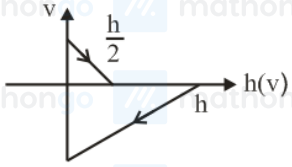
Q1. Dimensional formula for thermal conductivity is (here K denotes the temperature):

(1) $MLT^{-2}K$ (2) $MLT^{-2}K^{-2}$

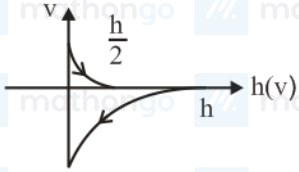
(3) $MLT^{-3}K$ (4) $MLT^{-3}K^{-1}$

Q2. A tennis ball is released from a height h and after freely falling on a wooden floor it rebounds and reaches height $h/2$. The velocity versus height of the ball during its motion may be represented graphically by: (graphs are drawn schematically and on not to scale)

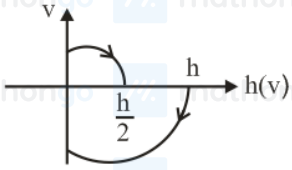
(1)



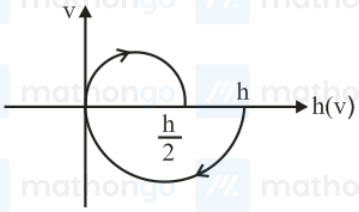
(2)



(3)



(4)

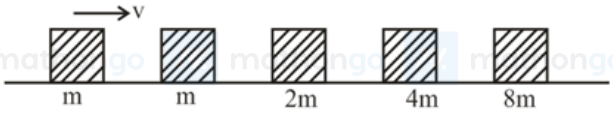


Q3. Starting from the origin at time $t = 0$, with initial velocity $5\,\hat{j}\ ms^{-1}$, a particle moves in the x -y plane with a constant acceleration of $\left(10\hat{i} + 4\hat{j}\right) ms^{-2}$. At time t, its coordinates are (20 m, y_0 m). The values of t and y_0 are, respectively:

(1) 2 s and 18 m (2) 4 s and 52 m

(3) 2 s and 24 m (4) 5 s and 25 m

Q4. Blocks of masses m, 2m, 4m and 8m are arranged in a line of a frictionless floor. Another block of mass m , moving with speed v along the same line (see figure) collides with mass m in perfectly inelastic manner. All the subsequent collisions are also perfectly inelastic. By the time the last block of mass 8m starts moving the total energy loss is p% of the original energy. Value of 'p ' is close to:



(1) 77 (2) 94

(3) 37 (4) 87

Q5. On the x-axis and at a distance x from the origin, the gravitational field due to a mass distribution is given by $\frac{Ax}{(x^2+a^2)^{3/2}}$ in the x-direction. The magnitude of the gravitational potential on the x-axis at a distance x, taking its value to be zero at infinity is:

(1) $\frac{A}{(x^2+a^2)^{1/2}}$ (2) $\frac{A}{(x^2+a^2)^{3/2}}$

(3) $A\left(x^2+a^2\right)^{1/2}$ (4) $A\left(x^2+a^2\right)^{3/2}$

Q6. A air bubble of radius 1 cm in water has an upward acceleration of 9.8 cms^{-2}. The density of water is 1 gm cm^{-3} and water offers negligible drag force on the bubble. The mass of the bubble is $\left(g = 980\ cm/s^2\right)$.

(1) 4.51 gm (2) 3.15 gm
(3) 4.15 gm (4) 1.52 gm

Q7. The specific heat of water $= 4200\ \text{J kg}^{-1}\ \text{K}^{-1}$ and the latent heat of ice $= 3.4 \times 10^5\ \text{J kg}^{-1}$. 100 grams of ice at 0 °C is placed in 200 g of water at 25 °C. The amount of ice that will melt as the temperature of water reaches 0 °C is close to (in grams)

(1) 61.7 (2) 63.8
(3) 69.3 (4) 64.6

Q8. Match the $\frac{C_p}{C_v}$ ratio for ideal gases with different type of molecules:

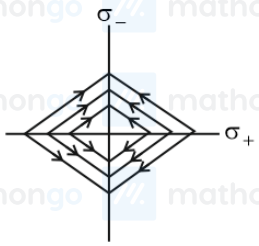
Molecule Type	C_p/C_v
(A) Monoatomic	(I) $7/5$
(B) Diatomic rigid molecules	(II) $9/7$
(C) Diatomic non-rigid molecules	(III) $4/3$
(D) Triatomic rigid molecules	(IV) $5/3$

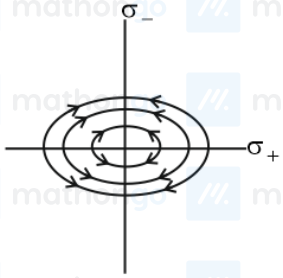
(1) (A) – (IV), (B) – (II), (C) – (I), (D) – (III) (2) (A) – (III), (B) – (IV), (C) – (II), (D) – (I)
(3) (A) – (IV), (B) – (I), (C) – (II), (D) – (III) (4) (A) – (II), (B) – (III), (C) – (I), (D) – (IV)

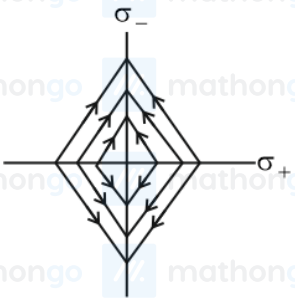
Q9. For a transvers wave travelling, along a straight line, the distance between two peaks (crests) is 5 m, while the distance between one crest and one trough is 1.5 m. The possible wavelengths (in m) of the waves are:

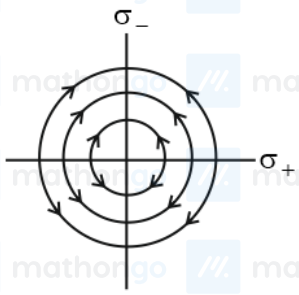
(1) 1, 3, 5 (2) $\frac{1}{1}, \frac{1}{3}, \frac{1}{5}, \ldots\ldots$
(3) 1, 2, 3, ... (4) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \ldots\ldots$

Q10. Two charged thin infinite plane sheets of uniform charge density σ_+ and σ_-, where $|\sigma_+| > |\sigma_-|$, intersect at the right angle. Which of the following best represents the electric field lines for the system:

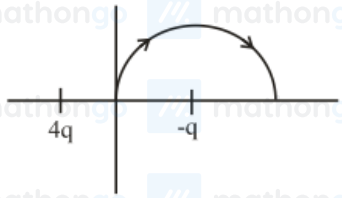
(1)


(2)


(3)


(4)


Q11. A two point charges $4q$ and $-q$ are fixed on the x -axis at $x = \frac{-d}{2}$ and $x = \frac{d}{2}$, respectively. If the third point charge 'q ' is taken from the origin to $x = d$ along the semicircle as shown in the figure, the energy of the charge will:



(1) Increase by $\frac{3q^2}{4\pi\in_0 d}$ (2) Increase by $\frac{2q^2}{3\pi\in_0 d}$

(3) decrease by $\frac{q^2}{4\pi\in_0 d}$ (4) decrease by $\frac{4q^2}{3\pi\in_0 d}$

Q12. A battery of 3.0 V is connected to a resistor dissipating 0.5 W of power. If the terminal voltage of the battery is 2.5 V, the power dissipated within the internal resistance is:

(1) 0.50 W (2) 0.072 W

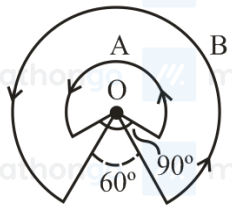
(3) 0.10 W (4) 0.125 W

Q13. A small bar magnet is placed with its axis at 30^o with an external magnetic field of 0.06 T experiences a torque of 0.018 Nm. The minimum work required to rotate it from its stable to unstable equilibrium position is:

(1) 6.4×10^{-2} J (2) 9.2×10^{-3} J

(3) 7.2×10^{-2} J (4) 11.7×10^{-3} J

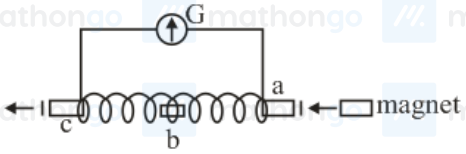
Q14. A wire A, bent in the shape of an arc of a circle, carrying a current of 2 A and having radius 2 cm and another wire B, also bent in the shape of an arc of a circle, carrying a current of 3 A and having radius of 4 cm, are placed as shown in the figure. The ratio of the magnetic fields due to the wires A and B at the common centre O is:



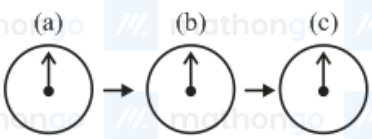
(1) 4 : 6 (2) 6 : 4

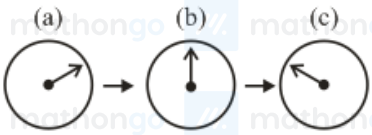
(3) 2 : 5 (4) 6 : 5

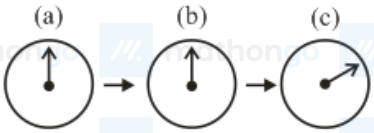
Q15. A small bar magnet is moved through a coil at constant speed from one end to the other. Which of the following series of observations will be seen on the galvanometer G attached across the coil?

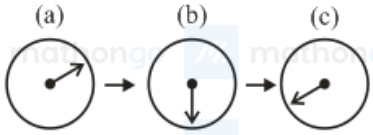


Three positions shown describe: (a) the magnet's entry (b) magnet is completely inside and (c) magnet's exit.

(1) 

(2) 

(3) 

(4) 

Q16. Choose the correct option relating wavelengths of different parts of electromagnetic wave spectrum:

(1) $\lambda_{\text{visible}} < \lambda_{\text{micro waves}} < \lambda_{\text{radio waves}} < \lambda_{\text{x-rays}}$

(2) $\lambda_{\text{radio waves}} > \lambda_{\text{micro waves}} > \lambda_{\text{visible}} > \lambda_{\text{x-rays}}$

(3) $\lambda_{\text{x-rays}} < \lambda_{\text{micro waves}} < \lambda_{\text{radio waves}} < \lambda_{\text{visible}}$

(4) $\lambda_{\text{visible}} > \lambda_{\text{x-rays}} > \lambda_{\text{radio waves}} > \lambda_{\text{micro waves}}$

Q17. A beam of plane polarized light of large cross-sectional area and uniform intensity of $3.3\ \text{W m}^{-2}$ falls normally on a polarizer (cross-sectional area $3 \times 10^{-4}\ \text{m}^2$), which rotates about its axis with an angular speed of $31.4\ \text{rad s}^{-1}$. The energy of light passing through the polarizer per revolution, is close to:

(1) 1.0×10^{-5} J

(2) 1.0×10^{-4} J

(3) 1.5×10^{-4} J

(4) 5.0×10^{-4} J

Q18. Particle A of mass $m_A = \frac{m}{2}$ moving along the x -axis with velocity v_0 collides elastically with another particle B at rest having mass $m_B = \frac{m}{3}$. If both the particles move along the x -axis after the collision, the change $\Delta\lambda$ in the wavelength of the particle A, in terms of its de-Broglie wavelength (λ_0) before the collision is:

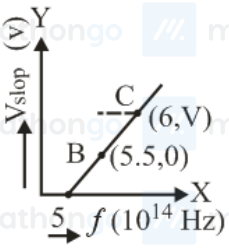
(1) $\Delta\lambda = \frac{3}{2}\lambda_0$

(2) $\Delta\lambda = \frac{5}{2}\lambda_0$

(3) $\Delta\lambda = 2\lambda_0$

(4) $\Delta\lambda = 4\lambda_0$

Q19. Given figure shows few data points in a photo-electric effect experiment for a certain metal. The minimum energy for ejection of electrons from its surface is: (Planck's constant $h = 6.62 \times 10^{-34}$ J.s)



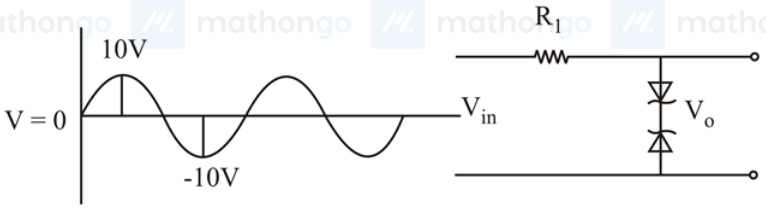
(1) 2.27 eV

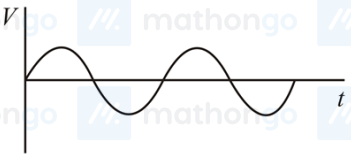
(2) 2.59 eV

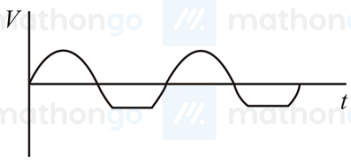
(3) 1.93 eV

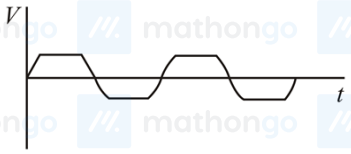
(4) 2.10 eV

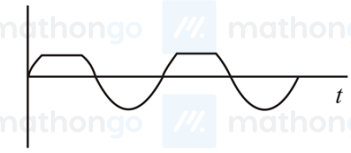
Q20. Take the breakdown voltage of the zener diode used in the given circuit as 6V. For the input voltage shown in the figure below, the time variation of the output voltage is: (Graphs drawn are schematic and not to the scale)



(1) 

(2) 

(3) 

(4) 

Q21. ABC is a plane lamina of the shape of an equilateral triangle. D, E are mid-points of AB, AC and G is the centroid of the lamina. Moment of inertia of the lamina about an axis passing through G and perpendicular to the plane ABC is I_0. If part ADE is removed, the moment of inertia of the remaining part about the same axis is $\frac{NI_0}{16}$ where N is an integer. Value of N is:

Q22. A circular disc of mass M and radius R is rotating about its axis with angular speed ω_1. If another stationary disc having radius $\frac{R}{2}$ and same mass M is dropped co-axially on to the rotating disc. Gradually both discs attain constant angular speed ω_2. The energy lost in the process is p% of the initial energy. Value of p is _____

Q23. A closed vessel contains 0.1 mole of a monoatomic ideal gas at 200 K. If 0.05 mole of the same gas at 400 K is added to it, the final equilibrium temperature (in K) of the gas in the vessel will be close to _____

Q24. In a compound microscope, the magnified virtual image is formed at a distance of 25 cm from the eye-piece. The focal length of its objective lens is 1 cm. If the magnification is 100 and the tube length of the microscope is 20 cm, then the focal length of the eye-piece lens (in cm) is _____

Q25. In the line spectra of hydrogen atom, difference between the largest and the shortest wavelengths of the Lyman series is 305 $\mathring{A}$. The corresponding difference for the Paschan series in $\mathring{A}$ is:_____

Q26. The region in the electromagnetic spectrum where the Balmer series lines appear is:

(1) Visible (2) Microwave
(3) Infrared (4) Ultraviolet

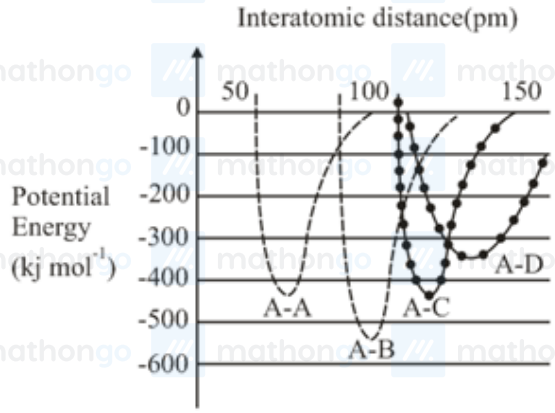
Q27. The elements with atomic numbers 101 and 104 belong to, respectively:

(1) Group 11 and Group 4 (2) Actinoids and Group 6
(3) Actinoids and Group 4 (4) Group 6 and Actinoids

Q28. The ionic radii of O^{2-}, F^-, Na^+ and Mg^{2+} are in the order:

(1) $F^- > O^{2-} > Na^+ > Mg^{2+}$ (2) $O^{2-} > F^- > Na^+ > Mg^{2+}$
(3) $Mg^{2+} > Na^+ > F^- > O^{2-}$ (4) $O^{2-} > F^- > Mg^{2+} > Na^+$

Q29. The intermolecular potential energy for the molecules A ,B , C and D given below suggests that:



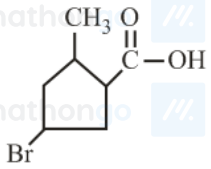
(1) $A-D$ has the shortest bond length
(2) $A-A$ has the largest bond enthalpy
(3) D is more electronegative than other atoms.
(4) $A-B$ has the stiffest bond.

Q30. For one mole of an ideal gas, which of these statements must be true?
(a) Internal energy (U) and enthalpy (H) each depends on temperature.
(b) Compressibility factor Z is not equal to 1
(c) $C_{P,m} - C_{V,m} = R$
(d) $dU = C_v\, dT$ for any process
(1) (a) and (c)
(2) (b), (c) and (d)
(3) (c) and (d)
(4) (a), (c) and (d)

Q31. On combustion of Li, Na and K in excess of air, the major oxides formed, respectively, are:
(1) Li_2O_2, Na_2O and K_2O_2
(2) Li_2O, Na_2O_2 and KO_2
(3) Li_2O, Na_2O and K_2O_2
(4) Li_2O, Na_2O_2 and K_2O

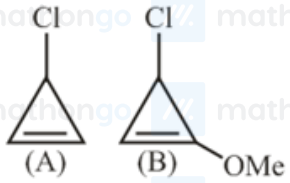
Q32. On heating, lead (ll) nitrate gives a brown gas (A). The gas (A) on cooling changes to a colourless solid/liquid (B). (B) on heating with NO changes to ablue solid (C). The oxidation number of nitrogen in solid (C) is:
(1) +5
(2) +2
(3) +3
(4) +4

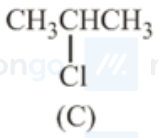
Q33. The IUPAC name of the following compound is:

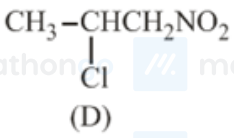


(1) 5-Bromo-3-methylcyclopentanoic acid
(2) 4-Bromo-2-methylcyclopentane carboxylic acid
(3) 3-Bromo-5-methylcyclopentanoic acid
(4) 3-Bromo-5-methylcyclopentanoic carboxylic acid

Q34. The decreasing order of reactivity of the following organic molecules towards $AgNO_3$ solution is:

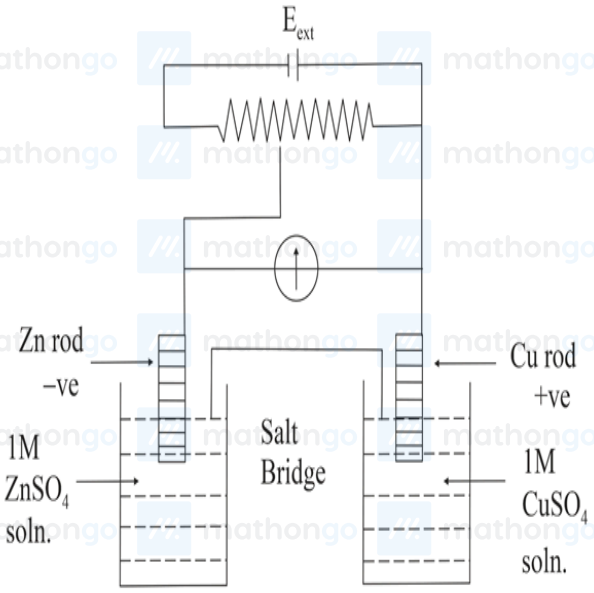






(1) (C) > (D) > (A) > (B)
(2) (A) > (B) > (D) > (C)
(3) (A) > (B) > (C) > (D)
(4) (B) > (A) > (C) > (D)

Q35.



$E^0_{Cu^{2+}|Cu} = +0.34\ V$

$E^0_{Zn^{2+}|Zn} = -0.76\ V$

Identify the incorrect statement from the options below for the above cell:

(1) If $E_{ext} > 1.1\ V$, e^- flow from Cu to Zn

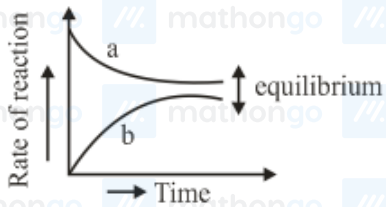
(2) If $E_{ext} > 1.1\ V$, Zn dissolves at Zn electrode and Cu deposits at Cu electrode

(3) If $E_{ext} < 1.1\ V$, Zn dissolves at anode and Cu deposits at cathode

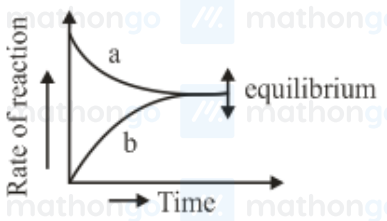
(4) If $E_{ext} = 1.1\ V$, no flow of e^- or current occurs

Q36. For the equilibrium $A \rightleftharpoons B$, the variation of the rate of the forward (a) and reverse (b) reaction with time is given by:

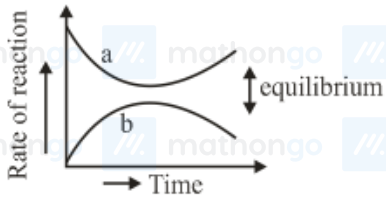
(1)



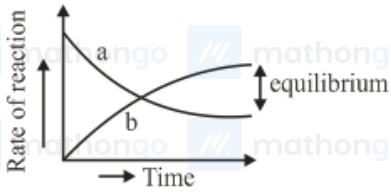
(2)



(3)



(4)



Q37. Match the following:

(i) Foam	(a) smoke
(ii) Gel	(b) cell fluid
(iii) Aerosol	(c) jellies
(iv) Emulsion	(d) rubber
	(e) froth
	(f) milk

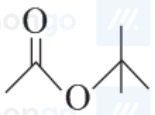
(1) (i) – (b), (ii) – (c), (iii) – (e), (iv) – (d)
(2) (i) – (d), (ii) – (b), (iii) – (a), (iv) – (e)
(3) (i) – (e), (ii) – (c), (iii) – (a), (iv) – (f)
(4) (i) – (d), (ii) – (b), (iii) – (e), (iv) – (f)

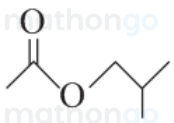
Q38. Among statements (a) – (d), the correct ones are :
(a) Lime stone is decomposed to CaO during the extraction of iron from its oxides.
(b) In the extraction of silver, silver is extracted as an anionic complex.
(c) Nickel is purified by Mond's process.
(d) Zr and Ti are purified by Van Arkel method.
(1) (a), (b), (c) and (d)
(2) (a), (c) and (d) only
(3) (b), (c) and (d) only
(4) (c) and (d) only

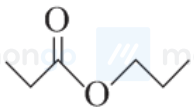
Q39. The number of isomers possible for $[Pt(en)(NO_2)_2]$ is:
(1) 2
(2) 4
(3) 1
(4) 3

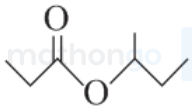
Q40. The pair in which both the species have the same magnetic moment (spin only) is:
(1) $[Cr(H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{2+}$
(2) $[Co(OH)_4]^{2-}$ and $[Fe(NH_3)_6]^{2+}$
(3) $[Mn(H_2O)_6]^{2+}$ and $[Cr(H_2O)_6]^{2+}$
(4) $[Cr(H_2O)_6]^{2+}$ and $[CoCl_4]^{2-}$

Q41. An organic compound (A) (molecular formula $C_6H_{12}O_2$) was hydrolysed with dil. H_2SO_4 to give a carboxylic acid (B) and an alcohol (C). 'C ' gives white turbidity immediately when treated with anhydrous $ZnCl_2$ and conc. HCl. The organic compound (A) is:

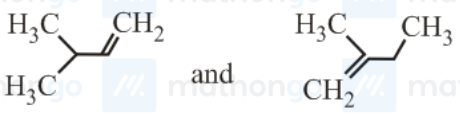
(1) 

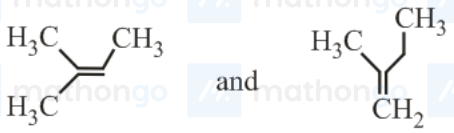
(2) 

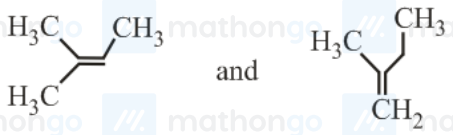
(3) 

(4) 

Q42. When neopentyl alcohol is heated with an acid, it slowly converted into an 85 : 15 mixture of alkenes A and B, respectively. What are these alkenes?

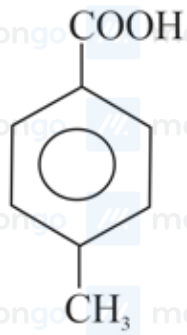
(1) 

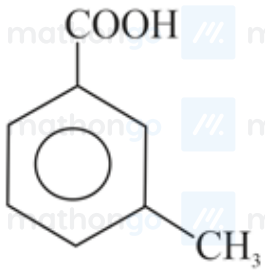
(2) 

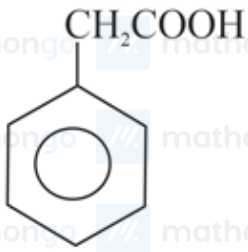
(3) 

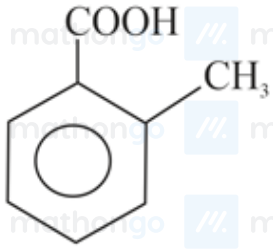
(4) 

Q43. [P] on treatment with Br_2 / $FeBr_3$ in CCl_4 produced a single isomer $C_8H_7O_2Br$ wile heating [P] with sodalime gives toluene. The compound [P] is:

(1) 

(2) 

(3) 

(4) 

Q44. Which of the following will react with $CHCl_3 + \text{alc. } KOH$?

(1) Adenine and proline
(2) Thymine and proline
(3) Adenine and lysine
(4) Adenine and thymine

Q45. What are the functional groups present in the structure of maltose?

(1) One ketal and one hemiketal
(2) Two acetals
(3) One acetal and one hemiacetal
(4) One acetal and one ketal

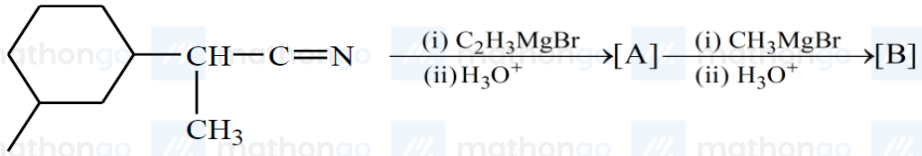
Q46. The mass of ammonia in grams produced when 2.8 kg of dinitrogen quantitatively reacts with 1 kg of dihydrogen is _____

Q47. A 20.0 mL solution containing 0.2 g impure H_2O_2 reacts completely with 0.316 g of $KMnO_4$ in acid solution. The purity of H_2O_2 (in %) is_____ (mol. wt. of $H_2O_2 = 34$; mol. wt. of $KMnO_4 = 158$)

Q48. At 300 K, the vapour pressure of a solution containing 1 mole of n -hexane and 3 moles of n -heptane is 550 mm of Hg. At the same temperature, if one more mole of n -heptane is added to this solution, the vapour pressure of the solution increases by 10 mm of Hg. What is the vapour pressure in mmHg of n - heptane in its pure state_____?

Q49. If 75% of a first order reaction was completed in 90 minutes, 60% of the same reaction would be completed in approximately (in minutes) _____
(Take: $\log 2 = 0.30$; $\log 2.5 = 0.40$)

Q50. The number of chiral centres present in [B] is _____



Q51. Let [t] denote the greatest integer$\leq$ t. Then the equation in x, $[x]^2 + 2[x+2] - 7 = 0$ has :
(1) exactly two solutions
(2) exactly four integral solutions
(3) no integral solution
(4) infinitely many solutions

Q52. Let α and β be the roots of $x^2 - 3x + p = 0$ and γ and δ be the roots of $x^2 - 6x + q = 0$. If $\alpha, \beta, \gamma, \delta$ from a geometric progression. Then ratio $(2q + p) : (2q - p)$ is
(1) 3 : 1
(2) 9 : 7
(3) 5 : 3
(4) 33 : 31

Q53. Let $u = \frac{2z+i}{z-ki}$, $z = x + iy$ and $k > 0$. If the curve represented by$\text{Re}\,(u) + \text{Im}\,(u) = 1$ intersects the y-axis at points P and Q where PQ = 5 then the value of k is
(1) $\frac{3}{2}$
(2) $\frac{1}{2}$
(3) 4
(4) 2

Q54. If $1 + (1 - 2^2 \cdot 1) + (1 - 4^2 \cdot 3) + (1 - 6^2 \cdot 5) + \ldots\ldots + (1 - 20^2 \cdot 19) = \alpha - 220\,\beta$, then an ordered pair $(\alpha,\ \beta)$ is equal to:
(1) $(10,\ 97)$
(2) $(11,\ 103)$
(3) $(10,\ 103)$
(4) $(11,\ 97)$

Q55. The value of $\sum_{r=0}^{20} {}^{50-r}C_6$ is equal to:
(1) ${}^{51}C_7 - {}^{30}C_7$
(2) ${}^{50}C_7 - {}^{30}C_7$
(3) ${}^{50}C_6 - {}^{30}C_6$
(4) ${}^{51}C_7 + {}^{30}C_7$

Q56. A triangle ABC lying in the first quadrant has two vertices as $A(1, 2)$ and $B(3, 1)$. If$\angle BAC = 90^\circ$,and ar $(\Delta\,\text{ABC}) = 5\sqrt{5}$ sq. units, then the abscissa of the vertex C is :

(1) $1+\sqrt{5}$ (2) $1+2\sqrt{5}$
(3) $2+\sqrt{5}$ (4) $2\sqrt{5}-1$

Q57. Let $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$ be a given ellipse, length of whose latus rectum is 10. If its eccentricity is the maximum value of the function, $\phi(t)=\frac{5}{12}+t-t^2$, then a^2+b^2 is equal to :
(1) 145 (2) 116
(3) 126 (4) 135

Q58. Let $P(3,3)$ be a point on the hyperbola, $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$. If the normal to it at P intersects the x-axis at $(9,0)$ and e is its eccentricity, then the ordered pair $\left(a^2,e^2\right)$ is equal to:
(1) $\left(\frac{9}{2},3\right)$ (2) $\left(\frac{3}{2},2\right)$
(3) $\left(\frac{9}{2},2\right)$ (4) $(9,3)$

Q59. Given the following two statements:
$(\mathrm{S}_1):(\mathrm{q}\vee\mathrm{p})\rightarrow(\mathrm{p}\leftrightarrow\sim\mathrm{q})$ is a tautology
$(\mathrm{S}_2):\sim\mathrm{q}\wedge(\sim\mathrm{p}\leftrightarrow\mathrm{q})$ is a fallacy. Then :
(1) both (S_1) and (S_2) are not correct. (2) only (S_1) is correct.
(3) only (S_2) is correct. (4) both (S_1) and (S_2) are correct.

Q60. The mean and variance of 8 observations are 10 and 13. 5, respectively. If 6 of these observations are $5,7,10,12,14,15$, then the absolute difference of the remaining two observations is :
(1) 9 (2) 5
(3) 3 (4) 7

Q61. Two vertical poles $AB=15\ m$ and $CD=10\ m$ are standing apart on a horizontal ground with points A and C on the ground. If P is the point of intersection of BC and AD, then the height of P (in m) above the line AC is :
(1) $20/3$ (2) 5
(3) $10/3$ (4) 6

Q62. A survey shows that 63% of the people in a city read newspaper A whereas 76% read news paper B. If $x\%$ of the people read both the newspapers, then a possible value of x can be:
(1) 29 (2) 37
(3) 65 (4) 55

Q63. If $A=\begin{bmatrix}\cos\theta & i\sin\theta\\ i\sin\theta & \cos\theta\end{bmatrix}$, $\left(\theta=\frac{\pi}{24}\right)$ and $A^5=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$, where $i=\sqrt{-1}$, then which one of the following is not true?
(1) $0\le a^2+b^2\le 1$ (2) $a^2-d^2=0$
(3) $a^2-c^2=1$ (4) $a^2-b^2=\frac{1}{2}$

Q64. If $\left(a+\sqrt{2}b\cos x\right)\left(a-\sqrt{2}b\cos y\right)=a^2-b^2$, where $a>b>0$, then $\frac{dx}{dy}$ at $\left(\frac{\pi}{4},\frac{\pi}{4}\right)$ is:
(1) $\frac{a-2b}{a+2b}$ (2) $\frac{a-b}{a+b}$
(3) $\frac{a+b}{a-b}$ (4) $\frac{2a+b}{2a-b}$

Q65. Let f be a twice differentiable function on $(1,6)$, If $f(2)=8,\ f'(2)=5,\ f'(x)\geq 1$ and $f''(x)\geq 4$, for all $x\in(1,6)$, then :

(1) $f(5)+f'(5)\leq 26$ (2) $f(5)+f'(5)\geq 28$

(3) $f'(5)+f''(5)\leq 20$ (4) $f(5)\leq 10$

Q66. The integral $\int\left(\frac{x}{x\sin x+\cos x}\right)^2 dx$ is equal to, (where C is a constant of integration):

(1) $\tan x-\frac{x\sec x}{x\sin x+\cos x}+C$ (2) $\sec x+\frac{x\tan x}{x\sin x+\cos x}+C$

(3) $\sec x-\frac{x\tan x}{x\sin x+\cos x}+C$ (4) $\tan x+\frac{x\sec x}{x\sin x+\cos x}+C$

Q67. Let $f(x)=\int\frac{\sqrt{x}}{(1+x)^2}dx\ \ (x\geq 0)$. Then $f(3)-f(1)$ is equal to :

(1) $-\frac{\pi}{12}+\frac{1}{2}+\frac{\sqrt{3}}{4}$ (2) $\frac{\pi}{6}+\frac{1}{2}-\frac{\sqrt{3}}{4}$

(3) $-\frac{\pi}{6}+\frac{1}{2}+\frac{\sqrt{3}}{4}$ (4) $\frac{\pi}{12}+\frac{1}{2}-\frac{\sqrt{3}}{4}$

Q68. Let $f(x)=|x-2|$ and $g(x)=f(f(x)),\ x\in[0,4]$. Then $\int_0^3(g(x)-f(x))\,dx$ is equal to

(1) 1 (2) 0

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

Q69. Let $y=y(x)$ be the solution of the differential equation, $xy'-y=x^2(x\cos x+\sin x)$,$x>0$. If $y(\pi)=\pi$, then $y''\left(\frac{\pi}{2}\right)+y\left(\frac{\pi}{2}\right)$ is equal to :

(1) $2+\frac{\pi}{2}$ (2) $1+\frac{\pi}{2}+\frac{\pi^2}{4}$

(3) $2+\frac{\pi}{2}+\frac{\pi^2}{4}$ (4) $1+\frac{\pi}{2}$

Q70. Let x_0 be the point of local maxima of $f(x)=\vec{a}\cdot\left(\vec{b}\times\vec{c}\right)$, where$\vec{a}=x\hat{i}-2\hat{j}+3\hat{k},\ \vec{b}=-2\hat{i}+x\hat{j}-\hat{k}$ and $\vec{c}=7\hat{i}-2\hat{j}+x\hat{k}$. Then the value of $\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$ at $x=x_0$ is:

(1) -4 (2) -30

(3) 14 (4) -22

Q71. Let $\left(2x^2+3x+4\right)^{10}=\sum_{r=0}^{20}a_r x^r$. Then $\frac{a_7}{a_{13}}$ is equal to _____

Q72. If the system of equations

$x-2y+3z=9$

$2x+y+z=b$

$x-7y+az=24$, has infinitely many solutions, then $a-b$ is equal to _____

Q73. Suppose a differentiable function $f(x)$ satisfies the identity $f(x+y)=f(x)+f(y)+xy^2+x^2y$, for all real x and y. If $\lim\limits_{x\to 0}\frac{f(x)}{x}=1$, then $f'(3)$ is equal to :

Q74. If the equation of a plane P, passing through the intersection of the planes, $x+4y-z+7=0$ and $3x+y+5z=8$ is $ax+by+6z=15$ for some $a,b\in R$, then the distance of the point $(3,2,-1)$ from the plane P is .....

Q75. The probability of a man hitting a target is $\frac{1}{10}$. The least number of shots required, so that the probability of his hitting the target at least once is greater than $\frac{1}{4}$, is....

ANSWER KEYS

1. (4)	**2.** (3)	**3.** (1)	**4.** (2)	**5.** (1)	**6.** (3)	**7.** (1)	**8.** (3)
9. (2)	**10.** (3)	**11.** (4)	**12.** (3)	**13.** (3)	**14.** (4)	**15.** (2)	**16.** (2)
17. (2)	**18.** (4)	**19.** (1)	**20.** (3)	**21.** (11)	**22.** (20)	**23.** (267)	**24.** (6.25)
25. (10553.14)	**26.** (1)	**27.** (3)	**28.** (2)	**29.** (4)	**30.** (4)	**31.** (2)	**32.** (3)
33. (2)	**34.** (4)	**35.** (2)	**36.** (2)	**37.** (3)	**38.** (1)	**39.** (4)	**40.** (1)
41. (1)	**42.** (2)	**43.** (1)	**44.** (3)	**45.** (3)	**46.** (3400)	**47.** (85)	**48.** (600)
49. (60)	**50.** (4)	**51.** (4)	**52.** (2)	**53.** (4)	**54.** (2)	**55.** (1)	**56.** (2)
57. (3)	**58.** (1)	**59.** (1)	**60.** (4)	**61.** (4)	**62.** (4)	**63.** (4)	**64.** (3)
65. (2)	**66.** (1)	**67.** (4)	**68.** (1)	**69.** (1)	**70.** (4)	**71.** (8)	**72.** (5)
73. (10)	**74.** (3)	**75.** (3)					