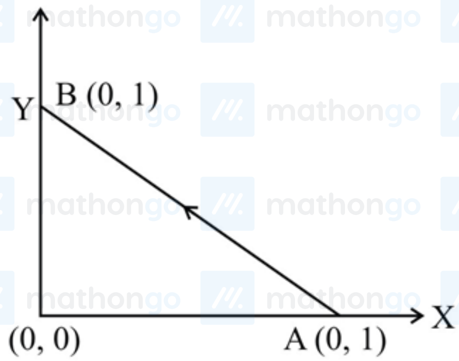
Q1. A quantity f is given by $f=\sqrt{\frac{hc^5}{G}}$ where c is speed of light, G univasal gravitational constant and h is the Planck's constant. Dimension of f is that of:

(1) area
(2) energy
(3) momentum
(4) volume

Q2. Consider a force $\overrightarrow{F}=-x\hat{i}+y\hat{j}$. The work done by this force in moving a particle from point $A(1,0)$ to $B(0,1)$



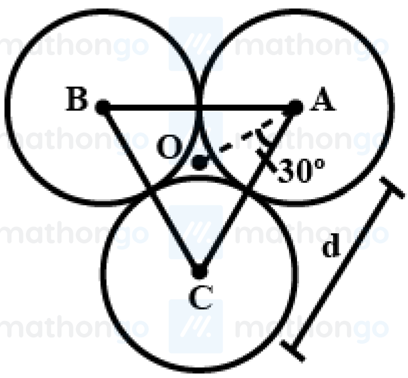
along the line segment is : (all quantities are in SI units)

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

Q3. Two particles of equal mass m have respective initial velocities $u\hat{i}$ and $u\left(\frac{\hat{i}+\hat{j}}{2}\right)$. They collide completely inelastically. The energy lost in the process is:

(1) $\frac{1}{3}mu^2$
(2) $\frac{1}{8}mu^2$
(3) $\frac{3}{4}mu^2$
(4) $\sqrt{\frac{2}{3}}mu^2$

Q4.



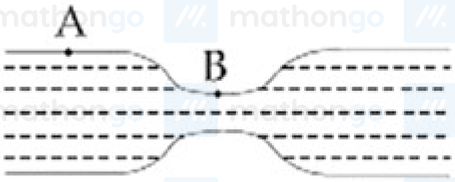
Three solid spheres each of mass m and diameter d are stuck together such that the lines connecting the centres form an equilateral triangle of side of length d . The ratio $\frac{I_0}{I_A}$ of moment of inertia I_0 of the system about an axis passing the centroid and about center of any of the spheres I_A and perpendicular to the plane of the triangle is:

(1) $\frac{13}{23}$
(2) $\frac{15}{13}$
(3) $\frac{23}{13}$
(4) $\frac{13}{15}$

Q5. A body A of mass m is moving in a circular orbit of radius R about a planet. Another body B of mass $\frac{m}{2}$ collides with A with a velocity which is half $\left(\frac{\overrightarrow{v}}{2}\right)$ the instantaneous velocity $\overrightarrow{v}$ of A. The collision is completely inelastic. Then, the combined body:

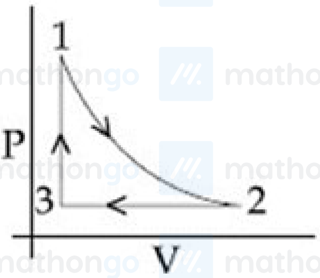
(1) continues to move in a circular orbit
(2) Escapes from the Planet's Gravitational field
(3) Falls vertically downwards towards the planet
(4) starts moving in an elliptical orbit around the planet

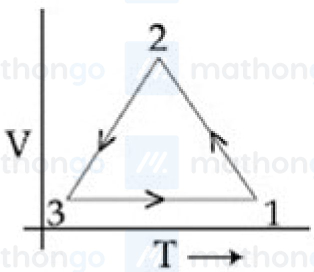
Q6. Water flows m a horizontal tube (see figure). The pressure of water changes by 700 Nm^{-2} between A and B where the area of cross section are 40 cm^2 and 20 cm^2, respectively. Find the rate of flow of water through the tube. (density of water $= 1000\ kgm^{-3}$)



(1) $3020 \mathrm{cm}^3/\mathrm{s}$
(2) $2720 \mathrm{cm}^3/\mathrm{s}$
(3) $2420 \mathrm{cm}^3/\mathrm{s}$
(4) $1810 \mathrm{cm}^3/\mathrm{s}$

Q7. Which of the following is an equivalent cyclic process corresponding to the thermodynamic cyclic given in the figure? Where, $1 \rightarrow 2$ is adiabatic. (Graphs are schematic and are not to scale)



(1)


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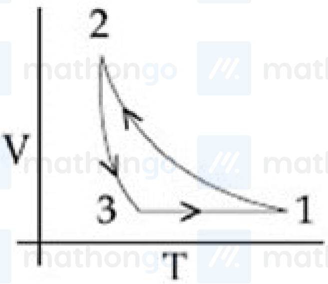
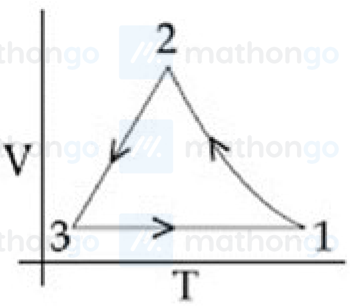


(3)


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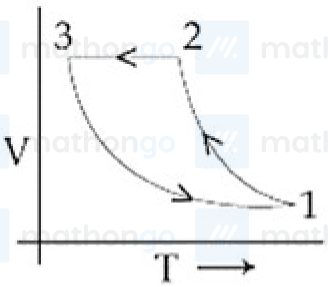
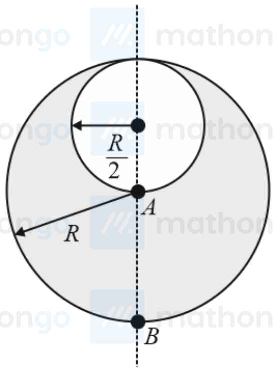


Q8. Consider two ideal diatomic gases A and B at some temperature T . Molecules of the gas A are rigid, and have a mass m . Molecules of the gas B have an additional vibrational mode and have a mass $\frac{m}{4}$. The ratio of the specific heats $\left(C_V\right)_A$ and $\left(C_V\right)_B$ of gas A and B, respectively is:

(1) 7 : 9
(2) 5 : 9
(3) 3 : 5
(4) 5 : 7

Q9. Three harmonic waves having equal frequency v and same intensity I_0 , have phase angles 0, $\frac{\pi}{4}$ and $-\frac{\pi}{4}$ respectively. When they are superimposed the intensity of the resultant wave is close to:
(1) $5.8I_0$
(2) $0.2I_0$
(3) $3I_0$
(4) I_0

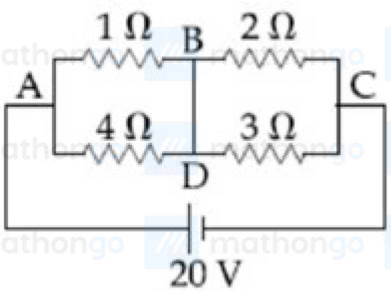
Q10. Consider a sphere of radius R which carries a uniform charge density ρ . If a sphere of radius $\frac{R}{2}$ is carved out of it, as shown, the ratio $\frac{|\overrightarrow{E_A}|}{|\overrightarrow{E_B}|}$ of magnitude of electric field $\overrightarrow{E_A}$ and $\overrightarrow{E_B}$, respectively, at points A and B due to the remaining portion is:



(1) $\frac{21}{34}$
(2) $\frac{18}{34}$
(3) $\frac{17}{54}$
(4) $\frac{18}{54}$

Q11. An electric dipole of moment $\overrightarrow{p} = \left(-\hat{i} - 3\hat{j} + 2\hat{k}\right) \times 10^{-29}$ C m at the origin $(0,0,0)$. The electric field due to this dipole at $\overrightarrow{r} = +\hat{i} + 3\hat{j} + 5\hat{k}$ (note that $\overrightarrow{r} \bullet \overrightarrow{p} = 0$) is parallel to:
(1) $\left(+\hat{i} - 3\hat{j} - 2\hat{k}\right)$
(2) $\left(-\hat{i} + 3\hat{j} - 2\hat{k}\right)$
(3) $\left(+\hat{i} + 3\hat{j} - 2\hat{k}\right)$
(4) $\left(-\hat{i} - 3\hat{j} + 2\hat{k}\right)$

Q12. In the given circuit diagram, a wire is joining points B and D. The current in this wire is:



(1) 0.4A
(2) 2A
(3) 4A
(4) zero

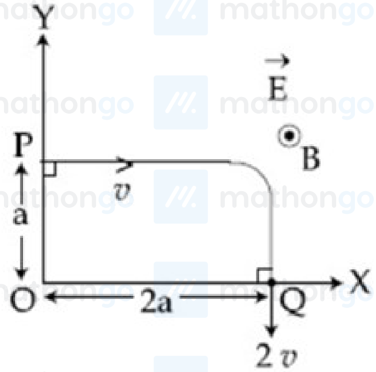
Q13. Radiation, with wavelength 6561 Å falls on a metal surface to produce photoelectrons. The electrons are made to enter a uniform magnetic field of 3×10^{-4} T . If the radius of the largest circular path followed by the electrons is 10 mm , the work function of the metal is close to:

(1) 1.6 eV
(2) 0.8eV
(3) 1.1 eV
(4) 1.8eV

Q14. A long, straight Wire of radius a carries a current distributed uniformly over its cross-section. The ratio of the magnetic fields due to the wire at distance $\frac{a}{3}$ and $2a$, respectively from the axis of the wire is:

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

Q15. A charged particle of mass ' m ' and charge ' q ' moving under the influence of uniform electric field $\vec{E}\,\hat{i}$ and a uniform magnetic field $\vec{B}\,\hat{k}$ follows a trajectory from point P to Q as shown in figure. The velocities at P and Q are respectively, $\vec{vi}$ and $-2\vec{vj}$. Then which of the following statements (A, B, C, D) are the correct? (Trajectory shown is schematic and not to scale)



(A) $E = \frac{3}{2}\left(\frac{mv^2}{qa}\right)$

(B) Rate of work done by the electric field at P is $\frac{3}{2}\left(\frac{mv^3}{a}\right)$

(C) Rate of work done by both the fields at Q is zero

(D) The difference between the magnitude of angular momentum of the particle at P and Q is 2mav .

(1) $(A),(C),(D)$
(2) $(B),(C),(D)$
(3) $(A),(B),(C)$
(4) $(A),(B),(C),(D)$

Q16. The electric fields of two plane electromagnetic plane waves in vacuum are given by $\overrightarrow{E_1} = E_0\hat{j}\cos(\omega t - kx)$ and $\overrightarrow{E_2} = E_0\hat{k}\cos(\omega t - ky)$ At $t = 0$, a particle of charge q is at origin with a velocity $\vec{v} = 08c\hat{j}$ (c is the speed of light in vaccum). The instantaneous force experienced by the particle is:

(1) $E_0q\left(0.8\hat{i} - \hat{j} + 0.4\hat{k}\right)$
(2) $E_0q\left(0.4\hat{i} - 3\hat{j} + 0.8\hat{k}\right)$
(3) $E_0q\left(-0.8\hat{i} + \hat{j} + \hat{k}\right)$
(4) $E_0q\left(0.8\hat{i} + \hat{j} + 0.2\hat{k}\right)$

Q17. A vessel of depth 2h is half filled with a liquid of refractive index $2\sqrt{2}$ and the upper half with another liquid of refractive index $\sqrt{2}$. The liquids are immiscible. The apparent depth of the inner surface of the bottom of the vessel will be

(1) $\frac{h}{\sqrt{2}}$
(2) $\frac{h}{2(\sqrt{2}+1)}$
(3) $\frac{h}{3\sqrt{2}}$
(4) $\frac{3\sqrt{2}h}{4}$

Q18. The aperture diameter of a telescope is $5m$. The separation between the moon and the earth is $4 \times 10^5 km$. With light of wavelength of 5500Å, the minimum separation between objects on the surface of moon, so that they are just resolved, is close to:

(1) 60m
(2) 20m
(3) 200m
(4) 600m

Q19. A particle moving with kinetic energy E has de Broglie wavelength λ. If energy ΔE is added to its energy, the wavelength become $\frac{\lambda}{2}$. Value of ΔE, is:

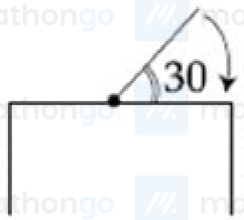
(1) E
(2) $4E$
(3) $3E$
(4) $2E$

Q20. If the screw on a screw-gauge is given six rotations, it moves by $3mm$ on the main scale. If there are 50 divisions on the circular scale the least count of the screw gauge is:

(1) 0.001cm
(2) 0.02m
(3) 0.01cm
(4) 0.001mm

Q21. The distance x covered by a paritcle in one dimensional motion varies with time t as $x^2 = at^2 + 2bt + c$. If the acceleration of the particle depends on x as x^{-n}, where n is an integer, the value of n is ________

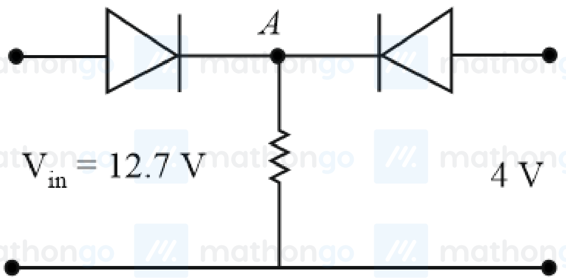
Q22. One end of a straight uniform $1m$ long bar is pivoted on horizontal table. It is released from rest when it makes an angle 30^o from the horizontal (see figure). Its angular speed when it hits the table is given as $\sqrt{n}\ rad\ s^{-1}$, where n is an integer. The value of n is ____________



Q23. A body of mass $m = 10$ kg is attached to one end of a wire of length 0.3 m. What is the maximum angular speed (in rad s^{-1}) with which it can be rotated about its other end in a space station without breaking the wire? [Breaking stress of wire (σ)= $4.8 \times 10^7\ N\ m^{-2}$ and area of cross-section of the wire= $10^{-2}\ cm^2$]

Q24. In a fluorescent lamp choke (a small transformer) $100V$ of reverse voltage is produced when the choke current changes uniformly from $0.25A$ to 0 in a duration of $0.025ms$. The self-inductance of the choke (in mH) is estimated to be ________

Q25. Both the diodes used in the circuit shown are assumed to be ideal and have negligible resistance when these are forward biased. Built in potential in each diode is $0.7V$. For the input voltages shown in the figure, the voltage (in Volts) at point A is ________



Q26. The de Broglie wavelength of an electron in the 4^{th} Bohr orbit is:

(1) $2\pi a_0$
(2) $4\pi a_0$
(3) $6\pi a_0$
(4) $8\pi a_0$

Q27. B has a smaller first ionization enthalpy than Be. Consider the following statement:

(I) it is easier to remove 2p electron than2s electron

(II) 2p electron of B is more shielded from the nucleus by the inner core of electrons than the 2s electrons of Be

(III) 2s electron has more penetration power than 2p electron

(IV) atomic radius of B is more than Be

(atomic number $B : 5,\ Be = 4$)

The correct statements are.

(1) (I), (II) and (IV)
(2) (II), (III) and (IV)
(3) (I), (II) and (III)
(4) (I), (III) and (IV)

Q28. The acidic, basic and amphoteric oxides, respectively, are

(1) $Na_2O,\ SO_3,\ Al_2O_3$
(2) $Cl_2O,\ CaO,\ P_4O_{10}$
(3) $N_2O_3,\ Li_2O,\ Al_2O_3$
(4) $MgO,\ Cl_2O,\ Al_2O_3$

Q29. If the magnetic moment of a di-oxygen species is 1.73 B. M., it may be

(1) O_2^- or O_2^+.
(2) O_2 or O_2^+.
(3) O_2 or O_2^-.
(4) O_2, O_2^- or O_2^+.

Q30. If enthalpy of atomization for $Br_2(l)$ is x kJ/mol and bond enthalpy for Br_2 is y kJ/mol, the relation between them

(1) is $x = y$.
(2) does not exist.
(3) is $x > y$.
(4) is $x < y$.

Q31. The K_{sp} for the following dissociation is 1.6×10^{-5}

$PbCl_{2(s)} \rightleftharpoons Pb^{2+}_{(aq)} + 2Cl^-_{(aq)}$

Which of the following choices is correct for a mixture of 300 mL 0.134 M $Pb(NO_3)_2$ and 100 mL 0.4 M NaCl?

(1) Not enough data provided
(2) $Q < K_{sp}$
(3) $Q > K_{sp}$
(4) $Q = K_{sp}$

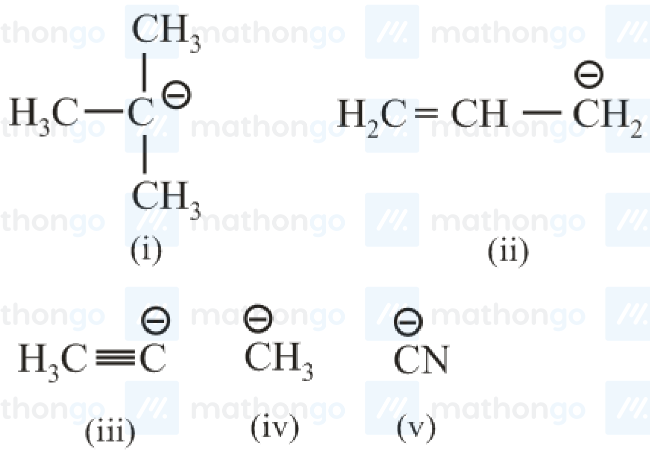
Q32. The compound that cannot act both as oxidizing and reducing agent is

(1) H_3PO_4
(2) HNO_2
(3) H_2SO_3
(4) H_2O_2

Q33. ‘ X ’ melts at low temperature and is a bad conductor of electricity in both liquid and solid state. X is:

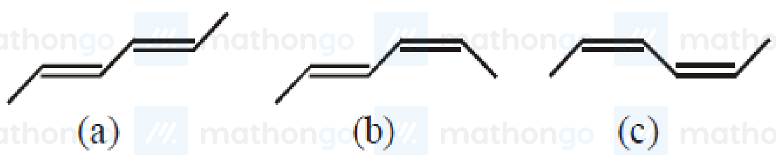
(1) zinc sulphide
(2) Mercury
(3) Silicon carbide
(4) Carbon tetrachloride

Q34. The increasing order of basicity for the following intermediates is (from weak to strong)



(1) (iii) < (i) < (ii) < (iv) < (v)
(2) (v) < (i) < (iv) < (ii) < (iii)
(3) (v) < (iii) < (ii) < (iv) < (i)
(4) (iii) < (iv) < (ii) < (i) < (v)

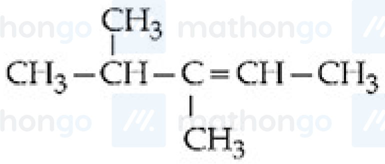
Q35. The correct order of heat of combustion for following alkadienes is:

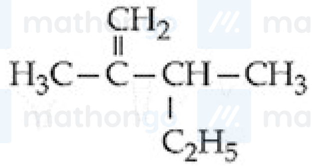


(1) (a) < (b) < (c)
(2) (a) < (c) < (b)
(3) (c) < (b) < (a)
(4) (b) < (c) < (a)

Q36. The major product (Y) in the following reactions is:

$$CH_3-\overset{\overset{CH_3}{|}}{CH}-C\equiv CH \xrightarrow[H_2O]{HgSO_4,\ H_2SO_4} X \xrightarrow[\text{(ii) Conc. } H_2SO_4/\Delta]{\text{(i) } C_2H_5MgBr,\ H_2O} Y$$

(1)


(2)


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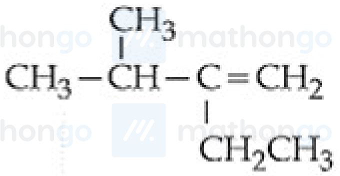

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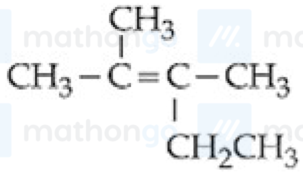


Q37. For the following reactions

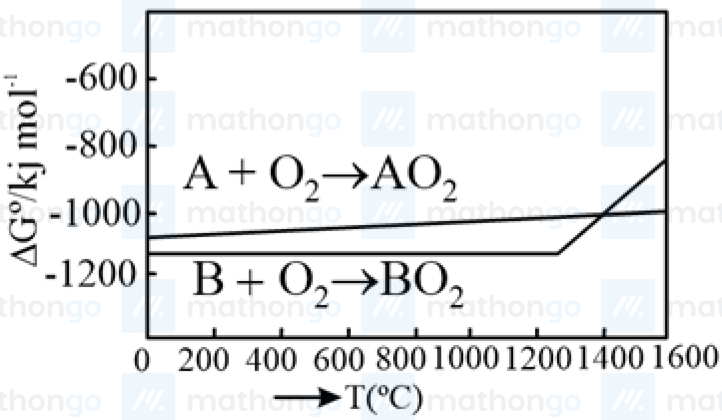
$A \xrightarrow{700K} \text{Product}$

$A \xrightarrow[\text{catalyst}]{500K} \text{Product}$

It was found that the E_a is decreased by 30 KJ/mol in the presence of catalyst. If the rate remains unchanged, the activation energy for catalysed reaction is (Assume pre-exponential factor is same)

(1) 75 KJ/mol
(2) 105 KJ/mol
(3) 135 KJ/mol
(4) 198 KJ/mol

Q38. According to the following diagram, A reduces BO_2 when the temperature is:



(1) $< 1400°C$
(2) $> 1400°C$
(3) $> 1200°C$ but $< 1400°C$
(4) $< 1200°C$

Q39. The electronic configurations of bivalent europium and trivalent cerium are:
(atomic number: Xe = 54 , Ce = 58 , Eu = 63)

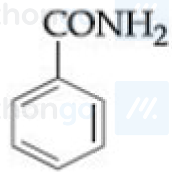
(1) $[Xe]4f^2$ and $[Xe]4f^7$
(2) $[Xe]4f^7$ and $[Xe]4f^1$
(3) $[Xe]4f^7 6s^2$ and $[Xe]4f^2 6s^2$
(4) $[Xe]4f^4$ and $[Xe]4f^9$

Q40. Complex X Of composition $Cr(H_2O)_6Cl_n$ Has a spin only magnetic moment of 3.83 B. M. It reacts with $AgNO_3$ And shows geometrical isomerism. The IUPAC nomenclature of X Is:

(1) Hexaaqua chromium(III) chloride
(2) Tetraaquadichlorido chromium(IV) chloride dihydrate
(3) Dichloridotetraaqua chromium(IV) chloride dihydrate
(4) Tetraaquadichlorido chromium(III) chloride dihydrate

Q41. $[Pd(F)(Cl)(Br)(I)]^{2-}$ has n number of geometrical isomers. Then, the spin-only magnetic moment and crystal field stabilization energy [CFSE] of $[Fe(CN)_6]^{n-6}$, respectively, are:
[Note: Ignore the pairing energy]
(1) 2.84 BM and $-16\Delta_0$
(2) 5.92 BM and 0
(3) 1.73 BM and $-2.0\Delta_0$
(4) 0 BM and $-2.4\Delta_0$

Q42. Which of these will produce the highest yield Friedel Crafts reaction?

(1)


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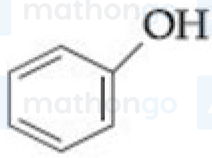

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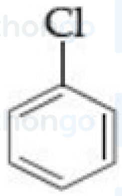

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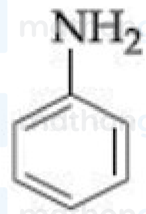
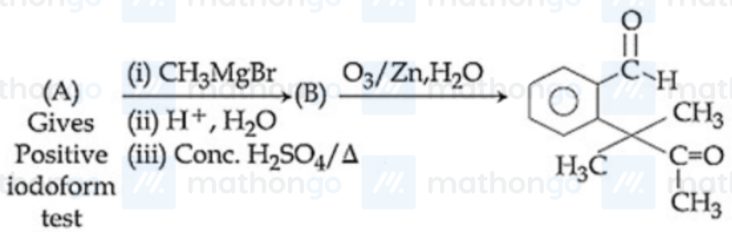
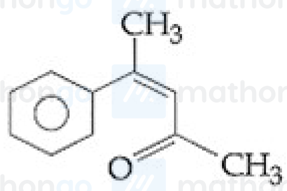
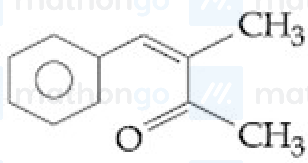
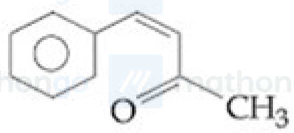


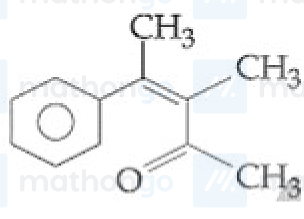
Q43. Identify (A) in the following reaction sequence:



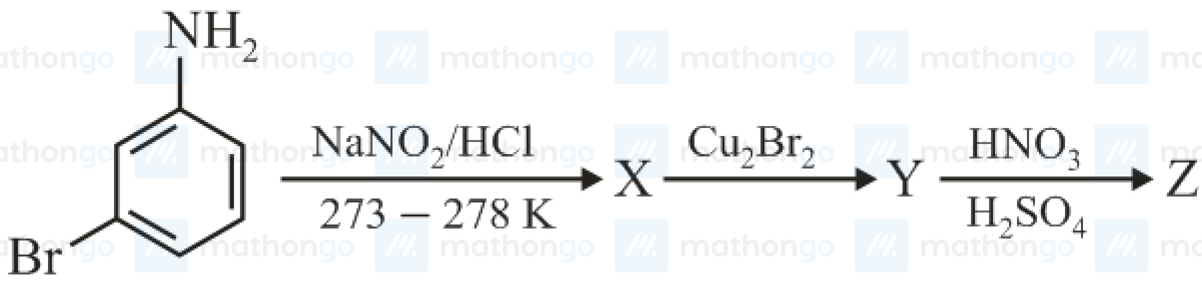
(1)


(2)


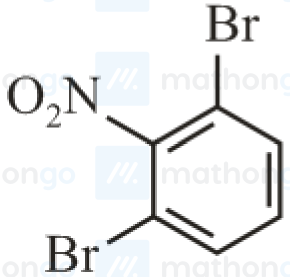
(3)


(4)


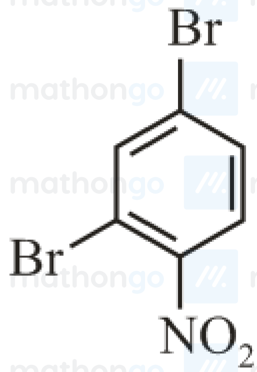
Q44. The major product Z obtained in the following reaction scheme is:



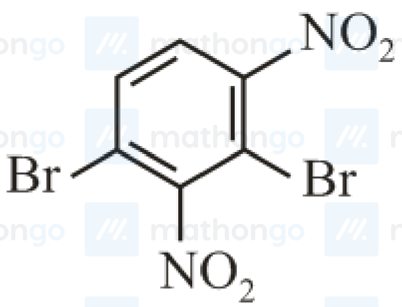
(1)



(2)



(3)



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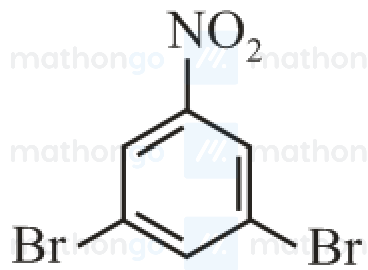

Q45. A chemist has 4 samples of artificial sweetener A, B, C and D . To identify these samples, he performed certain experiments and noted the following observations:

(i) A and D both form blue-violet colour with ninhydrin.

(ii) Lassaigne extract of C gives positive $AgNO_3$ test and negative $Fe_4[Fe(CN)_6]_3$ test.

(iii) Lassaigne extract of B and D gives positive sodium nitroprusside test.

Based on these observations which option is correct?

(1) A : Aspartame; B : Saccharin; C : Sucralose; D : Alitame

(2) A : Alitame; B : Saccharin; C : Aspartame; D : Sucralose

(3) A : Saccharin; B : Alitame; C : Sucralose; D : Aspartame

(4) A : Aspartame; B : Alitame; C : Saccharin; D : Sucralose

Q46. The molarity of HNO_3 in a sample which has density $1.4\ g/mL$ and mass percentage of 63% is ________ (Molecular Weight of $HNO_3 = 63$)

Q47. The hardness of a water sample containing 10^{-3} M $MgSO_4$ expressed as $CaCO_3$ equivalents (in ppm) is . (molar mass of $MgSO_4$ is 120.37 g/mol)

Q48. How much amount of NaCl should be added to 600 g of water ($\rho = 1.00$g/mL) to decrease the freezing point of water to $-0.2\ ^{\circ}C$? ________. (The freezing point depression constant for water = 2 K kgmol^{-1})

Q49. 108 g of silver (molar mass 108 gmol^{-1}) is deposited at cathode from $AgNO_3$(aq) solution by a certain quantity of electricity. The volume (in L) of oxygen gas produced at 273 K and 1 bar pressure from water by the same quantity of electricity is ________

Q50. The mass percentage of nitrogen in histamine is ________

Q51. The number of real roots of the equation, $e^{4x} + e^{3x} - 4e^{2x} + e^x + 1 = 0$ is:
(1) 1
(2) 3
(3) 2
(4) 4

Q52. Let z be a complex number such that $\left|\frac{z-i}{z+2i}\right| = 1$ and $|z| = \frac{5}{2}$. Then, the value of $|z+3i|$ is
(1) $\sqrt{10}$
(2) $\frac{7}{2}$
(3) $\frac{15}{4}$
(4) $2\sqrt{3}$

Q53. If the number of five digit numbers with distinct digits and 2 at the 10^{th} place is $336k$, then k is equal to:
(1) 4
(2) 6
(3) 7
(4) 8

Q54. The product $2^{\frac{1}{4}} \bullet 4^{\frac{1}{16}} \bullet 8^{\frac{1}{48}} \bullet 16^{\frac{1}{128}} \bullet \ldots$ to ∞ is equal to:
(1) $2^{\frac{1}{2}}$
(2) $2^{\frac{1}{4}}$
(3) 1
(4) 2

Q55. The value of $\cos^3\left(\frac{\pi}{8}\right).\cos\left(\frac{3\pi}{8}\right) + \sin^3\left(\frac{\pi}{8}\right).\sin\left(\frac{3\pi}{8}\right)$ is:
(1) $\frac{1}{\sqrt{2}}$
(2) $\frac{1}{2\sqrt{2}}$
(3) $\frac{1}{2}$
(4) $\frac{1}{4}$

Q56. A circle touches the y-axis at the point $(0,4)$ and passes through the point $(2,0)$. Which of the following lines is not a tangent to this circle?
(1) $4x - 3y + 17 = 0$
(2) $3x - 4y - 24 = 0$
(3) $3x + 4y - 6 = 0$
(4) $4x + 3y - 8 = 0$

Q57. If e_1 and e_2 are the eccentricities of the ellipse $\frac{x^2}{18} + \frac{y^2}{4} = 1$ and the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ respectively and (e_1, e_2) is a point on the ellipse $15x^2 + 3y^2 = k$, then the value of k is equal to
(1) 16
(2) 17
(3) 15
(4) 14

Q58. Negation of the statement: $\sqrt{5}$ is an integer or 5 is irrational is:
(1) $\sqrt{5}$ is not an integer 5 is not irrational
(2) $\sqrt{5}$ is not an integer and 5 is not irrational
(3) $\sqrt{5}$ is irrational or 5 is an integer
(4) $\sqrt{5}$ is an integer and 5 irrational

Q59. Let the observation $x_i (1 \leq i \leq 10)$ satisfy the equations $\sum_{i=1}^{10}(x_i - 5) = 10$, $\sum_{i=1}^{10}(x_i - 5)^2 = 40$. If μ and λ are the mean and the variance of the observations, $x_1 - 3, x_2 - 3, \ldots, x_{10} - 3$, then the ordered pair (μ, λ) is equal to:

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

Q60. If $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix}$, $B = adjA$ and $C = 3A$, then $\frac{|adjB|}{|C|}$ is equal to

(1) 8
(2) 16
(3) 72
(4) 2

Q61. If for some α and β in R , the intersection of the following three planes

$x + 4y - 2z = 1$
$x + 7y - 5z = \beta$
$x + 5y + \alpha z = 5$

is a line in R^3 , then $\alpha + \beta$ is equal to:

(1) 0
(2) 10
(3) 2
(4) -10

Q62. If $f(x) = \begin{cases} \frac{\sin(a+2)x + \sin x}{x} & ; x < 0 \\ b & ; x = 0 \\ \frac{(x+3x^2)^{1/3} - x^{1/3}}{x^{1/3}} & ; x > 0 \end{cases}$ is continuous at $x = 0$, then $a + 2b$ is equal to:

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

Q63. Let f be any function continuous on $[a, b]$ and twice differentiable on (a, b) . If all $x \in (a, b), f'(x) > 0$ and $f''(x) < 0$, then for any $c \in (a, b), \frac{f(c)-f(a)}{f(b)-f(c)}$

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

Q64. A spherical iron ball of 10cm radius is coated with a layer of ice of uniform thickness that melts at a rate of $50\text{cm}^3/\text{min}$. When the thickness of ice is 5cm , then the rate (in cm/min .) at which of the thickness of ice decreases, is:

(1) $\frac{5}{6\pi}$
(2) $\frac{1}{54\pi}$
(3) $\frac{1}{36\pi}$
(4) $\frac{1}{18\pi}$

Q65. The integral $\int \frac{dx}{(x+4)^{\frac{8}{7}}(x-3)^{\frac{6}{7}}}$ is equal to: (where C is a constant of integration)

(1) $\left(\frac{x-3}{x+4}\right)^{\frac{1}{7}} + C$
(2) $\left(\frac{x-3}{x+4}\right)^{\frac{-1}{7}} + C$
(3) $\frac{1}{2}\left(\frac{x-3}{x+4}\right)^{\frac{3}{7}} + C$
(4) $-\frac{1}{13}\left(\frac{x-3}{x+4}\right)^{\frac{-13}{7}} + C$

Q66. If for all real triplets (a, b, c), $f(x) = a + bx + cx^2$; then $\int_0^1 f(x)dx$ is equal to:

(1) $2\left\{3f(1)+2f\left(\frac{1}{2}\right)\right\}$
(2) $\frac{1}{2}\left\{f(1)+3f\left(\frac{1}{2}\right)\right\}$
(3) $\frac{1}{3}\left\{f(0)+f\left(\frac{1}{2}\right)\right\}$
(4) $\frac{1}{6}\left\{f(0)+f(1)+4f\left(\frac{1}{2}\right)\right\}$

Q67. The value of $\int_0^{2\pi}\frac{x\sin^8 x}{\sin^8 x+\cos^8 x}dx$ is equal to:
(1) 2π
(2) $2\pi^2$
(3) π^2
(4) 4π

Q68. If $f'(x)=\tan^{-1}(\sec x+\tan x), -\frac{\pi}{2}<x<\frac{\pi}{2}$ and $f(0)=0$, then $f(1)$ is equal to:
(1) $\frac{\pi+1}{4}$
(2) $\frac{1}{4}$
(3) $\frac{\pi-1}{4}$
(4) $\frac{\pi+2}{4}$

Q69. Let D be the centroid of the triangle with vertices $(3,-1)$, $(1,3)$ and $(2,4)$. Let P be the point of intersection of the lines $x+3y-1=10$ and $3x-y+1=0$. Then, the line passing through the points D and P also passes through the point:
(1) $(-9,-6)$
(2) (9,7)
(3) (7,6)
(4) $(-9,-7)$

Q70. In a box, there are 20 cards, out of which 10 are labelled as A and the remaining 10 are labelled as B. Cards are drawn at random, one after the other and with replacement, till a second A card is obtained. The probability that the second A card appears before the third B card is:
(1) $\frac{9}{16}$
(2) $\frac{11}{16}$
(3) $\frac{13}{16}$
(4) $\frac{15}{16}$

Q71. The number of distinct solutions of the equation, $\log_{\frac{1}{2}}|\sin x|=2-\log_{\frac{1}{2}}|\cos x|$ in the interval $[0,2\pi]$, is ________

Q72. The coefficient of x^4 in the expansion of $\left(1+x+x^2\right)^{10}$ is ________

Q73. If for $x\geq 0, y=y(x)$ is the solution of the differential equation,
$(x+1)dy=\left((x+1)^2+y-3\right)dx, y(2)=0$ then $y(3)$ is equal to ________

Q74. If the vectors, $\overrightarrow{p}=(a+1)\hat{i}+a\hat{j}+a\hat{k}, \overrightarrow{q}=a\hat{i}+(a+1)\hat{j}+a\hat{k}$ and $\overrightarrow{r}=a\hat{i}+a\hat{j}+(a+1)\hat{k}(a\in R)$ are coplanar and $3\left(\overrightarrow{p}.\overrightarrow{q}\right)^2-\lambda\left|\overrightarrow{r}\times\overrightarrow{q}\right|^2=0$, then the value of λ is ________

Q75. The projection of the line segment joining the point $(1,-1,3)$ and $(2,-4,11)$ on the line joining the points $(-1,2,3)$ and $(3,-2,10)$ is ________

ANSWER KEYS

1. (2)	**2.** (3)	**3.** (2)	**4.** (1)	**5.** (4)	**6.** (2)	**7.** (3)	**8.** (4)
9. (1)	**10.** (2)	**11.** (3)	**12.** (2)	**13.** (3)	**14.** (1)	**15.** (3)	**16.** (4)
17. (4)	**18.** (1)	**19.** (3)	**20.** (1)	**21.** (3)	**22.** (15)	**23.** (4)	**24.** (10)
25. (12)	**26.** (4)	**27.** (3)	**28.** (3)	**29.** (1)	**30.** (3)	**31.** (3)	**32.** (1)
33. (4)	**34.** (3)	**35.** (1)	**36.** (4)	**37.** (1)	**38.** (2)	**39.** (2)	**40.** (4)
41. (3)	**42.** (2)	**43.** (2)	**44.** (2)	**45.** (1)	**46.** (14)	**47.** (100)	**48.** (1.74)
49. (5.66)	**50.** (37.8)	**51.** (1)	**52.** (2)	**53.** (4)	**54.** (1)	**55.** (2)	**56.** (4)
57. (1)	**58.** (2)	**59.** (1)	**60.** (1)	**61.** (2)	**62.** (3)	**63.** (4)	**64.** (4)
65. (1)	**66.** (4)	**67.** (3)	**68.** (1)	**69.** (1)	**70.** (2)	**71.** (8)	**72.** (615)
73. (3)	**74.** (1)	**75.** (8)					