Q1. Given below are two statements :

Statement I : Astronomical unit (Au), Parsec (Pc) and Light year (ly) are units for measuring astronomical distances.

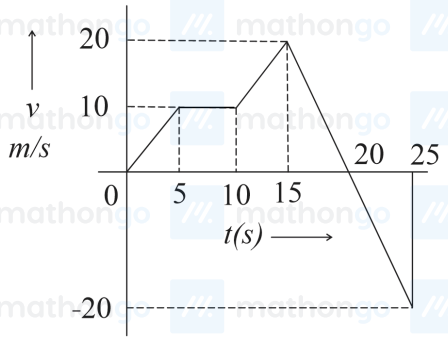
Statement II : Au < Parsec (Pc) < ly

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

(1) Both Statements I and Statements II are incorrect (2) Statements I is correct but Statements II is incorrect

(3) Both Statements I and Statements II are correct (4) Statements I is incorrect but Statements II is correct

Q2. Form the v - t graph shown, the ratio of distance to displacement in 25 s of motion is:



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

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

Q3. A coin placed on a rotating table just slips when it is placed at a distance of 1 cm from the centre. If the angular velocity of the table is halved, it will just slip when placed at a distance of _____ from the centre:

(1) 8 cm (2) 4 cm

(3) 1 cm (4) 2 cm

Q4. An average force of 125 N is applied on a machine gun firing bullets each of mass 10 g at the speed of 250 m s^{-1} to keep it in position. The number of bullets fired per second by the machine gun is :

(1) 50 (2) 25

(3) 100 (4) 5

Q5. The radii of two planets A and B are R and $4R$ and their densities are ρ and $\frac{\rho}{3}$ respectively. The ratio of acceleration due to gravity at their surfaces $g_A : g_B$ will be

(1) $4:3$ (2) $1:16$

(3) $3:16$ (4) $3:4$

Q6. 1 kg of water at $100°C$ is converted into steam at $100°C$ by boiling at atmospheric pressure. The volume of water changes from 1.00×10^{-3} m^3 as a liquid to 1.671 m^3 as steam. The change in internal energy of the system during the process will be (Given latent heat of vaporisation $= 2257$ kJ / kg, Atmospheric pressure $= 1 \times 10^5$ Pa

(1) -2426 kJ (2) +2090 kJ

(3) -2090 kJ (4) +2476 kJ

Q7. On a temperature scale 'X', the boiling point of water is 65°X and the freezing point is -15°X. Assuming that the X scale is linear. The equivalent temperature corresponding to -95°X on the Fahrenheit scale would be

(1) -112°F (2) -48°F

(3) -148°F (4) -63°F

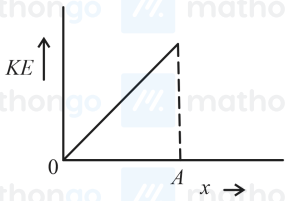
Q8. Three vessels of equal volume contain gases at the same temperature and pressure. The first vessel contains neon (monoatomic), the second contains chlorine (diatomic) and third contains uranium hexafluoride (polyatomic). Arrange these on the basis of their root mean square speed v_{rms} and choose the correct answer from the options given below:

(1) $\mathrm{v}_{rms}(\mathrm{mono}) > \mathrm{v}_{rms}(\mathrm{dia}) > \mathrm{v}_{rms}(\mathrm{poly})$ (2) $\mathrm{V}_{rms}(\mathrm{mono}) = \mathrm{V}_{rms}(\mathrm{dia}) = \mathrm{V}_{rms}(\mathrm{poly})$

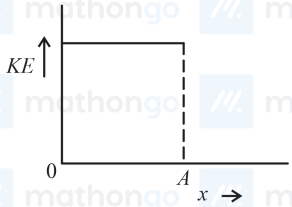
(3) $\mathrm{v}_{rms}(\mathrm{mono}) < \mathrm{v}_{rms}(\mathrm{dia}) < \mathrm{v}_{rms}(\mathrm{poly})$ (4) $\mathrm{v}_{rms}(\mathrm{dia}) < \mathrm{v}_{rms}(\mathrm{poly}) < \mathrm{v}_{rms}(\mathrm{mono})$

Q9. The variation of kinetic energy (KE) of a particle executing simple harmonic motion with the displacement (x) starting from mean position to extreme position (A) is given by

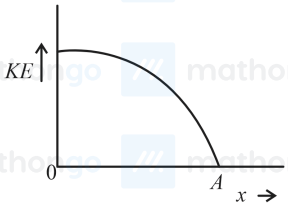
(1)



(2)



(3)



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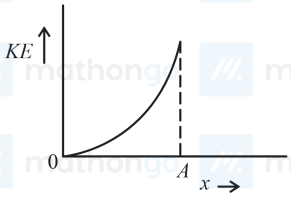


Q10. The electric field in an electromagnetic wave is given as $\vec{E} = 20\sin\omega t - \frac{x}{c}\vec{j}\ \mathrm{N\ C^{-1}}$, where ω and c are angular frequency and velocity of electromagnetic wave respectively. The energy contained in a volume of $5 \times 10^{-4}\ \mathrm{m^3}$ will be

(Given $\varepsilon_0 = 8.85 \times 10^{-12}\ \mathrm{C^2\ N^{-1}\ m^{-2}}$)

(1) 88.5×10^{-13} J (2) 17.7×10^{-13} J

(3) 28.5×10^{-13} J (4) 8.85×10^{-13} J

Q11. A parallel plate capacitor of capacitance 2 F is charged to a potential V. The energy stored in the capacitor is E_1. The capacitor is now connected to another uncharged identical capacitor in parallel combination. The energy stored in the combination is E_2. The ratio $\frac{E_2}{E_1}$ is

(1) 2: 1 (2) 2: 3

(3) 1: 2 (4) 1: 4

Q12. Two identical heater filaments are connected first in parallel and then in series. At the same applied voltage, the ratio of heat produced in same time for parallel to series will be:

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

(3) 2: 1 (4) 1: 2

Q13. The current sensitivity of moving coil galvanometer is increased by 25%. This increase is achieved only changing in the number of turns of coils and area of cross section of the wire while keeping the resistance of galvanometer coil constant. The percentage change in the voltage sensitivity will be:

(1) $+25\%$ (2) -50%

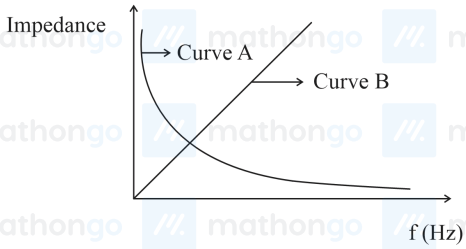
(3) -25% (4) Zero

Q14. The free space inside a current carrying toroid is filled with a material of susceptibility 2×10^{-2}. The percentage increase in the value of magnetic field inside the toroid will be

(1) 0.2% (2) 0.1%

(3) 2% (4) 1%

Q15.



As per the given graph, choose the correct representation for curve A and curve B

{Where $X_C =$ Reactance of pure capacitive circuit connected with A.C. source

$X_L =$ Reactance of pure inductive circuit connected with A.C. source

$R =$ Impedance of pure resistive circuit connected with A.C. source

$Z =$ Impedance of the LCR series circuit }

(1) $A = X_C, B = R$ (2) $A = X_L, B = R$

(3) $A = X_L, B = Z$ (4) $A = X_C, B = X_L$

Q16. The critical angle for a denser-rarer interface is 45°. The speed of light in rarer medium is 3×10^8 m s^{-1}. The speed of light in the denser medium is:

(1) 3.12×10^7 m s^{-1} (2) 5×10^7 m s^{-1}

(3) 2.12×10^8 m s^{-1} (4) $\sqrt{2} \times 10^8$ m s^{-1}

Q17. A metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V_0. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential becomes $\frac{V_0}{4}$. The threshold wavelength for this metallic surface will be

(1) 3λ (2) 4λ

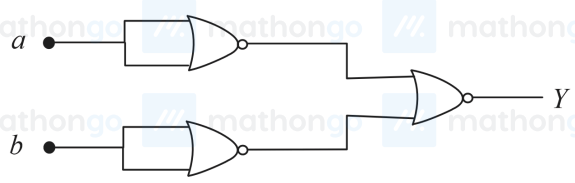
(3) $\frac{3}{2}\lambda$ (4) $\frac{\lambda}{4}$

Q18. Two radioactive elements A and B initially have same number of atoms. The half life of A is same as the average life of B. If λ_A and λ_B are decay constants of A and B respectively, then choose the correct relation from the given options.

(1) $\lambda_A \ln 2 = \lambda_B$ (2) $\lambda_A = \lambda_B$

(3) $\lambda_A = \lambda_B \ln 2$ (4) $\lambda_A = 2\lambda_B$

Q19. The logic performed by the circuit shown in figure is equivalent to



(1) AND (2) NOR
(3) OR (4) NAND

Q20. A transmitting antenna is kept on the surface of the earth. The minimum height of receiving antenna required to receive the signal in line of sight at 4 km distance from it is $x \times 10^{-2}$ m. The value of x is _____.
(Let, radius of earth $R = 6400$ km)
(1) 125 (2) 1250
(3) 12.5 (4) 1.25

Q21. A projectile fired at 30° to the ground is observed to be at same height at time 3 s and 5 s after projection, during its flight. The speed of projection of the projectile is m s^{-1}.
(Given $g = 10$ m s^{-2})

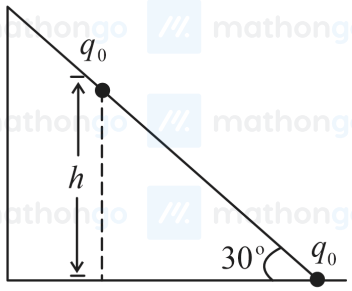
Q22. A force $\vec{F} = 2 + 3x\hat{i}$ acts on a particle in the x direction where F is in Newton and x is in meter. The work done by this force during a displacement from $x = 0$ to $x = 4$ m is _____ J.

Q23. A solid sphere of mass 500 g radius 5 cm is rotated about one of its diameter with angular speed of 10 rad s^{-1}. If the moment of inertia of the sphere about its tangent is $x \times 10^{-2}$ times its angular momentum about the diameter. Then the value of x will be

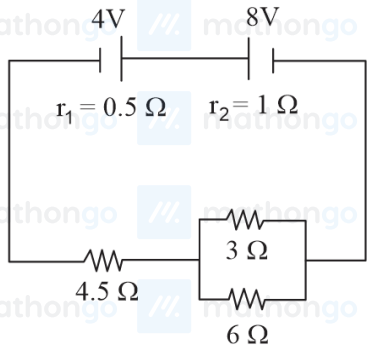
Q24. The length of a wire becomes l_1 and l_2 when 100 N and 120 N tension are applied respectively. If $10l_2 = 11l_1$, then the natural length of wire will be $\frac{1}{x}l_1$. Here the value of x is

Q25. The equation of wave is given by $Y = 10^{-2}\sin 2\pi(160t - 0.5x + \frac{\pi}{4})$, where x and Y are in m and t in s. The speed of the wave is _____ km h^{-1}.

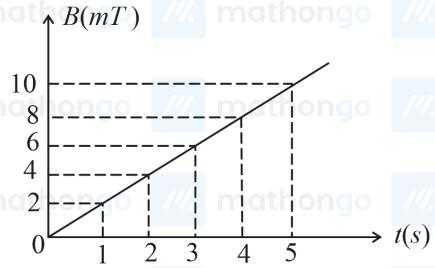
Q26. As shown in the figure, a configuration of two equal point charges $q_0 = +2\mu C$ is placed on an inclined plane. Mass of each point charge is 20 g. Assume that there is no friction between charge and plane. For the system of two point charges to be in equilibrium (at rest) the height $h = x \times 10^{-3}$ m. The value of x is
Take $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2 C^{-2}, $g = 10$ m s^{-2}



Q27. In the circuit diagram shown in figure given below, the current flowing through resistance 3 Ω is $\frac{x}{3}$ A. The value of x is _____.



Q28. The magnetic field B crossing normally a square metallic plate of area $4\ \text{m}^2$ is changing with time as shown in figure. The magnitude of induced emf in the plate during $t = 2$ s to $t = 4$ s, is _____ mV.



Q29. The radius of curvature of each surface of a convex lens having refractive index 1.8 is 20 cm. The lens is now immersed in a liquid of refractive index 1.5. The ratio of power of lens in air to its power in the liquid will be x: 1. The value of x is

Q30. A monochromatic light is incident on a hydrogen sample in ground state. Hydrogen atoms absorb a fraction of light and subsequently emit radiation of six different wavelengths. The frequency of incident light is $x \times 10^{15}$ Hz. The value of x is _____
(Given $h = 4.25 \times 10^{-15}$ eVs)

Q31. 25 mL of silver nitrate solution (1M) is added dropwise to 25 mL of potassium iodide $(1.05\ \text{M})$ solution. The ion(s) present in very small quantity in the solution is/are

(1) I^- only
(2) K^+ only
(3) NO_3^- only
(4) Ag^+ and I^- both

Q32. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A: In the photoelectric effect, the electrons are ejected from the metal surface as soon as the beam of light of frequency greater than threshold frequency strikes the surface.

Reason R : When the photon of any energy strikes an electron in the atom, transfer of energy from the photon to the electron takes place.

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

(1) Both A and R are correct and R is the correct explanation of A
(2) A is correct but R is not correct
(3) Both A and R are correct but R is NOT the correct explanation of A
(4) A is not correct but R is correct

Q33. For compound having the formula $GaAlCl_4$, the correct option from the following is

(1) Ga is coordinated with CI in $GaAlCl_4$

(2) Ga is more electronegative than AI and is present as a cationic part of the salt $GaAlCl_4$

(3) CI forms bond with both AI and Ga in $GaAlCl_4$

(4) Oxidation state of Ga in the salt $GaAlCl_4$ is $+3$

Q34. For elements B, C, N Li, Be, O and F, the correct order of first ionisation enthalpy is

(1) Li < Be < B < C < O < N < F

(2) B < Li < Be < C < N < O < F

(3) Li < Be < B < C < N < O < F

(4) Li < B < Be < C < O < N < F

Q35. Match List-I with List-II:

	List-I Species		List-II Geometry/Shape
A.	H_3O^+	I.	Tetrahedral
B.	Acetylide anion	II.	Linear
C.	NH_4^+	III.	Pyramidal
D.	ClO_2^-	IV.	Bent

Choose the correct answer from the options given below:

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

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

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

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

Q36. Match List-I with List-II:

	List-I		List-II
A.	K	I.	Thermonuclear reactions
B.	KCI	II.	Fertilizer
C.	KOH	III.	Sodium potassium pump
D.	Li	IV.	Absorbent of CO_2

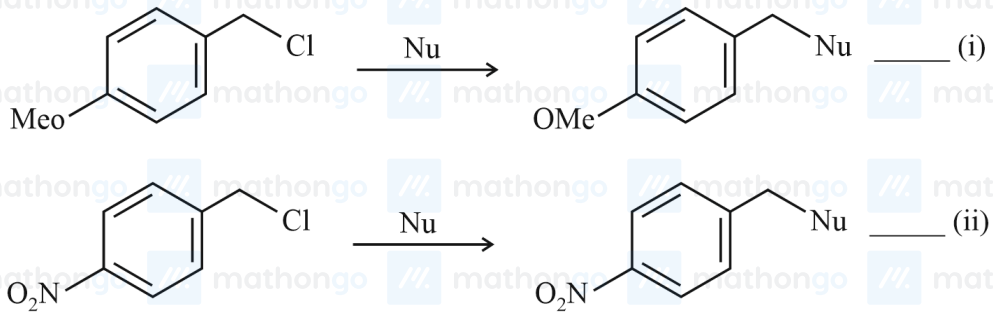
(1) A(III), B(II), C(IV), D(I)

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

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

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

Q37.

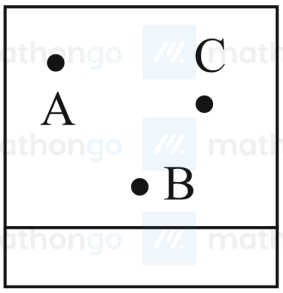


Where Nu = Nucleophile

Find out the correct statement from the options given below for the above two reactions.

(1) Reaction (I) is of 2^{nd} order and reaction (II) is of 1^{st} order
(2) Reactions (I) and (II) both are of 2^{nd} order
(3) Reactions (I) is of 1^{st} order and reaction (II) is of 2^{nd} order
(4) Reaction (I) and (II) both are of 1st order

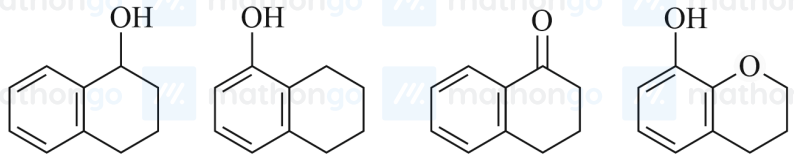
Q38. Thin layer chromatography of a mixture shows the following observation:



The correct order of elution in the silica gel column chromatography is

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

Q39. Arrange the following compounds in increasing order of rate of aromatic electrophilic substitution reaction.



a b c d

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

Q40. Given below are two statements :

Statement-I : If BOD is 4 ppm and dissolved oxygen is 8 ppm , then it is a good quality water.

Statement-II : If the concentration of zinc and nitrate salts are 5 ppm each, then it can be a good quality water.

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

(1) Statement I is correct but Statement II is incorrect
(2) Statement I is incorrect but Statement II is correct
(3) Both the statements I and II are incorrect
(4) Both the statements I and II are correct

Q41. In the extraction process of copper, the product obtained after carrying out the reactions

(i) $2Cu_2S + 3O_2 \longrightarrow 2Cu_2O + 2SO_2$

(ii) $2Cu_2O + Cu_2S \longrightarrow 6Cu + SO_2$ is called

(1) Blister copper
(2) Reduced copper
(3) Copper scrap
(4) Copper matte

Q42. Given below are two statements :

Statement-I : Methane and steam passed over a heated Ni catalyst produces hydrogen gas.

Statement-II : Sodium nitrite reacts with NH_4Cl to give H_2O, N_2 and NaCl.

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

(1) Statement I is incorrect but Statement II is correct

(2) Both the statements I and II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Both the statements I and II are correct

Q43. When a solution of mixture having two inorganic salts was treated with freshly prepared ferrous sulphate in acidic medium, a dark brown ring was formed whereas on treatment with neutral $FeCl_3$, it gave deep red colour which disappeared on boiling and a brown red ppt was formed. The mixture contains

(1) SO_3^{2-} &CH_3COO^-

(2) CH_3COO^-&NO_3^-

(3) SO_3^{2-} &$C_2O_4^{2-}$

(4) $C_2O_4^{2-}$ &NO_3^-

Q44. The complex that dissolves in water is

(1) $NH_4{}_3AsMo_3O_{10}{}_4$

(2) $Fe_4Fe(CN)_6{}_3$

(3) $K_3CoNO_2{}_6$

(4) $Fe_3(OH)_2(OAc)_6Cl$

Q45. The set which does not have ambidentate ligand(s) is

(1) $C_2O_4^{2-}$, ethylene diammine, H_2O

(2) EDTA $^{4-}$, NCS^-, $C_2O_4^{2-}$

(3) NO_2^-, $C_2O_4^{2-}$, EDTA $^{4-}$

(4) $C_2O_4^{2-}$, NO_2^-, NCS^-

Q46. Which of the following complex has a possibility to exist as meridional isomer?

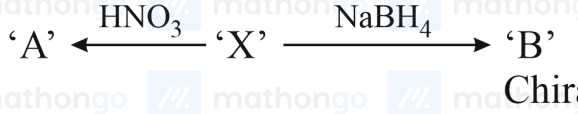
(1) $[Co(NH_3)_3(NO_2)_3]$

(2) $[Pt(NH_3)_2Cl_2]$

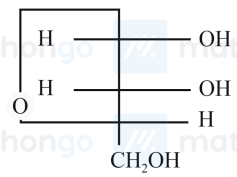
(3) $[Co(en)_2Cl_2]$

(4) $[Co(en)_3]$

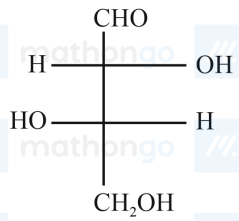
Q47. L-isomer of tetrose $X(C_4H_8O_4)$ gives positive Schiff's test and has two chiral carbons. On acetylation 'X' yields triacetate. 'X' also undergoes following reactions.



(1)



(2)



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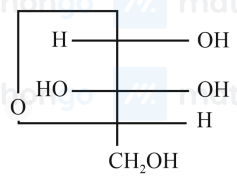

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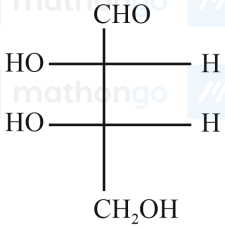
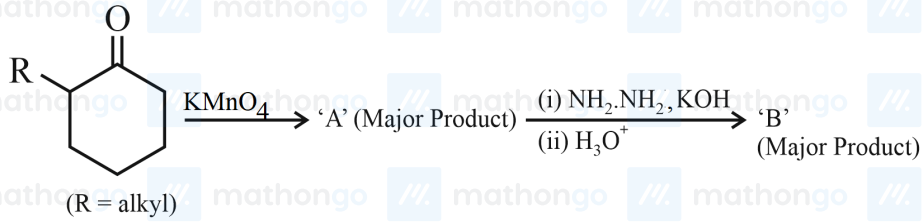
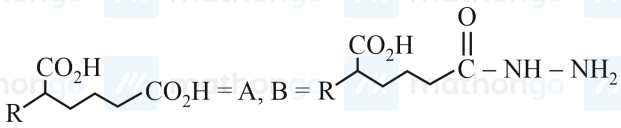


Q48.



'A' and 'B' in the above reactions are:

(1)



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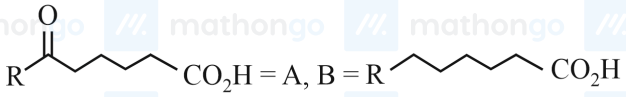
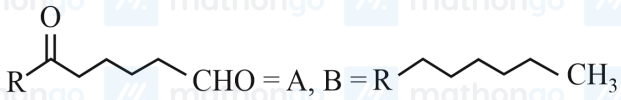


(3)



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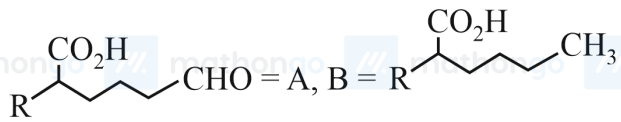
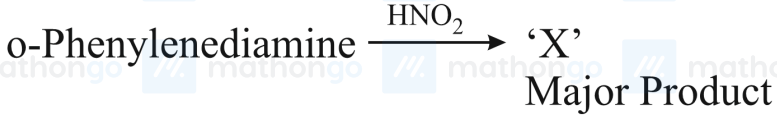
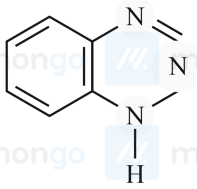


Q49.

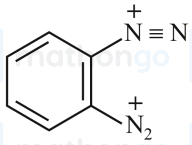


'X'

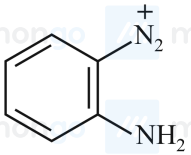
(1)



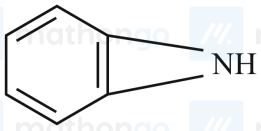
(2)



(3)



(4)



Q50. The polymer X-consists of linear molecules and is closely packed. It is prepared in the presence of trimethylammoniumpropyl and titanium tetrachloride under low pressure. The polymer X is

(1) High density polythene
(2) Polyacrylonitrile
(3) Low density polythene
(4) Polytetrafluoroethane

Q51. A solution of sugar is obtained by mixing 200 g of its 25% solution and 500 g of its 40 % solution (both by mass). The mass percentage of the resulting sugar solution is _____ (Nearest integer)

Q52. Solid fuel used in rocket is a mixture of Fe_2O_3 and Al (in ratio 1 : 2). The heat evolved (kJ) per gram of the mixture is _____ (Nearest integer)

Given $\Delta H_f^0 Al_2O_3 = -1700$ kJ mol^{-1}

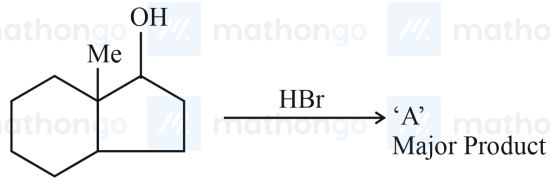
$\Delta H_f^0 Fe_2O_3 = -840$ kJ mol^{-1}

Molar mass of Fe, AI and O are 56, 27 and 16 g mol^{-1} respectively

Q53. A mixture of one mole of H_2O and 1 mole of CO is taken in a 10 litre container and heated to 725 K. At equilibrium 40% of water by mass reacts with carbon monoxide according to the equation:

$COg + H_2Og \rightleftharpoons CO_2g + H_2g$. The equilibrium constant $K_C \times 10^2$ for the reaction is _____ (Nearest integer)

Q54.



The number of hyperconjugation structures involved to stabilize carbocation formed in the above reaction is _____.

Q55. An atomic substance A of molar mass 12 g mol^{-1} has a cubic crystal structure with edge length of 300 pm. The no. of atoms present in one unit cell of A is

(Nearest integer)

Given the density of A is 3.0 g m m^{-1} and $NA_A = 6.02 \times 10^{23}$ mol^{-1}

Q56. 0.004 M K_2SO_4 solution is isotonic with 0.01 M glucose solution. Percentage dissociation of K_2SO_4 is _____ (Nearest integer)

Q57. In an electrochemical reaction of lead, at standard temperature, if $E^o_{Pb^{2+}/Pb} = m$ Volt and $E^o_{Pb^{4+}/Pb} = n$ Volt, then the value of $E°Pb^{2+}/Pb^{4+}$ is given by m – xn. The value of x is _____.

(Nearest integer)

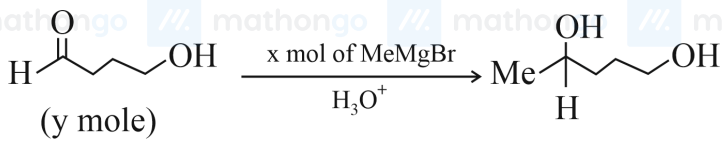
Q58. $KClO_3 + 6FeSO_4 + 3H_2SO_4 \rightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$

The above reaction was studied at 300 K by monitoring the concentration of $FeSO_4$ in which initial concentration was 10 M and after half an hour became 8.8 M. The rate of production of $Fe_2(SO_4)_3$ is _____ $\times$ $l0^{-6}$ mol L^{-1} s^{-1}

(Nearest integer)

Q59. The ratio of spin-only magnetic moment values $\mu_{eff}Cr(CN)_6^{3-} / \mu_{eff}CrH_2O6^{3+}$ is _____

Q60.



The ratio x/y on completion of the above reaction is _____ .

Q61. The number of integral solution x of $\log_{x+\frac{7}{2}}\frac{x-7^2}{2x-3} \geq 0$ is

(1) 7 (2) 8
(3) 6 (4) 5

Q62. Let w_1 be the point obtained by the rotation of $z_1 = 5+4i$ about the origin through a right angle in the anticlockwise direction, and w_2 be the point obtained by the rotation of $z_2 = 3+5i$ about the origin through a right angle in the clockwise direction. Then the principal argument $w_1 - w_2$ is equal to

(1) $\pi - \tan^{-1}\frac{8}{9}$ (2) $-\pi + \tan^{-1}\frac{33}{5}$
(3) $-\pi + \tan^{-1}\frac{8}{9}$ (4) $\pi - \tan^{-1}\frac{33}{5}$

Q63. The number of triplets $x,\ y,\ z$ where $x,\ y,\ z$ are distinct non negative integers satisfying $x+y+z=15$, is

(1) 80 (2) 136
(3) 114 (4) 92

Q64. Let $x_1, x_2, \ldots, x_{100}$ be in an arithmetic progression, with $x_1 = 2$ and their mean equal to 200 . If $y_i = ix_i - i, 1 \leq i \leq 100$, then the mean of $y_1, y_2, \ldots, y_{100}$ is

(1) 10100 (2) 10101.50
(3) 10049.50 (4) 10051.50

Q65. The number of elements in the set $S = \theta \in [0, 2\pi]: 3\cos^4\theta - 5\cos^2\theta - 2\sin^6\theta + 2 = 0$ is

(1) 10 (2) 8
(3) 12 (4) 9

Q66. Consider ellipses $E_k: kx^2 + k^2y^2 = 1, k = 1, 2, \ldots, 20$. Let C_k be the circle which touches the four chords joining the end points (one on minor axis and another on major axis) of the ellipse E_k. If r_k is the radius of the circle C_k, then the value of $\sum_{k=1}^{20}\frac{1}{r_k^2}$ is

(1) 3080 (2) 2870
(3) 3210 (4) 3320

Q67. Let R be a rectangle given by the lines $x=0,\ x=2, y=0$ and $y=5$. Let A$\alpha, 0$ and B$0, \beta,\ \alpha \in 0, 2$ and $\beta \in 0, 5$, be such that the line segment AB divides the area of the rectangle R in the ratio 4: 1. Then, the mid-point of AB lies on a

(1) straight line (2) parabola
(3) hyperbola (4) circle

Q68. Let sets A and B have 5 elements each. Let the mean of the elements in sets A and B be 5 and 8 respectively and the variance of the elements in sets A and B be 12 and 20 respectively. A new set C of 10 elements is formed by subtracting 3 from each element of A and adding 2 to each element of B. Then the sum of the mean and variance of the elements of C is

(1) 40 (2) 32
(3) 38 (4) 36

Q69. An organization awarded 48 medals in event $'A'$, 25 in event $'B'$ and 18 in event $'C'$. If these medals went to total 60 men and only five men got medals in all the three events, then, how many received medals in exactly two of three events?

(1) 15 (2) 21

(3) 10 (4) 9

Q70. Let A be a 2×2 matrix with real entries such that $A' = \alpha A + 1$, where $\alpha \in \mathbb{R}$ - -1, 1., If det A^2 - $A = 4$, the sum of all possible values of α is equal to

(1) 0 (2) $\frac{3}{2}$

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

Q71. Let $fx = x^2$ - $x + -x + x$, where $x \in \mathbb{R}$ and t denotes the greatest integer less than or equal to t. Then, f is

(1) continuous at $x = 0$, but not continuous at $x = 1$ (2) continuous at $x = 1$, but not continuous at $x = 0$

(3) continuous at $x = 0$ and $x = 1$ (4) not continuous at $x = 0$ and $x = 1$

Q72. Let $f: 2, 4 \to \mathbb{R}$ be a differentiable function such that $x\log_e xf'x + \log_e xfx + fx \geq 1, x \in 2, 4$ with $f2 = \frac{1}{2}$ and $f4 = \frac{1}{2}$.

Consider the following two statements:

(A) $fx \leq 1$, for all $x \in 2, 4$

(B) $fx \geq 1 / 8$, for all $x \in 2, 4$

Then,

(1) Neither statement (A) nor statement (B) is true (2) Only statement (B) is true

(3) Both the statements (A) and (B) are true (4) Only statement (A) is true

Q73. The value of the integral $\int_{-\log_e 2}^{\log_e 2} e^x \log_e e^x + \sqrt{1 + e^{2x}}\, dx$ is equal to

(1) $\log_e \frac{\sqrt{2}(2+\sqrt{5})^2}{\sqrt{1+\sqrt{5}}}$ - $\frac{\sqrt{5}}{2}$ (2) $\log_e \frac{(2+\sqrt{5})^2}{\sqrt{1+\sqrt{5}}} + \frac{\sqrt{5}}{2}$

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

Q74. Area of the region $x, y: x^2 + y$ - $2^2 \leq 4, x^2 \geq 2y$ is

(1) $\pi + \frac{8}{3}$ (2) $2\pi + \frac{16}{3}$

(3) π - $\frac{8}{3}$ (4) 2π - $\frac{16}{3}$

Q75. Let $y = yx$ be a solution curve of the differential equation, 1 - $x^2y^2dx = ydx + xdy$, If the line $x = 1$ intersects the curve $y = yx$ at $y = 2$ and the line $x = 2$ intersects the curve $y = yx$ at $y = \alpha$, then a value of α is

(1) $\frac{1 - 3e^2}{23e^2 + 1}$ (2) $\frac{1 + 3e^2}{23e^2 - 1}$

(3) $\frac{3e^2}{23e^2 - 1}$ (4) $\frac{3e^2}{23e^2 + 1}$

Q76. For any vector $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$, with $10a_i < 1, i = 1, 2, 3$, consider the following statements:

A : $\max a_1, a_2, a_3 \leq \vec{a}$

B : $\left|\vec{a}\right| \leq 3\max a_1, a_2, a_3$

(1) Only B is true (2) Only A is true
(3) Both A and B are true (4) Neither A nor B is true

Q77. Let $\vec{a}$ be a non-zero vector parallel to the line of intersection of the two planes described by $\hat{i}+\hat{j}, \hat{i}+\hat{k}$ and $\hat{i}$ - $\hat{j}, \hat{j}$ - $\hat{k}$. If θ is the angle between the vector $\vec{a}$ and the vector $\vec{b}=2\hat{i}$ - $2\hat{j}+\hat{k}$ and $\vec{a}\cdot\vec{b}=6$, then the ordered pair $\theta, |\vec{a}\times\vec{b}|$ is equal to

(1) $\frac{\pi}{3}, 3\sqrt{6}$ (2) $\frac{\pi}{4}, 3\sqrt{6}$
(3) $\frac{\pi}{3}, 6$ (4) $\frac{\pi}{4}, 6$

Q78. Let (α,β,γ) be the image of point $P(2,3,5)$ in the plane $2x+y$ - $3z=6$. Then $\alpha+\beta+\gamma$ is equal to

(1) 5 (2) 10
(3) 12 (4) 9

Q79. If the equation of the plane that contains the point $(-2,3,5)$ and is perpendicular to each of the planes $2x+4y+5z=8$ and $3x$ - $2y+3z=5$ is $\alpha x+\beta y+\gamma z+97=0$ then $\alpha+\beta+\gamma=$

(1) 15 (2) 18
(3) 16 (4) 17

Q80. Let $S=M=a_{ij},\ a_{ij}\in 0,1,2,\ 1\le i,j\le 2$ be a sample space and $AM\in S: M$ is invertible be an even. Then PA is equal to

(1) $\frac{16}{27}$ (2) $\frac{47}{81}$
(3) $\frac{49}{81}$ (4) $\frac{50}{81}$

Q81. If a and b are the roots of the equation x^2 - $7x$ - $1=0$, then the value of $\frac{a^{21}+b^{21}+a^{17}+b^{17}}{a^{19}+b^{19}}$ is equal to

Q82. In an examination, 5 students have been allotted their seats as per their roll numbers. The number of ways, in which none of the students sits on the allotted seat, is

Q83. Let $S=109+\frac{108}{5}+\frac{107}{5^2}+\ \ldots\ .\ +\frac{2}{5^{107}}+\frac{1}{5^{108}}$. Then the value of $16S$ - $(25)^{-54}$ is equal to

Q84. The number of integral terms in the expansion of $3^{\frac{1}{2}}+5^{\frac{1}{4}}{}^{680}$ is equal to

Q85. The mean of the coefficients of $x, x^2, \ldots\ \ldots, x^7$ in the binomial expression of $(2+x)^9$ is _____

Q86. Let H_n: $\frac{x^2}{1+n}$ - $\frac{y^2}{3+n}=1,\quad n\in\mathbb{N}$. Let k be the smallest even value of n such that the eccentricity of H_k is a rational number. If l is the length of the latus rectum of H_k, then $21l$ is equal to

Q87. The number of ordered triplets of the truth values of p, q and r such that the truth value of the statement $p\vee q\wedge p\vee r\Rightarrow q\vee r$ is True, is equal to

Q88. Let $A=\begin{matrix}0 & 1 & 2\\ a & 0 & 3\\ 1 & c & 0\end{matrix}$, where $a,c\in R$. If $A^3=A$ and the positive value of a belongs to the interval $(n$ - $1,\quad n]$, where $n\in\mathbb{N}$, then n is equal to ____.

Q89. For $m,\quad n>0$, let $\alpha m,n=\int_0^2 t^m 1+3t^n dt$. If $,11\alpha 10,6+18\alpha 11,5=p14^6$, then p is equal to

Q90. Let a line L pass through the origin and be perpendicular to the lines
$L_1: \vec{r} = \hat{i} - 11\hat{j} - 7\hat{k} + \lambda\hat{i} + 2\hat{j} + 3\hat{k}, \quad \lambda \in \mathbb{R}$ and
$L_2: \vec{r} = -\hat{i} + \hat{k} + \mu 2\hat{i} + 2\hat{j} + \hat{k}, \quad \mu \in \mathbb{R}$. If P is the point of intersection of L and L_1, and $Q\alpha, \beta, \gamma$ is the foot of perpendicular from P on L_2, then $9\alpha + \beta + \gamma$ is equal to _____.

ANSWER KEYS

1. (2)	**2.** (3)	**3.** (2)	**4.** (1)	**5.** (4)	**6.** (2)	**7.** (3)	**8.** (1)
9. (3)	**10.** (4)	**11.** (3)	**12.** (2)	**13.** (1)	**14.** (3)	**15.** (4)	**16.** (3)
17. (1)	**18.** (3)	**19.** (1)	**20.** (1)	**21.** (80)	**22.** (32)	**23.** (35)	**24.** (2)
25. (1152)	**26.** (300)	**27.** (1)	**28.** (8)	**29.** (4)	**30.** (3)	**31.** (4)	**32.** (2)
33. (2)	**34.** (4)	**35.** (3)	**36.** (1)	**37.** (3)	**38.** (3)	**39.** (4)	**40.** (4)
41. (1)	**42.** (4)	**43.** (2)	**44.** (4)	**45.** (1)	**46.** (1)	**47.** (2)	**48.** (2)
49. (1)	**50.** (1)	**51.** (36)	**52.** (4)	**53.** (44)	**54.** (7)	**55.** (4)	**56.** (75)
57. (2)	**58.** (333)	**59.** (1)	**60.** (2)	**61.** (3)	**62.** (1)	**63.** (3)	**64.** (3)
65. (4)	**66.** (1)	**67.** (3)	**68.** (3)	**69.** (2)	**70.** (4)	**71.** (2)	**72.** (3)
73. (1)	**74.** (4)	**75.** (2)	**76.** (3)	**77.** (4)	**78.** (2)	**79.** (1)	**80.** (4)
81. (51)	**82.** (44)	**83.** (2175)	**84.** (171)	**85.** (2736)	**86.** (306)	**87.** (7)	**88.** (2)
89. (32)	**90.** (5)						