Q1. To find the spring constant (k) of a spring experimentally, a student commits 2% positive error in the measurement of time and 1% negative error in measurement of mass. The percentage error in determining value of k is :

(1) 5% (2) 1%

(3) 3% (4) 4%

Q2.

LIST I	LIST II		
A.	Torque	I.	$\left[M^1L^1T^{-2}A^{-2}\right]$
B.	Magnetic field	II.	$\left[L^2A^1\right]$
C.	Magnetic moment	III.	$\left[M^1T^{-2}A^{-1}\right]$
D.	Permeability of free space	IV.	$\left[M^1L^2T^{-2}\right]$

Match List I with List II Choose the correct answer from the options given below:

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

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

Q3. A train starting from rest first accelerates uniformly up to a speed of $80\ \mathrm{km/h}$ for time t, then it moves with a constant speed for time $3t$. The average speed of the train for this duration of journey will be (in $\mathrm{km/h}$) :

(1) 40 (2) 80

(3) 30 (4) 70

Q4. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (where $m_2 > m_1$). If the acceleration of the system is $\frac{g}{\sqrt{2}}$, then the ratio of the masses $\frac{m_1}{m_2}$ is:

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

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

Q5. A bullet of mass $50\ \mathrm{g}$ is fired with a speed $100\ \mathrm{m/s}$ on a plywood and emerges with $40\ \mathrm{m/s}$. The percentage loss of kinetic energy is :

(1) 84% (2) 16%

(3) 32% (4) 44%

Q6. Four particles A, B, C, D of mass $\frac{m}{2}, m, 2m, 4m$, have same momentum, respectively. The particle with maximum kinetic energy is :

(1) B (2) A

(3) D (4) C

Q7. To project a body of mass m from earth's surface to infinity, the required kinetic energy is (assume, the radius of earth is $R_E, g =$ acceleration due to gravity on the surface of earth):

(1) $2mgR_E$ (2) $4mgR_E$

(3) mgR_E (4) $1/2mgR_E$

Q8. A small ball of mass m and density ρ is dropped in a viscous liquid of density ρ_0. After sometime, the ball falls with constant velocity. The viscous force on the ball is :

(1) $mg(1-\rho\rho_0)$ (2) $mg\left(1+\frac{\rho}{\rho_0}\right)$

(3) $mg\left(\frac{\rho_0}{\rho}-1\right)$ (4) $mg\left(1-\frac{\rho_0}{\rho}\right)$

Q9. A sample contains mixture of helium and oxygen gas. The ratio of root mean square speed of helium and oxygen in the sample, is:

(1) $\frac{1}{32}$ (2) $\frac{2\sqrt{2}}{1}$

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

Q10. The specific heat at constant pressure of a real gas obeying $PV^2=RT$ equation is:

(1) $\frac{R}{3}+C_V$ (2) C_V+R

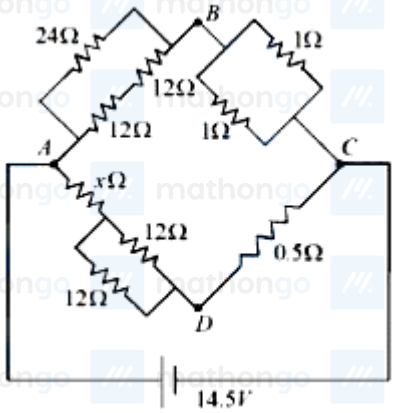
(3) $C_V+\frac{R}{2V}$ (4) R

Q11. Ques: σ is the uniform surface charge density of a thin spherical shell of radius R. The electric field at any point on the surface of the spherical shell is :

(1) $\sigma/\epsilon_o R$ (2) σ/ϵ_o

(3) $\sigma/4\epsilon_o$ (4) $\sigma/2\epsilon_o$

Q12. The value of unknown resistance (x) for which the potential difference between B and D will be zero in the

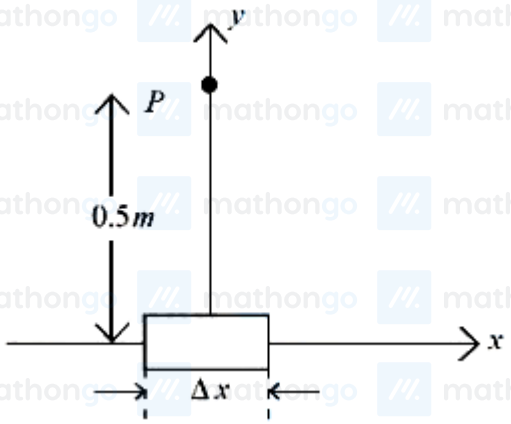


arrangement shown, is :

(1) 3Ω (2) 42Ω

(3) 9Ω (4) 6Ω

Q13. An element $\Delta l=\Delta x\hat{i}$ is placed at the origin and carries a large current $I=10$ A. The magnetic field on the y-axis at a distance of 0.5 m from the elements Δx of 1 cm length is:



(1) 4×10^{-8} T
(2) 10×10^{-8} T
(3) 8×10^{-8} T
(4) 12×10^{-8} T

Q14. Given below are two statements: Statement I: In an LCR series circuit, current is maximum at resonance. Statement II: Current in a purely resistive circuit can never be less than that in a series LCR circuit when connected to same voltage source. In the light of the above statements, choose the correct from the options given below:

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

Q15. Electromagnetic waves travel in a medium with speed of 1.5×10^8 m s^{-1}. The relative permeability of the medium is 2.0 . The relative permittivity will be:

(1) 2
(2) 4
(3) 5
(4) 1

Q16. In photoelectric experiment energy of 2.48eV irradiates a photo sensitive material. The stopping potential was measured to be 0.5 V. Work function of the photo sensitive material is :

(1) 1.68eV
(2) 2.48eV
(3) 1.98eV
(4) 0.5eV

Q17. Which of the following phenomena does not explain by wave nature of light. A. reflection B. diffraction C. photoelectric effect D. interference E. polarization Choose the most appropriate answer from the options given below:

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

Q18. The ratio of the shortest wavelength of Balmer series to the shortest wavelength of Lyman series for hydrogen atom is :

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

Q19. The correct truth table for the following logic circuit is :

(1)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	1

(2)

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1

(3)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Q20. While measuring diameter of wire using screw gauge the following readings were noted. Main scale reading is 1 mm and circular scale reading is equal to 42 divisions. Pitch of screw gauge is 1 mm and it has 100 divisions on circular scale. The diameter of the wire is $\frac{x}{50}$ mm. The value of x is :

(1) 21 (2) 142

(3) 71 (4) 42

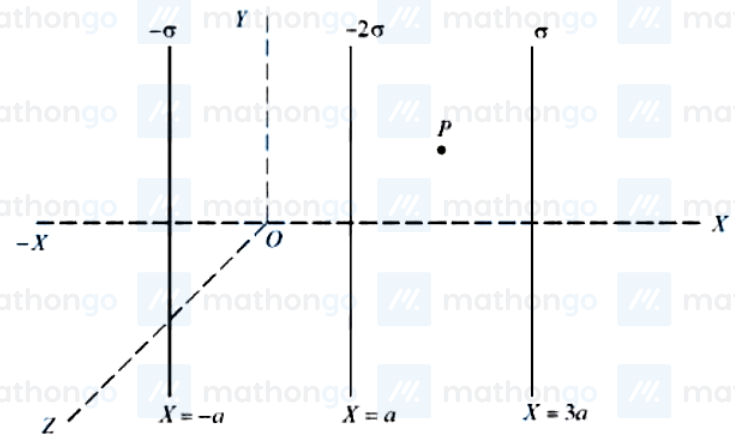
Q21. For three vectors $\vec{A} = (-x\hat{i} - 6\hat{j} - 2\hat{k}), \vec{B} = (-\hat{i} + 4\hat{j} + 3\hat{k})$ and $\vec{C} = (-8\hat{i} - \hat{j} + 3\hat{k})$, if $\vec{A} \cdot (\vec{B} \times \vec{C}) = 0$, then value of x is _____

Q22. If the radius of earth is reduced to three-fourth of its present value without change in its mass then value of duration of the day of earth will be _____ hours 30 minutes.

Q23. A big drop is formed by coalescing 1000 small droplets of water. The ratio of surface energy of 1000 droplets to that of energy of big drop is $\frac{10}{x}$. The value of x is _____

Q24. A particle is doing simple harmonic motion of amplitude 0.06 m and time period 3.14 s. The maximum velocity of the particle is _____ cm/s.

Q25. Three infinitely long charged thin sheets are placed as shown in figure. The magnitude of electric field at the point P is $\frac{x\sigma}{\epsilon_o}$. The value of x is _____ (all quantities are measured in SI units).



Q26. A wire of resistance R and radius r is stretched till its radius became $r/2$. If new resistance of the stretched wire is xR, then value of x is _____

Q27. A circular coil having 200 turns, 2.5×10^{-4} m^2 area and carrying 100μA current is placed in a uniform magnetic field of 1T. Initially the magnetic dipole moment $(\vec{M})$ was directed along $\vec{B}$. Amount of work, required to rotate the coil through 90° from its initial orientation such that $\vec{M}$ becomes perpendicular to $\vec{B}$, is _____ μJ.

Q28. When a *dc* voltage of 100 V is applied to an inductor, a *dc* current of 5 A flows through it. When an ac voltage of 200 V peak value is connected to inductor, its inductive reactance is found to be $20\sqrt{3}\Omega$. The power dissipated in the circuit is _____ W.

Q29. The refractive index of prism is $\mu = \sqrt{3}$ and the ratio of the angle of minimum deviation to the angle of prism is one. The value of angle of prism is _____.

Q30. Radius of a certain orbit of hydrogen atom is $8.48\tilde{A}\ldots$. If energy of electron in this orbit is E/x. then $x =$ _____ (Given $a_0 = 0.529\tilde{A}\ldots, E =$ energy of electron in ground state).

Q31. The density of ' x ' M solution (' X ' molar) of NaOH is 1.12 g mL^{-1}, while in molality, the concentration of the solution is 3 m(3molal). Then x is (Given : Molar mass of NaOH is 40 g/mol)

(1) 3.5 (2) 3.8
(3) 2.8 (4) 3.0

Q32. The electron affinity value are negative for A. Be $\rightarrow$ Be^- B. N $\rightarrow$ N^- C. O $\rightarrow$ O^{2-} D. Na $\rightarrow$ Na^- E. Al $\rightarrow$ Al^- Choose the most appropriate answer from the options given below :

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

Q33. Which of the following material is not a semiconductor.

(1) Silicon (2) Copper oxide
(3) Germanium (4) Graphite

Q34. Match List I with List II

	List - I (Hybridization)		List - II (Orientation in Space)
A.	sp^3	I.	Trigonal bipyramidal
B.	dsp^2	II.	Octahedral
C.	$sp^3 d$	III.	Tetrahedral
D.	$sp^3 d^2$	IV.	Square planar

Choose the correct answer from the options given below:

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

Q35. Match List I with List II

	List - I (Compound/Species)		List - II (Shape/Geometry)
A.	SF_4	I.	Tetrahedral
B.	BrF_3	II.	Pyramidal
C.	BrO_3^-	III.	See saw
D.	$NH_4^{+}{}^{+}KS$	IV.	Bent T-Shape

Choose the correct answer from the options given below:

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

Q36. Match List I with List II

	List - I (Molecule/Species)		List - II (Property/Shape)
A.	SO_2Cl_2	I.	Paramagnetic
B.	NO	II.	Diamagnetic
C.	NO_2^-	III.	Tetrahedral
D.	I_3^-	IV.	Linear

Choose the correct answer from the options given below:

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

Q37. At $-20^{\circ}C$ and 1 atm pressure, a cylinder is filled with equal number of H_2, I_2 and HI molecules for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, the K_p for the process is $x \times 10^{-1}$. x = _____ [Given : $R = 0.082$ L atm K^{-1} mol^{-1}]

(1) 0.01
(2) 10
(3) 2
(4) 1

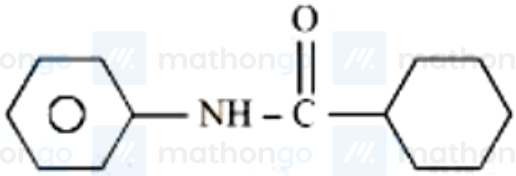
Q38. Functional group present in sulphonic acids is :

(1) $-SO_4H$
(2) $-SO_3H$
(3) $-\overset{\overset{O}{\|}}{S}-OH$
(4) $-SO_2$

Q39. Which of the following statements are correct? A. Glycerol is purified by vacuum distillation because it decomposes at its normal boiling point. B. Aniline can be purified by steam distillation as aniline is miscible in water. C. Ethanol can be separated from ethanol water mixture by azeotropic distillation because it forms azeotrope. D. An organic compound is pure, if mixed M.P. is remained same. Choose the most appropriate answer from the options given below :

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

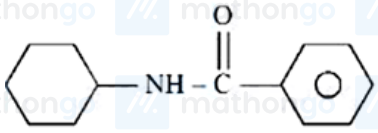
Q40.



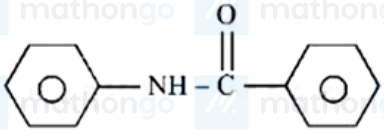
(X)

Which of the following is metamer of the given compound (X) ?

(1)



(2)



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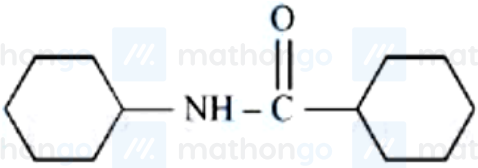

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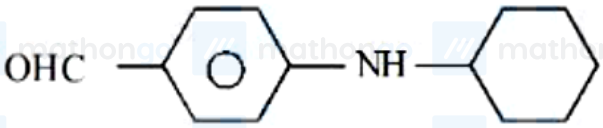
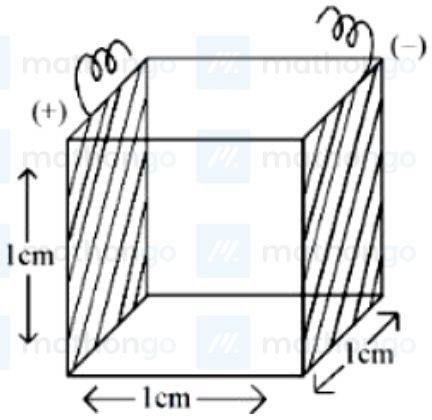


Q41. Given below are two statements: Statement I : Gallium is used in the manufacturing of thermometers. Statement II : A thermometer containing gallium is useful for measuring the freezing point (256 K) of brine solution. In the light of the above statements, choose the correct answer from the options given below :

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

Q42. A conductivity cell with two electrodes (dark side) are half filled with infinitely dilute aqueous solution of a weak electrolyte. If volume is doubled by adding more water at constant temperature, the molar conductivity



of the cell will -

(1) decrease sharply
(2) increase sharply
(3) remain same or can not be measured accurately
(4) depend upon type of electrolyte

Q43. The number of element from the following that do not belong to lanthanoids is Eu, Cm, Er, Tb, Yb and Lu

(1) 3 (2) 4

(3) 1 (4) 5

Q44. Match List I with List II

	List - I (Compound)		List - II (Uses)
A.	Iodoform	I.	Fire extinguisher
B.	Carbon tetrachloride	II.	Insecticide
C.	CFC	III.	Antiseptic
D.	DDT	IV.	Refrigerants

Choose the correct answer from the options given below:

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

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

Q45. he following complexes $\underset{(A)}{[CoCl(NH_3)_5]^{2+}}, \underset{(B)}{[Co(CN)_6]^{3-}}, \underset{(C)}{[Co(NH_3)_5(H_2O)]^{3+}}, \underset{(D)}{[Cu(H_2O)_4]^{2+}}$ The correct order of A, B, C and D in terms of wavenumber of light absorbed is :

(1) $C < D < A < B$ (2) $B < C < A < D$

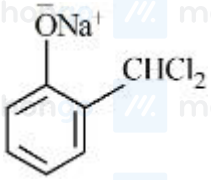
(3) $A < C < B < D$ (4) $D < A < C < B$

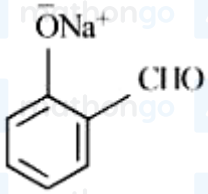
Q46. Given below are two statements : Statement I : Piciric acid is 2,4,6 - trinitrotoluene. Statement II : Phenol - 2,4 - disulphonic acid is treated with Conc. HNO_3 to get picric acid. In the light of the above statements, choose the most appropriate answer from the options given below :

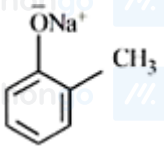
(1) Statement I is incorrect but Statement II is correct (2) Both Statement I and Statement II are incorrect

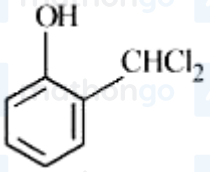
(3) Statement I is correct but Statement II is incorrect (4) Both Statement I and Statement II are correct

Q47. In Reimer - Tiemann reaction, phenol is converted into salicylaldehyde through an intermediate. The structure of intermediate is _____

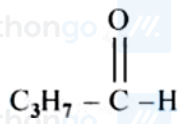
(1) 

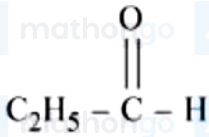
(2) 

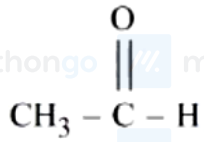
(3) 

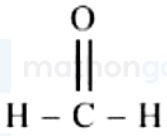
(4) 

Q48. Which among the following aldehydes is most reactive towards nucleophilic addition reactions?

(1) 

(2) 

(3) 

(4) 

Q49.

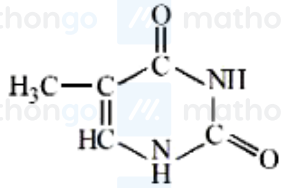
	List - I (Precipitating reagent and conditions)		List - II (Cation)
A.	$NH_4Cl + NH_4OH$/ARKS	I.	Mn^{2+}
B.	$NH_4OH + Na_2CO_3$	II.	Pb^{2+}
C.	$NH_4OH + NH_4Cl + H_2S$ gas	III.	Al^{3+}
D.	dilute HCl	IV.	Sr^{2+}

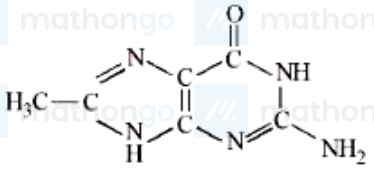
Match List I with List II Choose the correct answer from the options given below:

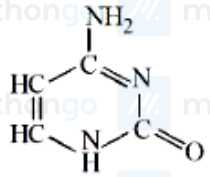
(1) A-III, B-IV, C-I, D-II (2) A-III, B-IV, C-II, D-I

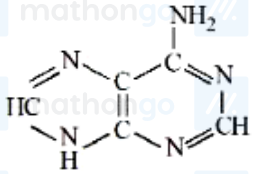
(3) A-IV, B-III, C-II, D-I (4) A-IV, B-III, C-I, D-II

Q50. DNA molecule contains 4 bases whose structure are shown below. One of the structures is not correct, identify the incorrect base structure.

(1) 

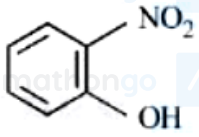
(2) 

(3) 

(4) 

Q51. Frequency of the de-Broglie wave of electron in Bohr's first orbit of hydrogen atom is _____ $\times 10^{13}$ Hz (nearest integer). [Given : R_H(Rydberg constant) $= 2.18 \times 10^{-18}$ J, h (Plank's constant) $= 6.6 \times 10^{-34}$ J.s.]

Q52. Number of molecules from the following which can exhibit hydrogen bonding is _____ (nearest integer)

$CH_3OH, H_2O, C_2H_6, C_6H_6,$  $, HF, NH_3$

Q53. An ideal gas, $\overline{C}_v = \frac{5}{2}R$, is expanded adiabatically against a constant pressure of 1 atm untill it doubles in volume. If the initial temperature and pressure is 298 K and 5 atm, respectively then the final temperature is _____ K (nearest integer). [$\overline{C}_v$ is the molar heat capacity at constant volume]

Q54. The major product of the following reaction is P. $CH_3C=C-CH_3 \xrightarrow[\text{273 K}]{\substack{\text{(i) Na/ ing } NH_3 \\ \text{(ii) dil. } KMnO_4}}$ '' Number of oxygen atoms present in product ' P ' is _____ (nearest integer)

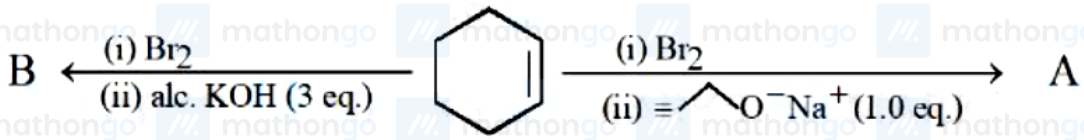
Q55. Consider the dissociation of the weak acid HX as given below $HX(aq) \rightleftharpoons H^+(aq) + X^-(aq), Ka = 1.2 \times 10^{-5}$ [K_a : dissociation constant] The osmotic pressure of 0.03M aqueous solution of HX at 300 K is _____ $\times 10^{-2}$ bar (nearest integer). [Given : $R = 0.083$ Lbarmol^{-1} K^{-1}]

Q56. Time required for 99.9% completion of a first order reaction is _____ times the time required for completion of 90% reaction.(nearest integer)

Q57. Among CrO, Cr_2O_3 and CrO_3, the sum of spin-only magnetic moment values of basic and amphoteric oxides is _____ 10^{-2}BM (nearest integer). (Given atomic number of Cr is 24)

Q58. The difference in the 'spin-only' magnetic moment values of $KMnO_4$ and the manganese product formed during titration of $KMnO_4$ against oxalic acid in acidic medium is _____ BM. (nearest integer)

Q59. The major products from the following reaction sequence are product A and product B.



The total sum of π electrons in product A and product B are _____ (nearest integer)

Q60. 9.3 g of pure aniline upon diazotisation followed by coupling with phenol gives an orange dye. The mass of orange dye produced (assume 100\% yield/conversion) is _____ g. (nearest integer)

Q61. Let α, β be the distinct roots of the equation $x^2 - (t^2 - 5t + 6)x + 1 = 0, t \in \mathbb{R}$ and $a_n = \alpha^n + \beta^n$. Then the minimum value of $\frac{a_{2023}+a_{2025}}{a_{2024}}$ is

(1) $-1/4$ (2) $-1/4$
(3) $-1/2$ (4) $1/4$

Q62. The number of triangles whose vertices are at the vertices of a regular octagon but none of whose sides is a side of the octagon is

(1) 48 (2) 56
(3) 24 (4) 16

Q63. Let $A = \{n \in [100, 700] \cap \mathbb{N} : n$ is neither a multiple of 3 nor a multiple of $4\}$. Then the number of elements in A is

(1) 290 (2) 280
(3) 300 (4) 310

Q64. Let a variable line of slope $m > 0$ passing through the point $(4, -9)$ intersect the coordinate axes at the points A and B. The minimum value of the sum of the distances of A and B from the origin is

(1) 30 (2) 25
(3) 15 (4) 10

Q65. If $A(3,1,-1), B\left(\frac{5}{3}, \frac{7}{3}, \frac{1}{3}\right), C(2,2,1)$ and $D\left(\frac{10}{3}, \frac{2}{3}, \frac{-1}{3}\right)$ are the vertices of a quadrilateral $ABCD$, then its area is

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

Q66. A circle is inscribed in an equilateral triangle of side of length 12 . If the area and perimeter of any square inscribed in this circle are m and n, respectively, then $m+n^2$ is equal to

(1) 408 (2) 414
(3) 396 (4) 312

Q67. Let C be the circle of minimum area touching the parabola $y=6-x^2$ and the lines $y=\sqrt{3}|x|$. Then, which one of the following points lies on the circle C ?

(1) $(1,2)$ (2) $(1,1)$
(3) $(2,2)$ (4) $(2,4)$

Q68. Let $f:(-\infty, \infty)-\{0\} \rightarrow \mathbb{R}$ be a differentiable function such that $f'(1)=\lim_{a \rightarrow \infty} a^2 f\left(\frac{1}{a}\right)$. Then $\lim_{a \rightarrow \infty} \frac{a(a+1)}{2} \tan^{-1}\left(\frac{1}{a}\right)+a^2-2 \log_e a$ is equal to

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

Q69. The mean and standard deviation of 20 observations are found to be 10 and 2 . respectively. On rechecking, it was found that an observation by mistake was taken 8 instead of 12. The correct standard deviation is

(1) 1.8 (2) 1.94
(3) $\sqrt{3.96}$ (4) $\sqrt{3.86}$

Q70. Let the relations R_1 and R_2 on the set $X=\{1,2,3, \ldots, 20\}$ be given by $R_1=\{(x, y): 2x-3y=2\}$ and $R_2=\{(x, y):-5x+4y=0\}$. If M and N be the minimum number of elements required to be added in R_1 and R_2, respectively, in order to make the relations symmetric, then $M+N$ equals

(1) 12 (2) 16
(3) 8 (4) 10

Q71. For $\alpha, \beta \in \mathbb{R}$ and a natural number n, let $A_r=\begin{vmatrix} r & 1 & \frac{n^2}{2}+\alpha \\ 2r & 2 & n^2-\beta \\ 3r-2 & 3 & \frac{n(3n-1)}{2} \end{vmatrix}$. Then

(1) 0 (2) $4\alpha+2\beta$
(3) $2\alpha+4\beta$ (4) $2n$

Q72. The function f: R->R, $f(x)=\frac{x^2+2x-15}{x^2-4x+9}, x \in \mathbb{R}$ is

(1) one-one but not onto. (2) both one-one and onto.
(3) onto but not one-one. (4) neither one-one nor onto.

Q73. If $f(x)=\begin{cases}x^3\sin\left(\frac{1}{x}\right), x\neq 0\\ 0 \quad\quad , x=0\end{cases}$ then

(1) $f''\left(\frac{2}{\pi}\right)=\frac{24-\pi^2}{2\pi}$ (2) $f''\left(\frac{2}{\pi}\right)=\frac{12-\pi^2}{2\pi}$

(3) $f''(0)=1$ (4) $f''(0)=0$

Q74. The interval in which the function $f(x)=x^x, x>0$, is strictly increasing is

(1) $\left(0,\frac{1}{e}\right]$ (2) $(0,\infty)$

(3) $\left[\frac{1}{e},\infty\right)$ (4) $\left[\frac{1}{e^2},1\right)$

Q75. $\int_0^{\pi/4}\frac{\cos^2 x\sin^2 x}{\left(\cos^3 x+\sin^3 x\right)^2}dx$ is equal to

(1) $1/6$ (2) $1/3$

(3) $1/12$ (4) $1/9$

Q76. Let the area of the region enclosed by the curves $y=3x, 2y=27-3x$ and $y=3x-x\sqrt{x}$ be A. Then $10A$ is equal to

(1) 172 (2) 162

(3) 154 (4) 184

Q77. Let $y=y(x)$ be the solution of the differential equation $\left(1+x^2\right)\frac{dy}{dx}+y=e^{\tan^{-1}x}$, $y(1)=0$. Then $y(0)$ is

(1) $\frac{1}{2}\left(e^{\pi/2}-1\right)$ (2) $\frac{1}{2}\left(1-e^{\pi/2}\right)$

(3) $\frac{1}{4}\left(1-e^{\pi/2}\right)$ (4) $\frac{1}{4}\left(e^{\pi/2}-1\right)$

Q78. Let $y=y(x)$ be the solution of the differential equation $(2x\log_e x)\frac{dy}{dx}+2y=\frac{3}{x}\log_e x, x>0$ and $y\left(e^{-1}\right)=0$. Then, $y(e)$ is equal to

(1) $-\frac{3}{\mathrm{e}}$ (2) $-\frac{3}{2e}$

(3) $-\frac{2}{3e}$ (4) $-\frac{2}{\mathrm{e}}$

Q79. The shortest distance between the lines $\frac{x-3}{2}=\frac{y+15}{-7}=\frac{z-9}{5}$ and $\frac{x+1}{2}=\frac{y-1}{1}=\frac{z-9}{-3}$ is

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

(3) $5\sqrt{3}$ (4) $6\sqrt{3}$

Q80. A company has two plants A and B to manufacture motorcycles. 60% motorcycles are manufactured at plant A and the remaining are manufactured at plant B.80% of the motorcycles manufactured at plant A are rated of the standard quality, while 90% of the motorcycles manufactured at plant B are rated of the standard quality. A motorcycle picked up randomly from the total production is found to be of the standard quality. If p is the probability that it was manufactured at plant B, then $126p$ is

(1) 54 (2) 66

(3) 64 (4) 56

Q81. Let x_1, x_2, x_3, x_4 be the solution of the equation $4x^4+8x^3-17x^2-12x+9=0$ and $\left(4+x_1^2\right)\left(4+x_2^2\right)\left(4+x_3^2\right)\left(4+x_4^2\right)=\frac{125}{16}m$. Then the value of m is

Q82. Let the first term of a series be $T_1=6$ and its r^{th} term $T_r=3T_{r-1}+6^r, r=2,3,\quad\quad n$. If the sum of the first n terms of this series is $\frac{1}{5}\left(n^2-12n+39\right)\left(4\cdot 6^n-5\cdot 3^n+1\right)$, then n is equal to_____

Q83. If the second, third and fourth terms in the expansion of $(x+y)^n$ are 135,30 and $\frac{10}{3}$, respectively, then $6\left(n^3+x^2+y\right)$ is equal to _____

Q84. Let a conic C pass through the point $(4,-2)$ and $P(x,y), x \geq 3$, be any point on C. Let the slope of the line touching the conic C only at a single point P be half the slope of the line joining the points P and $(3,-5)$. If the focal distance of the point $(7,1)$ on C is d, then $12d$ equals _____

Q85. Let L_1, L_2 be the lines passing through the point $P(0,1)$ and touching the parabola $9x^2+12x+18y-14=0$. Let Q and R be the points on the lines L_1 and L_2 such that the $\triangle PQR$ is an isosceles triangle with base QR. If the slopes of the lines QR are m_1 and m_2, then $16\left(m_1^2+m_2^2\right)$ is equal to _____

Q86. Let $\alpha\beta\gamma=45; \alpha,\beta,\gamma \in \mathbb{R}$. If $x(\alpha,1,2)+y(1,\beta,2)+z(2,3,\gamma)=(0,0,0)$ for some $x,y,z \in \mathbb{R}, xyz \neq 0$, then $6\alpha+4\beta+\gamma$ is equal to _____

Q87. For $n \in \mathrm{N}$, if $\cot^{-1}3+\cot^{-1}4+\cot^{-1}5+\cot^{-1}n=\frac{\pi}{4}$, then n is equal to_____

Q88. Let $r_k=\frac{\int_0^1\left(1-x^7\right)^k dx}{\int_0^1\left(1-x^7\right)^{k+1} dx}, k \in \mathbb{N}$. Then the value of $\sum_{k=1}^{10}\frac{1}{7(r_k-1)}$ is equal to_____

Q89. Let $\vec{a}=2\hat{i}-3\hat{j}+4\hat{k}, \vec{b}=3\hat{i}+4\hat{j}-5\hat{k}$ and a vector $\vec{c}$ be such that $\vec{a}\times(\vec{b}+\vec{c})+\vec{b}\times\vec{c}=\hat{i}+8\hat{j}+13\hat{k}$. If $\vec{a}\cdot\vec{c}=13$, then $(24-\vec{b}\cdot\vec{c})$ is equal to_____

Q90. Let P be the point $(10,-2,-1)$ and Q be the foot of the perpendicular drawn from the point $R(1,7,6)$ on the line passing through the points $(2,-5,11)$ and $(-6,7,-5)$. Then the length of the line segment PQ is equal to _____

ANSWER KEYS

1. (1)	**2.** (3)	**3.** (4)	**4.** (2)	**5.** (1)	**6.** (2)	**7.** (3)	**8.** (4)
9. (2)	**10.** (3)	**11.** (2)	**12.** (4)	**13.** (1)	**14.** (3)	**15.** (1)	**16.** (3)
17. (3)	**18.** (1)	**19.** (1)	**20.** (3)	**21.** (4)	**22.** (13)	**23.** (1)	**24.** (12)
25. (2)	**26.** (16)	**27.** (5)	**28.** (250)	**29.** (60)	**30.** (16)	**31.** (4)	**32.** (2)
33. (4)	**34.** (2)	**35.** (3)	**36.** (2)	**37.** (2)	**38.** (2)	**39.** (2)	**40.** (1)
41. (4)	**42.** (3)	**43.** (3)	**44.** (2)	**45.** (4)	**46.** (1)	**47.** (1)	**48.** (4)
49. (1)	**50.** (2)	**51.** (661)	**52.** (5)	**53.** (274)	**54.** (2)	**55.** (76)	**56.** (3)
57. (877)	**58.** (6)	**59.** (8)	**60.** (20)	**61.** (2)	**62.** (4)	**63.** (3)	**64.** (2)
65. (4)	**66.** (1)	**67.** (4)	**68.** (4)	**69.** (3)	**70.** (4)	**71.** (2)	**72.** (4)
73. (1)	**74.** (3)	**75.** (1)	**76.** (2)	**77.** (2)	**78.** (1)	**79.** (2)	**80.** (1)
81. (221)	**82.** (6)	**83.** (806)	**84.** (75)	**85.** (68)	**86.** (55)	**87.** (47)	**88.** (65)
89. (46)	**90.** (13)						