2$ (2) $\log_{\mathrm{e}} 2$

(3) $1+\log_e 2$ (4) $2 \log_e 2-1$

Q5. The equation of the chord, of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$, whose mid-point is $(3,1)$ is :

(1) $48x+25y=169$ (2) $5x+16y=31$

(3) $25x+101y=176$ (4) $4x+122y=134$

Q6. Let the points $\left(\frac{11}{2}, \alpha\right)$ lie on or inside the triangle with sides $x+y=11, x+2y=16$ and $2x+3y=29$. Then the product of the smallest and the largest values of α is equal to :

(1) 44 (2) 22

(3) 33 (4) 55

Q7. Let $f:(0, \infty) \rightarrow \mathbf{R}$ be a function which is differentiable at all points of its domain and satisfies the condition $x^2 f'(x)=2xf(x)+3$, with $f(1)=4$. Then $2f(2)$ is equal to :

(1) 39 (2) 19

(3) 29 (4) 23

Q8. If $7=5+\frac{1}{7}(5+\alpha)+\frac{1}{7^2}(5+2\alpha)+\frac{1}{7^3}(5+3\alpha)+\quad \infty$, then the value of α is :

(1) $\frac{6}{7}$ (2) 6

(3) $\frac{1}{7}$ (4) 1

Q9. Let $[x]$ denote the greatest integer function, and let m and n respectively be the numbers of the points, where the function $f(x)=[x]+|x-2|, -2<x<3$, is not continuous and not differentiable. Then $\mathrm{m}+\mathrm{n}$ is equal to :

(1) 6 (2) 8

(3) 9 (4) 7

Q10. Let $A=[a_{ij}]$ be a square matrix of order 2 with entries either 0 or 1 . Let E be the event that A is an invertible matrix. Then the probability $\mathrm{P}(\mathrm{E})$ is :

(1) $\frac{3}{16}$ (2) $\frac{5}{8}$
(3) $\frac{3}{8}$ (4) $\frac{1}{8}$

Q11. Let the position vectors of three vertices of a triangle be $4\vec{p}+\vec{q}-3\vec{r}$, $-5\vec{p}+\vec{q}+2\vec{r}$ and $2\overrightarrow{\mathrm{p}}-\overrightarrow{\mathrm{q}}+2\overrightarrow{\mathrm{r}}$. If the position vectors of the orthocenter and the circumcenter of the triangle are $\frac{\vec{p}+\vec{q}+\vec{r}}{4}$ and $\alpha\vec{p}+\beta\vec{q}+\gamma\vec{r}$ respectively, then $\alpha+2\beta+5\gamma$ is equal to :

(1) 3 (2) 4
(3) 1 (4) 6

Q12. Let $\overrightarrow{\mathrm{a}}=3\hat{i}-\hat{j}+2\hat{k}$, $\overrightarrow{\mathrm{b}}=\overrightarrow{\mathrm{a}}\times(\hat{i}-2\hat{k})$ and $\overrightarrow{\mathrm{c}}=\overrightarrow{\mathrm{b}}\times\hat{k}$. Then the projection of $\overrightarrow{\mathrm{c}}-2\hat{j}$ on $\vec{a}$ is :

(1) $2\sqrt{14}$ (2) $\sqrt{14}$
(3) $3\sqrt{7}$ (4) $2\sqrt{7}$

Q13. The number of real solution(s) of the equation $x^2+3x+2=\min\{|x-3|,|x+2|\}$ is :

(1) 1 (2) 0
(3) 2 (4) 3

Q14. The function $f:(-\infty,\infty)\to(-\infty,1)$, defined by $f(x)=\frac{2^x-2^{-x}}{2^x+2^{-x}}$ is :

(1) Neither one-one nor onto (2) Onto but not one-one
(3) Both one-one and onto (4) One-one but not onto

Q15. In an arithmetic progression, if $S_{40}=1030$ and $S_{12}=57$, then $S_{30}-S_{10}$ is equal to :

(1) 525 (2) 510
(3) 515 (4) 505

Q16. Suppose A and B are the coefficients of 30^{th} and 12^{th} terms respectively in the binomial expansion of $(1+x)^{2\mathrm{n}-1}$. If $2\ \mathrm{A}=5\ \mathrm{B}$, then n is equal to :

(1) 22 (2) 20
(3) 21 (4) 19

Q17. Let $(2,3)$ be the largest open interval in which the function $f(x)=2\log_{\mathrm{e}}(x-2)-x^2+ax+1$ is strictly increasing and (b, c) be the largest open interval, in which the function $\mathrm{g}(x)=(x-1)^3(x+2-\mathrm{a})^2$ is strictly decreasing. Then $100(a+b-c)$ is equal to :

(1) 420 (2) 360
(3) 160 (4) 280

Q18. For some a, b, let $f(x)=\begin{vmatrix}\mathrm{a}+\frac{\sin x}{x} & 1 & \mathrm{b}\\ \mathrm{a} & 1+\frac{\sin x}{x} & \mathrm{b}\\ \mathrm{a} & 1 & \mathrm{b}+\frac{\sin x}{x}\end{vmatrix}$, $x\neq 0$, $\lim_{x\to 0}f(x)=\lambda+\mu\mathrm{a}+\nu\mathrm{b}$. Then $(\lambda+\mu+\nu)^2$ is equal to :

(1) 16 (2) 25
(3) 9 (4) 36

Q19. If the equation of the parabola with vertex $\mathrm{V}\left(\frac{3}{2},3\right)$ and the directrix $x+2y=0$ is $\alpha x^2+\beta y^2-\gamma xy-30x-60y+225=0$, then $\alpha+\beta+\gamma$ is equal to :

(1) 7 (2) 9
(3) 8 (4) 6

Q20. If $\alpha > \beta > \gamma > 0$, then the expression $\cot^{-1}\left\{\beta + \frac{(1+\beta^2)}{(\alpha-\beta)}\right\} + \cot^{-1}\left\{\gamma + \frac{(1+\gamma^2)}{(\beta-\gamma)}\right\} + \cot^{-1}\left\{\alpha + \frac{(1+\alpha^2)}{(\gamma-\alpha)}\right\}$ is equal to :

(1) π (2) 0
(3) $\frac{\pi}{2} - (\alpha+\beta+\gamma)$ (4) 3π

Q21. Let P be the image of the point $\mathrm{Q}(7,-2,5)$ in the line $\mathrm{L}: \frac{x-1}{2} = \frac{y+1}{3} = \frac{z}{4}$ and $\mathrm{R}(5,\mathrm{p},\mathrm{q})$ be a point on L. Then the square of the area of $\triangle PQR$ is _____.

Q22. If $\int \frac{2x^2+5x+9}{\sqrt{x^2+x+1}}\,\mathrm{d}x = x\sqrt{x^2+x+1} + \alpha\sqrt{x^2+x+1} + \beta\log_e\left|x+\frac{1}{2}+\sqrt{x^2+x+1}\right| + \mathrm{C}$, where C is the constant of integration, then $\alpha + 2\beta$ is equal to _____.

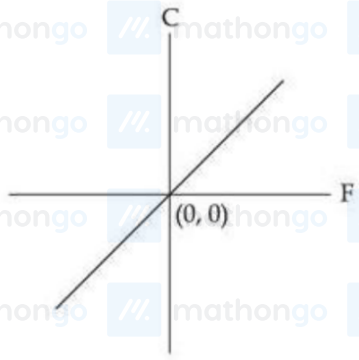
Q23. Let $y = y(x)$ be the solution of the differential equation $2\cos x\frac{\mathrm{d}y}{\mathrm{d}x} = \sin 2x - 4y\sin x, x \in \left(0, \frac{\pi}{2}\right)$. If $y\left(\frac{\pi}{3}\right) = 0$, then $y'\left(\frac{\pi}{4}\right) + y\left(\frac{\pi}{4}\right)$ is equal to _____.

Q24. Number of functions $f: \{1,2,\ldots,100\} \to \{0,1\}$, that assign 1 to exactly one of the positive integers less than or equal to 98 , is equal to _____.

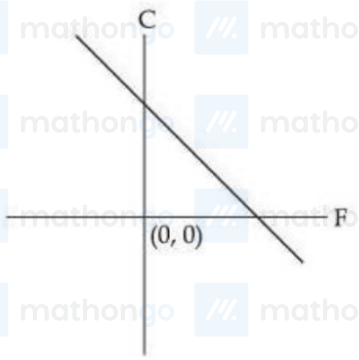
Q25. Let $\mathrm{H}_1: \frac{x^2}{\mathrm{a}^2} - \frac{y^2}{\mathrm{b}^2} = 1$ and $\mathrm{H}_2: -\frac{x^2}{\mathrm{A}^2} + \frac{y^2}{\mathrm{B}^2} = 1$ be two hyperbolas having length of latus rectums $15\sqrt{2}$ and $12\sqrt{5}$ respectively. Let their ecentricities be $e_1 = \sqrt{\frac{5}{2}}$ and e_2 respectively. If the product of the lengths of their transverse axes is $100\sqrt{10}$, then $25\mathrm{e}_2^2$ is equal to _____.

Q26. Which of the following figure represents the relation between Celsius and Fahrenheit temperatures ?

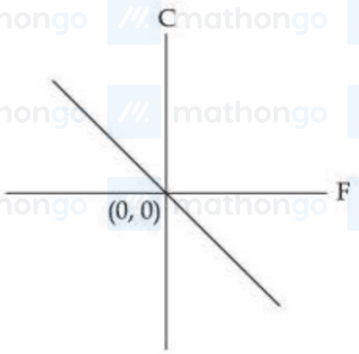
(1)



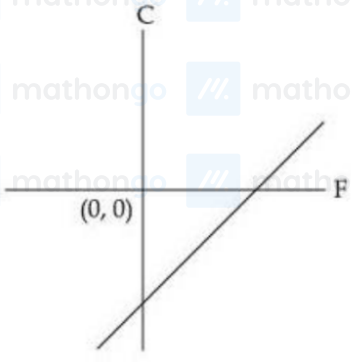
(2)



(3)



(4)



Q27. The position vector of a moving body at any instant of time is given as $\vec{r} = \left(5t^2\hat{i} - 5t\hat{j}\right)$ m. The magnitude and direction of velocity at $t = 2$ s is,

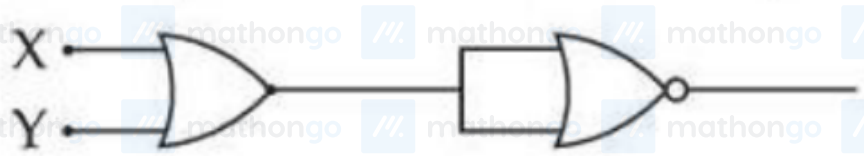
(1) $5\sqrt{15}$ m/s, making an angle of $\tan^{-1} 4$ with - ve Y axis

(2) $5\sqrt{15}$ m/s, making an angle of $\tan^{-1} 4$ with + ve X axis

(3) $5\sqrt{17}$ m/s, making an angle of $\tan^{-1} 4$ with + ve X axis

(4) $5\sqrt{17}$ m/s, making an angle of $\tan^{-1} 4$ with - ve Y axis

Q28. The output of the circuit is low (zero) for :



(A) X = 0, Y = 0 (B) $X = 0, Y = 1$ (C) $X = 1, Y = 0$ (D) X = 1, Y = 1 Choose the correct answer from the options given below :

(1) (B), (C) and (D) only

(2) (A), (B) and (C) only

(3) (A), (C) and (D) only

(4) (A), (B) and (D) only

Q29. Young's double slit inteference apparatus is immersed in a liquid of refractive index 1.44. It has slit separation of 1.5 mm . The slits are illuminated by a parallel beam of light whose wavelength in air is 690 nm . The fringe-width on a screen placed behind the plane of slits at a distance of 0.72 m , will be :

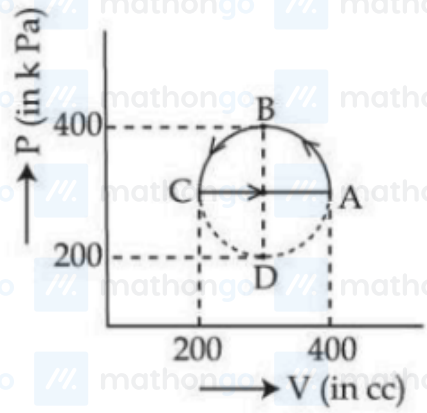
(1) 0.23 mm

(2) 0.33 mm

(3) 0.63 mm

(4) 0.46 mm

Q30. The magnitude of heat exchanged by a system for the given cyclic process ABCA (as shown in figure) is (in SI unit) :



(1) 5π

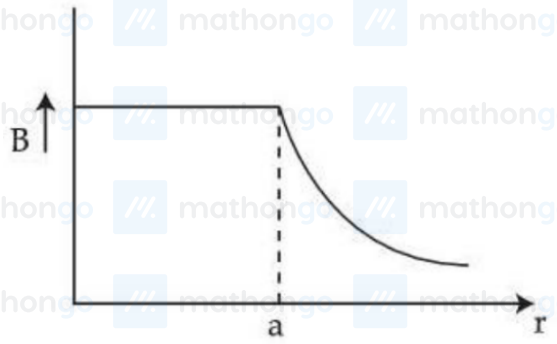
(2) 40π

(3) 10π

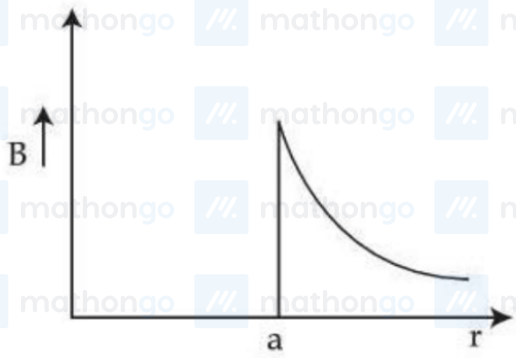
(4) zero

Q31. A long straight wire of a circular cross-section with radius ' a ' carries a steady current I. The current I is uniformly distributed across this cross-section. The plot of magnitude of magnetic field B with distance r from the centre of the wire is given by

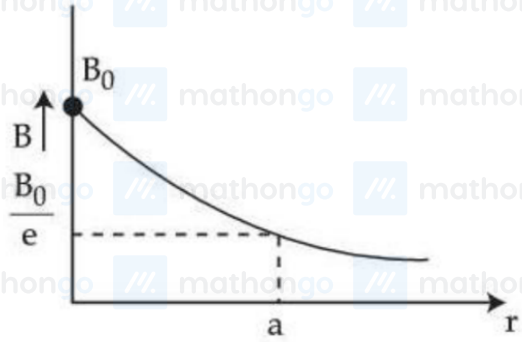
(1)



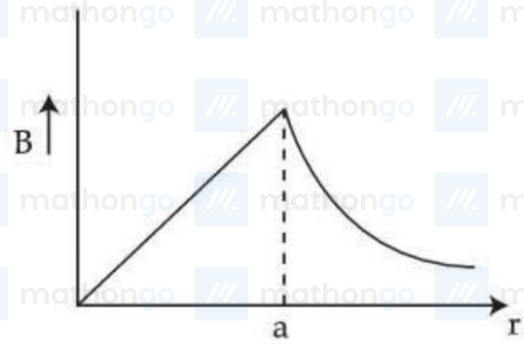
(2)



(3)



(4)



Q32. In photoelectric effect, the stopping potential $(\mathrm{V}_0)\mathrm{v/s}$ frequency (ν) curve is plotted. (h is the Planck's constant and ϕ_0 is work function of metal) (A) $\mathrm{V}_0\mathrm{v/s}\nu$ is linear. (B) The slope of $\mathrm{V}_0\mathrm{v/s}\nu$ curve $= \frac{\phi_0}{\mathrm{h}}$ (C) h constant is related to the slope of $\mathrm{V}_0\mathrm{v/s}\nu$ line. (D) The value of electric charge of electron is not required to determine h using the $V_0\mathrm{v/s}\nu$ curve. (E) The work function can be estimated without knowing the value of h. Choose the correct answer from the options given below :

(1) (C) and (D) only
(2) (A), (C) and (E) only
(3) (A), (B) and (C) only
(4) (D) and (E) only

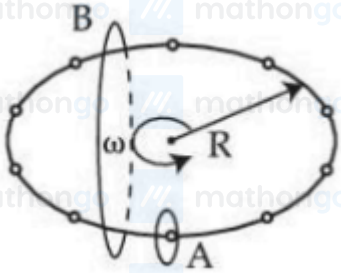
Q33. A solid sphere and a hollow sphere of the same mass and of same radius are rolled on an inclined plane. Let the time taken to reach the bottom by the solid sphere and the hollow sphere be t_1 and t_2, respectively, then

(1) $t_1 > t_2$
(2) $t_1 = t_2$
(3) $t_1 < t_2$
(4) $t_1 = 2t_2$

Q34. A small uncharged conducting sphere is placed in contact with an identical sphere but having $4 \times 10^{-8}\mathrm{C}$ charge and then removed to a distance such that the force of repulsion between them is 9×10^{-3} N. The distance between them is (Take $\frac{1}{4\pi\epsilon_o}$ as $9 \times 10^9\mathrm{inSI}$ units)

(1) 3 cm
(2) 2 cm
(3) 4 cm
(4) 1 cm

Q35.



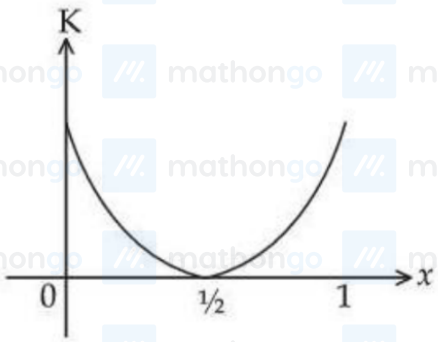
N equally spaced charges each of value q , are placed on a circle of radius R . The circle rotates about its axis with an angular velocity ω as shown in the figure. A bigger Amperian loop B encloses the whole circle where as a smaller Amperian loop A encloses a small segment. The difference between enclosed currents, $I_A - I_B$, for the given Amperian loops is

(1) $\frac{2\pi}{N}q\omega$ (2) $\frac{N^2}{2\pi}q\omega$

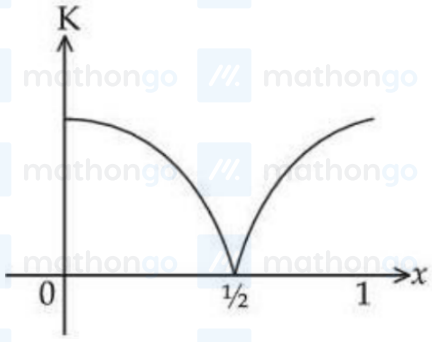
(3) $\frac{N}{\pi}q\omega$ (4) $\frac{N}{2\pi}q\omega$

Q36. A particle oscillates along the x-axis according to the law, $x(t) = x_0 \sin^2\left(\frac{t}{2}\right)$ where $x_0 = 1$ m. The kinetic energy (K) of the particle as a function of x is correctly represented by the graph

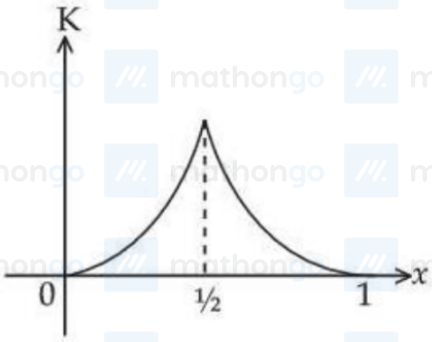
(1)



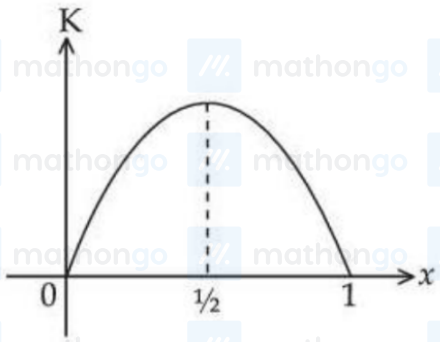
(2)



(3)



(4)

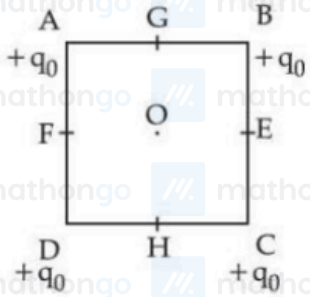


Q37. A photograph of a landscape is captured by a drone camera at a height of 18 km . The size of the camera film is 2 cm $\times$ 2 cm and the area of the landscape photographed is 400 km^2. The focal length of the lens in the drone camera is :

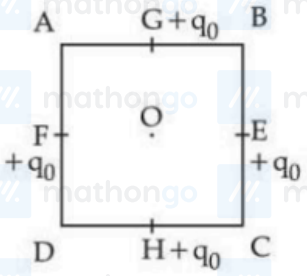
(1) 1.8 cm (2) 0.9 cm

(3) 2.8 cm (4) 2.5 cm

Q38.



Configuration (1)



Configuration (2)

(1) $\frac{Kq_0^2}{a}(4-2\sqrt{2})$ (2) $\frac{Kq_0^2}{a}(3-\sqrt{2})$

(3) $\frac{Kq_0^2}{a}(4\sqrt{2}-2)$ (4) $\frac{Kq_0^2}{a}(3\sqrt{2}-2)$

Q39. Arrange the following in the ascending order of wavelength (λ) : (A) Microwaves (λ_1) (B) Ultraviolet rays (λ_2) (C) Infrared rays (λ_3) (D) X-rays (λ_4) Choose the most appropriate answer from the options given below :

(1) $\lambda_4 < \lambda_3 < \lambda_2 < \lambda_1$ (2) $\lambda_3 < \lambda_4 < \lambda_2 < \lambda_1$

(3) $\lambda_4 < \lambda_3 < \lambda_1 < \lambda_2$ (4) $\lambda_4 < \lambda_2 < \lambda_3 < \lambda_1$

Q40. The energy E and momentum p of a moving body of mass m are related by some equation. Given that c represents the speed of light, identify the correct equation

(1) $\mathrm{E^2 = pc^2 + m^2c^2}$ (2) $\mathrm{E^2 = p^2c^2 + m^2c^2}$

(3) $\mathrm{E^2 = pc^2 + m^2c^4}$ (4) $\mathrm{E^2 = p^2c^2 + m^2c^4}$

Q41. The temperature of a body in air falls from $40^\circ\mathrm{C}$ to $24^\circ\mathrm{C}$ in 4 minutes. The temperature of the air is $16^\circ\mathrm{C}$. The temperature of the body in the next 4 minutes will be:

(1) $\frac{14}{3}^\circ\mathrm{C}$ (2) $\frac{42}{3}^\circ\mathrm{C}$

(3) $\frac{28}{3}^\circ\mathrm{C}$ (4) $\frac{56}{3}^\circ\mathrm{C}$

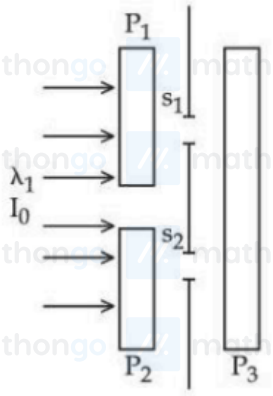
Q42. A solid sphere is rolling without slipping on a horizontal plane. The ratio of the linear kinetic energy of the centre of mass of the sphere and rotational kinetic energy is :

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

(3) $\frac{5}{2}$ (4) $\frac{2}{5}$

Q43. In a Young's double slit experiment, three polarizers are kept as shown in the figure. The transmission axes of P_1 and P_2 are orthogonal to each other. The polarizer P_3 covers both the slits with its transmission axis at 45° to those of P_1 and P_2. An unpolarized light of wavelength λ and intensity I_0 is incident on P_1 and P_2. The

intensity at a point after P_3 where the path difference between the light waves from s_1 and s_2 is $\frac{\lambda}{3}$, is



(1) $\frac{I_0}{2}$
(2) $\frac{I_0}{4}$
(3) $\frac{I_0}{3}$
(4) I_0

Q44. Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : In an insulated container, a gas is adiabatically shrunk to half of its initial volume. The temperature of the gas decreases. Reason (R): Free expansion of an ideal gas is an irreversible and an adiabatic process. In the light of the above statements, choose the correct answer from the options given below :

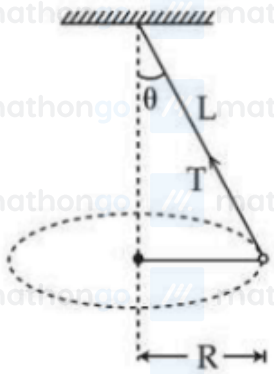
(1) Both $(\mathbf{A})$ and $(\mathbf{R})$ are true but $(\mathbf{R})$ is NOT the correct explanation of $(\mathbf{A})$
(2) (A) is false but (R) is true
(3) (A) is true but (R) is false
(4) Both $(\mathbf{A})$ and $(\mathbf{R})$ are true and $(\mathbf{R})$ is the correct explanation of $(\mathbf{A})$

Q45. Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : A electron in a certain region of uniform magnetic field is moving with constant velocity in a straight line path. Reason (R): The magnetic field in that region is along the direction of velocity of the electron. In the light of the above statements, choose the correct answer from the options given below :

(1) (A) is true but (R) is false
(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
(3) Both $(\mathbf{A})$ and $(\mathbf{R})$ are true and $(\mathbf{R})$ is the correct explanation of $(\mathbf{A})$
(4) (A) is false but (R) is true

Q46. The ratio of the power of a light source S_1 to that the light source S_2 is 2. S_1 is emitting 2×10^{15} photons per second at 600 nm . If the wavelength of the source S_2 is 300 nm , then the number of photons per second emitted by S_2 is $\ldots\ldots \times 10^{14}$.

Q47.



A string of length L is fixed at one end and carries a mass of M at the other end. The mass makes $\left(\frac{3}{\pi}\right)$ rotations per second about the vertical axis passing through end of the string as shown. The tension in the string is ..... ML.

Q48. The increase in pressure required to decrease the volume of a water sample by 0.2% is $\mathrm{P} \times 10^5 \mathrm{Nm}^{-2}$. Bulk modulus of water is $2.15 \times 10^9 \mathrm{Nm}^{-2}$. The value of P is .....

Q49. A tightly wound long solenoid carries a current of 1.5 A . An electron is executing uniform circular motion inside the solenoid with a time period of 75 ns . The number of turns per metre in the solenoid is ..... -.
[Take mass of electron $\mathrm{m_e} = 9 \times 10^{-31}$ kg, charge of electron $|\mathrm{q_e}| = 1.6 \times 10^{-19}\mathrm{C}$,
$\mu_0 = 4\pi \times 10^{-7} \frac{\mathrm{N}}{\mathrm{A}^2}, 1 \text{ ns} = 10^{-9} \text{ s}$]

Q50. Acceleration due to gravity on the surface of earth is ' g '. If the diameter of earth is reduced to one third of its original value and mass remains unchanged, then the acceleration due to gravity on the surface of the earth is ..... g.

Q51. For hydrogen atom, the orbital/s with lowest energy is/are : (A) 4 s (B) $3\mathrm{p}_x$ (C) $3\ \mathrm{d}_{x^2-y^2}$ (D) $3\ \mathrm{d}_{z^2}$ (E) $4\mathrm{p}_z$
Choose the correct answer from the options given below :
(1) (B), (C) and (D) only
(2) (A) and (E) only
(3) (A) only
(4) (B) only

Q52. Match List - I with List - II.

	List - I (Transition metal ion)		**List - II (Spin only magnetic moment (B.M.))**
(A)	Ti^{3+}	(I)	3.87
(B)	V^{2+}	(II)	0.00
(C)	Ni^{2+}	(III)	1.73
(D)	Sc^{3+}	(IV)	2.84

Choose the correct answer from the options given below :
(1) (A) $-$(III), (B) $-$ (I), (C) $-$ (IV), (D) $-$ (II)
(2) (A) $-$(III), (B) $-$ (I), (C) $-$ (II), (D) $-$ (IV)
(3) (A) $-$(IV), (B) $-$ (II), (C) $-$ (III), (D) $-$ (I)
(4) (A) $-$ (II), (B) $-$ (IV), (C) $-$ (I), (D) $-$ (III)

Q53. Given below are two statements : Statement (I): Experimentally determined oxygen-oxygen bond lengths in the $\mathrm{O_3}$ are found to be same and the bond length is greater than that of a $\mathrm{O=O}$ (double bond) but less than

that of a single $(O-O)$ bond. Statement (II) : The strong lone pair-lone pair repulsion between oxygen atoms is solely responsible for the fact that the bond length in ozone is smaller than that of a double bond $(\mathrm{O}=\mathrm{O})$ but more than that of a single bond $(\mathrm{O}-\mathrm{O})$. In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are false
(2) Statement I is false but Statement II is true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are true

Q54. When Ethane-1,2-diamine is added progressively to an aqueous solution of Nickel (II) chloride, the sequence of colour change observed will be :

(1) Violet $\rightarrow$ Blue $\rightarrow$ Pale Blue $\rightarrow$ Green
(2) Pale Blue $\rightarrow$ Blue $\rightarrow$ Green $\rightarrow$ Violet
(3) Green $\rightarrow$ Pale Blue $\rightarrow$ Blue $\rightarrow$ Violet
(4) Pale Blue $\rightarrow$ Blue $\rightarrow$ Violet $\rightarrow$ Green

Q55. Given below are two statements :

Statement (I) : The first ionization energy of Pb is greater than that of Sn .

Statement (II) : The first ionization energy of Ge is greater than that of Si .

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is false but Statement II is true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are true
(4) Both Statement I and Statement II are false

Q56. Identify correct statement/s : (A) $-\mathrm{OCH}_3$ and $-\mathrm{NHCOCH}_3$ are activating group. (B) -CN and -OH are meta directing group. (C) -CN and $-\mathrm{SO}_3\mathrm{H}$ are meta directing group. (D) Activating groups act as ortho - and para directing groups. (E) Halides are activating groups. Choose the correct answer from the options given below :

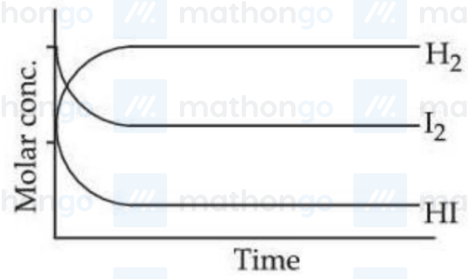
(1) (A) only
(2) (A), (B) and (E) only
(3) (A) and (C) only
(4) (A), (C) and (D) only

Q57. Based on the data given below : $\mathrm{E}^{\circ}_{\mathrm{Cr_2O_7^{2-}/Cr^{3+}}}=1.33\ \mathrm{V}$ $\mathrm{E}^{\circ}_{\mathrm{Cl_2/Cl^{(-)}}}=1.36\ \mathrm{V}$ $\mathrm{E}^{\circ}_{\mathrm{MnO_4^-/Mn^{2+}}}=1.51\ \mathrm{V}$ $\mathrm{E}^{\circ}_{\mathrm{Cr^{3+}/Cr}}=-0.74\ \mathrm{V}$ the strongest reducing agent is :

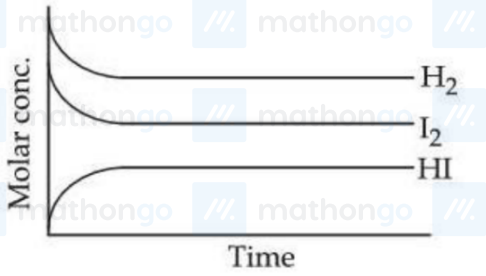
(1) Cr
(2) Cl^-
(3) MnO_4^-
(4) Mn^{2+}

Q58. For the reaction, $\mathrm{H_2(\,g) + I_2(\,g) \rightleftharpoons 2HI(\,g)}$ Attainment of equillibrium is predicted correctly by :

(1)

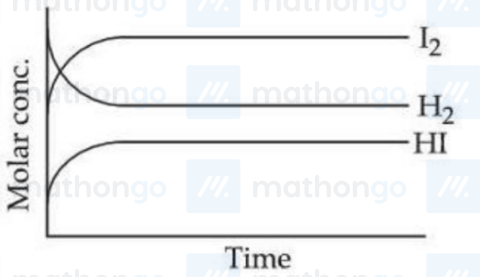


(2)



(3)

(4)



Q59. Find the compound ' A ' from the following reaction sequences. $A \xrightarrow{\text{aqua-regia}} B \xrightarrow[(2)\ AcOH]{(1)\ KNO_2|NH_4OH}$ yellow ppt

(1) CoS
(2) ZnS
(3) NiS
(4) MnS

Q60. The elemental composition of a compound is $54.2\%C, 9.2\%H$ and $36.6\%O$. If the molar mass of the compound is $132\ g\ mol^{-1}$, the molecular formula of the compound is : [Given : The relative atomic mass of $C : H : O = 12 : 1 : 16$]

(1) $C_4H_9O_3$
(2) $C_6H_{12}O_6$
(3) $C_4H_8O_2$
(4) $C_6H_{12}O_3$

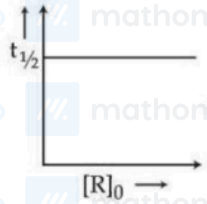
Q61. The conditions and consequence that favours the $t_{2g}{}^3 e_g{}^1$ configuration in a metal complex are

(1) weak field ligand, low spin complex
(2) weak field ligand, high spin complex
(3) strong field ligand, high spin complex
(4) strong field ligand, low spin complex

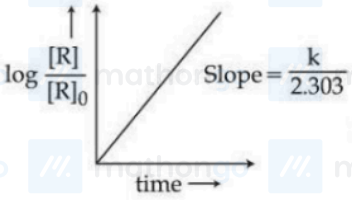
Q62. In the given structure, number of sp and sp^2 hybridized carbon atoms present respectively are :

(1) 4 and 5
(2) 3 and 5
(3) 3 and 6
(4) 4 and 6

Q63.

Statement (I) : 

is valid for first order reaction.

Statement (II) : 

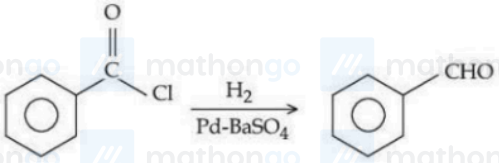
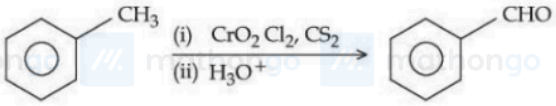
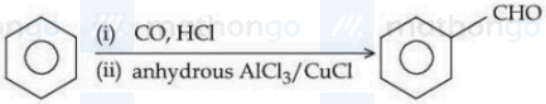
is valid for first order reaction.

Given below are two statements :

In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

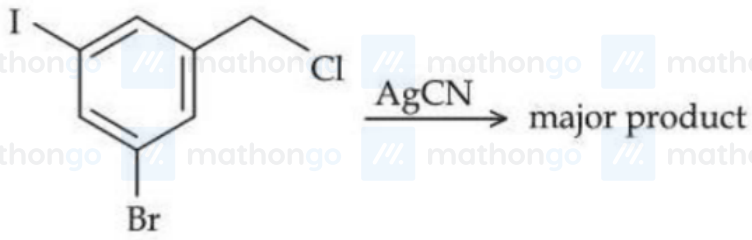
Q64. Match **List - I** with **List - II.**

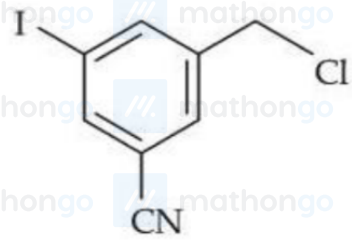
List - I	**List - II**
(A) $RCN \xrightarrow[(ii)\ H_3O^+]{(i)\ SnCl_2, HCl} R\,CHO$	(I) Etard reaction
(B) 	(II) Gatterman-Koch reaction
(C) 	(III) Rosenmund reduction
(D) 	(IV) Stephen reaction

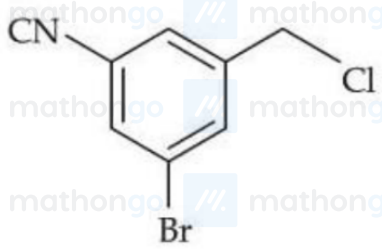
Choose the correct answer from the options given below :

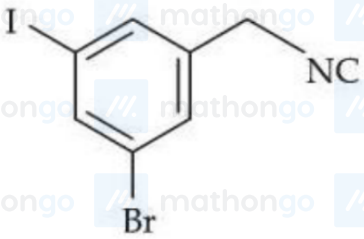
(1) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
(2) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
(3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
(4) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)

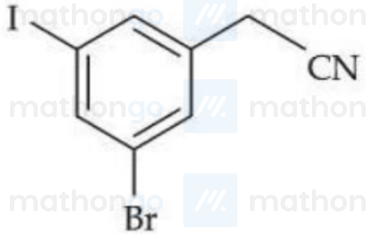
Q65. The structure of the major product formed in the following reaction is :



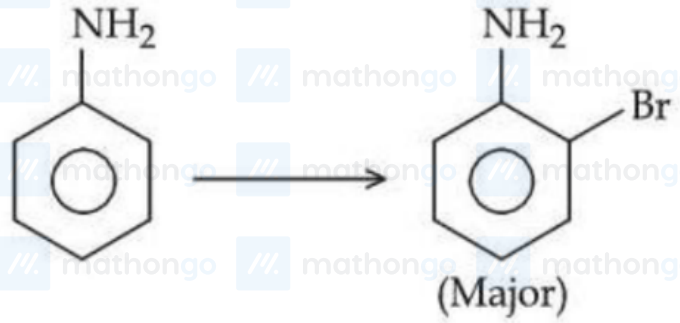
(1) 

(2) 

(3) 

(4) 

Q66.



For reaction

The correct order of set of reagents for the above conversion is :

(1) $Br_2 \mid FeBr_3, H_2O(\Delta), NaOH$

(2) $H_2SO_4, Ac_2O, Br_2, H_2O(\Delta), NaOH$

(3) $Ac_2O, Br_2, H_2O(\Delta), NaOH$

(4) $Ac_2O, H_2SO_4, Br_2, NaOH$

Q67. The successive 5 ionisation energies of an element are $800, 2427, 3658, 25024$ and $32824\ kJ/mol$, respectively. By using the above values predict the group in which the above element is present :

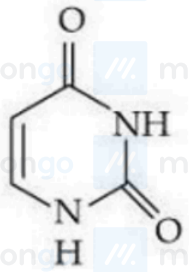
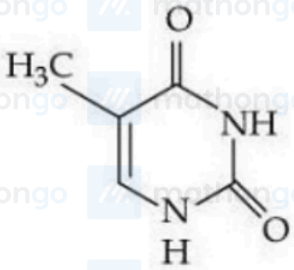
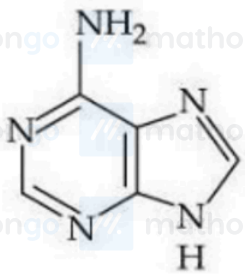
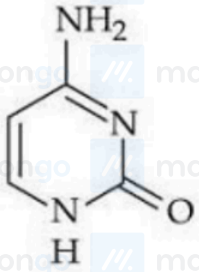
(1) Group 13

(2) Group 14

(3) Group 2

(4) Group 4

Q68. Match List - I with List - II.

List - I	List - II
(A) Adenine	(I) 
(B) Cytosine	(II) 
(C) Thymine	(III) 
(D) Uracil	(IV) 

Choose the correct answer from the options given below :

(1) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

(2) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

(3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

(4) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Q69. Which of the following mixing of 1 M base and 1 M acid leads to the largest increase in temperature?

(1) 30 mLCH_3COOH and 30 mL NaOH

(2) $45 mL CH_3COOH and 25 mL NaOH$

(3) 30 mL HCl and 30 mL NaOH

(4) 50 mL HCl and 20 mL NaOH

Q70. $\mathrm{S}(\mathrm{g})+\frac{3}{2}\mathrm{O}_2(\mathrm{g}) \rightarrow \mathrm{SO}_3(\mathrm{g})+2x\mathrm{kcal}$

$\mathrm{SO}_2(\mathrm{g})+\frac{1}{2}\mathrm{O}_2(\mathrm{g}) \rightarrow \mathrm{SO}_3(\mathrm{g})+y\mathrm{kcal}$

The heat of formation of $\mathrm{SO}_2(\mathrm{g})$ is given by :

(1) $x+y\mathrm{kcal}$

(2) $y-2x\mathrm{kcal}$

(3) $\frac{2x}{y}\mathrm{kcal}$

(4) $2x+y\mathrm{kcal}$

Q71. In Carius method of estimation of halogen, 0.25 g of an organic compound gave 0.15 g of silver bromide (AgBr). The percentage of Bromine in the organic compound is ..... $\times 10^{-1}\%$ (Nearest integer). (Given : Molar mass of Ag is 108 and Br is 80 g mol^{-1})

Q72. The observed and normal molar masses of compound MX_2 are 65.6 and 164 respectively. The percent degree of ionisation of MX_2 is ..... %. (Nearest integer)

Q73. Consider a complex reaction taking place in three steps with rate constants k_1, k_2 and k_3 respectively. The overall rate constant k is given by the expression $k=\sqrt{\frac{k_1 k_3}{k_2}}$. If the activation energies of the three steps are 60,30 and 10 kJ mol^{-1} respectively, then the overall energy of activation in kJmol^{-1} is ..... (Nearest integer)

Q74. The possible number of stereoisomers for 5-phenylpent-4-en-2-ol is .....

Q75. The hydrocarbon (X) with molar mass 80 g mol^{-1} and 90% carbon has ..... degree of unsaturation.

ANSWER KEYS

1. (3)	**2.** (3)	**3.** (2)	**4.** (1)	**5.** (1)	**6.** (3)	**7.** (1)	**8.** (2)
9. (2)	**10.** (3)	**11.** (1)	**12.** (1)	**13.** (3)	**14.** (4)	**15.** (3)	**16.** (3)
17. (2)	**18.** (1)	**19.** (2)	**20.** (1)	**21.** (957)	**22.** (16)	**23.** (1)	**24.** (392)
25. (55)	**26.** (4)	**27.** (4)	**28.** (1)	**29.** (1)	**30.** (1)	**31.** (4)	**32.** (2)
33. (3)	**34.** (2)	**35.** (4)	**36.** (4)	**37.** (1)	**38.** (4)	**39.** (4)	**40.** (4)
41. (4)	**42.** (3)	**43.** (2)	**44.** (2)	**45.** (3)	**46.** (5)	**47.** (36)	**48.** (43)
49. (250)	**50.** (9)	**51.** (1)	**52.** (1)	**53.** (3)	**54.** (3)	**55.** (2)	**56.** (4)
57. (1)	**58.** (2)	**59.** (1)	**60.** (4)	**61.** (2)	**62.** (2)	**63.** (3)	**64.** (4)
65. (3)	**66.** (2)	**67.** (1)	**68.** (2)	**69.** (3)	**70.** (2)	**71.** (255)	**72.** (75)
73. (20)	**74.** (4)	**75.** (3)					