Q1. The equation of state of a real gas is given by $P + \frac{a}{V^2}\left(V - b\right) = RT$, where P, V and T are pressure, volume and temperature respectively and R is the universal gas constant. The dimensions of $\frac{a}{b^2}$ is similar to that of :

(1) PV (2) P

(3) RT (4) R

Q2. A bullet is fired into a fixed target looses one third of its velocity after travelling 4 cm. It penetrates further $D \times 10^{-3}$ m before coming to rest. The value of D is :

(1) 32 (2) 5

(3) 3 (4) 4

Q3. Given below are two statements :

Statement (I) : The limiting force of static friction depends on the area of contact and independent of materials.

Statement (II) : The limiting force of kinetic friction is independent of the area of contact and depends on materials.

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 Statement I and Statement II are incorrect (4) Both Statement I and Statement II are correct

Q4. A ball suspended by a thread swings in a vertical plane so that its magnitude of acceleration in the extreme position and lowest position are equal. The angle (θ) of thread deflection in the extreme position will be :

(1) $\tan^{-1}\left(\sqrt{2}\right)$ (2) $2\tan^{-1}\frac{1}{2}$

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

Q5. A heavy iron bar of weight 12 kg is having its one end on the ground and the other on the shoulder of a man. The rod makes an angle $60°$ with the horizontal, the normal force applied by the man on bar is:

(1) 6 kg - wt (2) 12 kg - wt

(3) 3 kg - wt (4) $6\sqrt{3}$ kg - wt

Q6. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The angular speed of the moon in its orbit about the earth is more than the angular speed of the earth in its orbit about the sun.

Reason (R): The moon takes less time to move around the earth than the time taken by the earth to move around the sun.

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

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

(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

Q7. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R)

Assertion (A) : The property of body, by virtue of which it tends to regain its original shape when the external force is removed, is Elasticity.

Reason (R) : The restoring force depends upon the bonded inter atomic and inter molecular force of solid.

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

(1) (A) is false but (R) is true

(2) (A) is true but (R) is false

(3) Both (A) and (R) are true and (R) is the correct explanation (A)

(4) Both (A) and (R) are true but (R) is not the correct explanation of (A)

Q8. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is :

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

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

(3) $\frac{7}{5}$

(4) $\frac{9}{7}$

Q9. The total kinetic energy of 1 mole of oxygen at 27°C is :

[Use universal gas constant $\left(\mathrm{R}\right) = 8.31 \ \mathrm{J \ mol^{-1} \ K^{-1}}$]

(1) 6845.5 J

(2) 5942.0 J

(3) 6232.5 J

(4) 5670.5 J

Q10. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason(R)

Assertion (A) : Work done by electric field on moving a positive charge on an equipotential surface is always zero.

Reason (R) : Electric lines of forces are always perpendicular to equipotential surfaces.

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

(1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(2) (A) is correct but (R) is not correct

(3) (A) is not correct but (R) is correct

(4) Both (A) and (R) are correct and (R) is the correct explanation of (A)

Q11. Wheatstone bridge principle is used to measure the specific resistance S_1 of given wire, having length L, radius r. If X is the resistance of wire, then specific resistance is : $S_1 = X\frac{\pi r^2}{L}$. If the length of the wire gets doubled then the value of specific resistance will be :

(1) $\frac{S_1}{4}$

(2) $2 \ \mathrm{S_1}$

(3) $\frac{S_1}{2}$

(4) S_1

Q12. A current of 200 μA deflects the coil of a moving coil galvanometer through 60°. The current to cause deflection through $\frac{\pi}{10}$ radian is

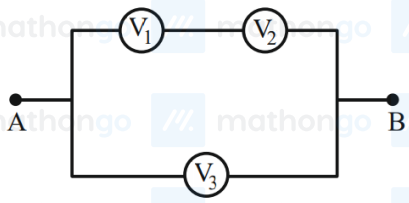
(1) 30 μA

(2) 120 μA

(3) 60 μA

(4) 180 μA

Q13. Three voltmeters, all having different internal resistances are joined as shown in figure. When some potential difference is applied across A and B, their readings are V_1, V_2 and V_3. Choose the correct option.



(1) $V_1 = V_2$ (2) $V_1 \neq V_3 - V_2$

(3) $V_1 + V_2 > V_3$ (4) $V_1 + V_2 = V_3$

Q14. The primary side of a transformer is connected to 230 V, 50 Hz supply. The turn ratio of primary to secondary winding is 10 : 1. Load resistance connected to the secondary side is 46 Ω. The power consumed in it is:

(1) 12.5 W (2) 10.0 W

(3) 11.5 W (4) 12.0 W

Q15. An object is placed in a medium of refractive index 3. An electromagnetic wave of intensity 6×10^8 W m^{-2} falls normally on the object and it is absorbed completely. The radiation pressure on the object would be (speed of light in free space $= 3 \times 10^8$ m s^{-1}):

(1) 36 N m^{-2} (2) 18 N m^{-2}

(3) 6 N m^{-2} (4) 2 N m^{-2}

Q16. When a polaroid sheet is rotated between two crossed polaroids then the transmitted light intensity will be maximum for a rotation of :

(1) 60° (2) 30°

(3) 90° (4) 45°

Q17. The threshold frequency of a metal with work function 6.63 eV is :

(1) 16×10^{15} Hz (2) 16×10^{12} Hz

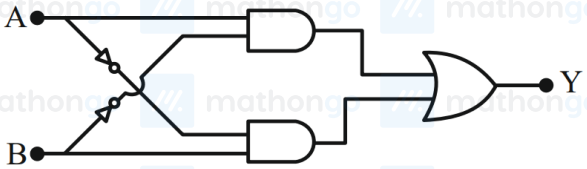
(3) 1.6×10^{12} Hz (4) 1.6×10^{15} Hz

Q18. The atomic mass of ${}_6C^{12}$ is 12.000000 u and that of ${}_6C^{13}$ is 13.003354 u. The required energy to remove a neutron from ${}_6C^{13}$, if mass of neutron is 1.008665 u, will be:

(1) 62.5MeV (2) 6.25MeV

(3) 4.95MeV (4) 49.5MeV

Q19. The truth table of the given circuit diagram is :



(1)

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

(2)

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

(3)

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

(4)

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

Q20. Given below are two statements: one is labelled as Assertion(A) and the other is labelled as Reason (R).
Assertion (A) : In Vernier calliper if positive zero error exists, then while taking measurements, the reading taken will be more than the actual reading.
Reason (R) : The zero error in Vernier Calliper might have happened due to manufacturing defect or due to rough handling.
In the light of the above statements, choose the correct answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

Q21. A body falling under gravity covers two points A and B separated by 80 m in 2 s. The distance of upper point A from the starting point is _____m. Use $g = 10$ m s^{-2}

Q22. A ring and a solid sphere roll down the same inclined plane without slipping. They start from rest. The radii of both bodies are identical and the ratio of their kinetic energies is $\frac{7}{x}$, where x is _____.

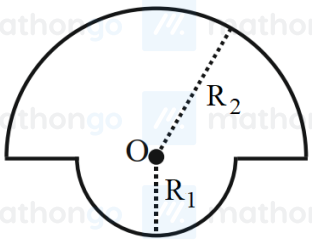
Q23. The reading of pressure metre attached with a closed pipe is 4.5×10^4 N m^{-2}. On opening the valve, water starts flowing and the reading of pressure metre falls to 2.0×10^4 N m^{-2}. The velocity of water is found to be $\sqrt{V}$ m s^{-1}. The value of V is _____.

Q24. A closed organ pipe 150 cm long gives 7 beats per second with an open organ pipe of length 350 cm, both vibrating in fundamental mode. The velocity of sound is _____ m s^{-1}.

Q25. The electric potential at the surface of an atomic nucleus $(Z = 50)$ of radius 9×10^{-13} cm is $\alpha \times 10^6$ V. What is the value of α?
(Charge of proton 1.6×10^{-19} C)

Q26. Two charges of -4 μC and +4 μC are placed at the points $A(1, 0, 4)$ m and $B(2, -1, 5)$ m located in an electric field $\vec{E} = 0.20\hat{i}$ V cm^{-1}. The magnitude of the torque acting on the dipole is $8\sqrt{\alpha} \times 10^{-5}$ N m, where $\alpha =$ _____.

Q27. The magnetic field at the centre of a wire loop formed by two semicircular wires of radii $R_1 = 2\pi$ m and $R_2 = 4\pi$ m carrying current $I = 4$ A as per figure given below is $\alpha \times 10^{-7}$ T. The value of α is _____.
(Centre O is common for all segments)



Q28. A series LCR circuit with $L = \frac{100}{\pi}$ mH, $C = \frac{10^{-3}}{\pi}$ F and $R = 10$ Ω, is connected across an AC source of 220 V, 50 Hz supply. The power factor of the circuit would be ____.

Q29. A parallel beam of monochromatic light of wavelength 5000 Å is incident normally on a single narrow slit of width 0.001 mm. The light is focused by convex lens on screen, placed on its focal plane. The first minima will be formed for the angle of diffraction of _____ (degree).

Q30. If Rydberg's constant is R, the longest wavelength of radiation in Paschen series will be $\frac{\alpha}{7R}$, where $\alpha =$ _____.

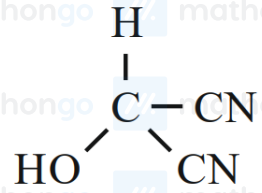
Q31. Which of the following cannot function as an oxidising agent?

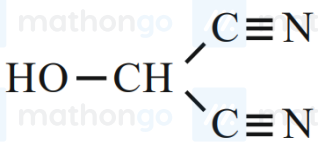
(1) N^{3-}
(2) SO_4^{2-}
(3) BrO_3^-
(4) MnO_4^-

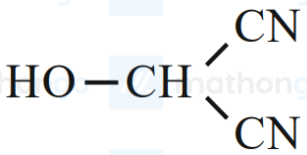
Q32. The molecular formula of second homologue in the homologous series of mono carboxylic acids is _____.

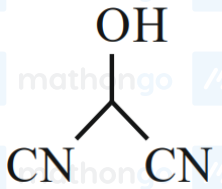
(1) $C_3H_6O_2$
(2) $C_2H_4O_2$
(3) CH_2O
(4) $C_2H_2O_2$

Q33. Bond line formula of $HOCH(CN)_2$ is:

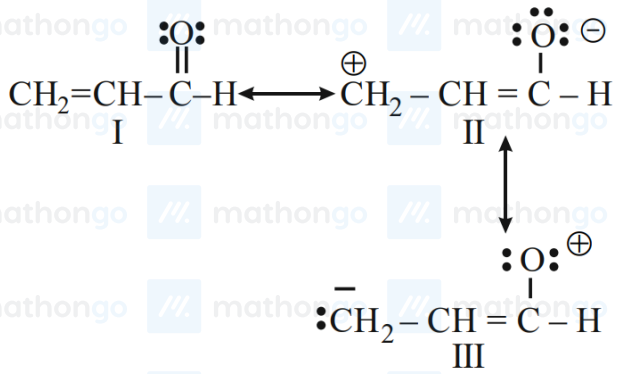
(1)


(2)


(3)


(4)


Q34. The order of relative stability of the contributing structure is:



Choose the correct answer from the options given below:

(1) I > II > III (2) II > I > III

(3) I = II = III (4) III > II > I

Q35. The incorrect statement regarding conformations of ethane is:

(1) Ethane has infinite number of conformations (2) The dihedral angle in staggered conformation is 60°

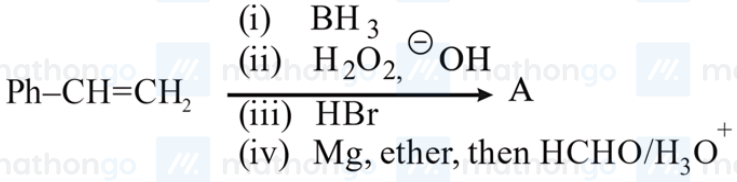
(3) Eclipsed conformation is the most stable conformation. (4) The conformations of ethane are interconvertible to one-another

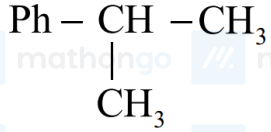
Q36. The technique used for purification of steam volatile water immiscible substance is:

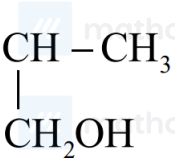
(1) Fractional distillation (2) Fractional distillation under reduced pressure

(3) Distillation (4) Steam distillation

Q37. The final product A, formed in the following reaction sequence is:



(1) Ph - CH_2 - CH_2 - CH_3 (2) 

(3)  (4) Ph - CH_2 - CH_2 - CH_2 - OH

Q38. The quantity which changes with temperature is:

(1) Molarity (2) Mass percentage

(3) Molality (4) Mole fraction

Q39. Which of the following statements is not correct about rusting of iron?

(1) Coating of iron surface by tin prevents rusting, even if the tin coating is peeling off.
(2) When pH lies above 9 or 10 , rusting of iron does not take place.
(3) Dissolved acidic oxides SO_2, NO_2 in water act as catalyst in the process of rusting.
(4) Rusting of iron is envisaged as setting up of electrochemical cell on the surface of iron object.

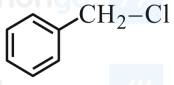
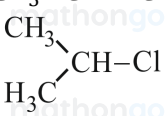
Q40. Given below are two statements:
Statement (I) : Oxygen being the first member of group 16 exhibits only -2 oxidation state.
Statement (II) : Down the group 16 stability of $+4$ oxidation state decreases and $+6$ oxidation state increases.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement I is correct but Statement II is incorrect
(2) Both Statement I and Statement II are correct
(3) Both Statement I and Statement II are incorrect
(4) Statement I is incorrect but Statement II is correct

Q41. Choose the correct option having all the elements with d^{10} electronic configuration from the following:
(1) $^{27}Co, ^{28}Ni, ^{26}Fe, ^{24}Cr$
(2) $^{29}Cu, ^{30}Zn, ^{48}Cd, ^{47}Ag$
(3) $^{46}Pd, ^{28}Ni, ^{26}Fe, ^{24}Cr$
(4) $^{28}Ni, ^{24}Cr, ^{26}Fe, ^{29}Cu$

Q42. Given below are two statements:
Statement (I) : In the Lanthanoids, the formation of Ce^{+4} is favoured by its noble gas configuration.
Statement (II) : Ce^{+4} is a strong oxidant reverting to the common $+3$ state.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

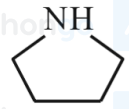
Q43. Identity the incorrect pair from the following:
(1) Photography - AgBr
(2) Polythene preparation - $TiCl_4, AlCH_3{}_3$
(3) Haber process - Iron
(4) Wacker process - $PtCl_2$

Q44. Identify from the following species in which d^2sp^3 hybridization is shown by central atom:
(1) $CoNH_3{}_6{}^{3+}$
(2) BrF_5
(3) $Pt(Cl)_4{}^{2-}$
(4) SF_6

Q45. Which among the following halide/s will not show S_N1 reaction:
(1) $H_2C = CH - CH_2Cl$
(2) $CH_3 - CH = CH - Cl$
(3) 
(4) 

Q46. Identify B formed in the reaction.

$$Cl - CH_2{}_4 - Cl \xrightarrow{\text{excess } NH_3} A \xrightarrow{NaOH} B + H_2O + NaCl$$

(1) 

(2) $H_2N - CH_2 - NH_2$

(3) $^{-}ClH_3N^{+} - CH_2 - \overset{+}{N}H_3Cl^{-}$

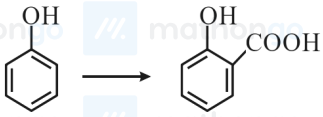
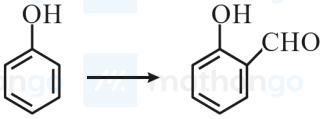
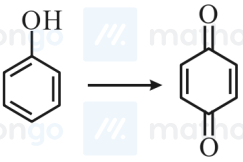
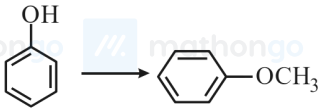
(4) 

Q47. Phenolic group can be identified by a positive:

(1) Phthalein dye test (2) Lucas test

(3) Tollen's test (4) Carbylamine test

Q48. Match List-I with List-II.

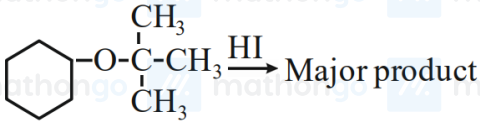
List I (Reaction)		List II (Reagent(s))
(A) 	(I)	$Na_2Cr_2O_7 / H_2SO_4$
(B) 	(II)	(i) NaOH (ii) CH_3Cl
(C) 	(III)	(i)NaOH, $CHCl_3$ (ii) NaOH (iii) HCl
(D) 	(IV)	(i) NaOH (ii) CO_2 (iii) HCl

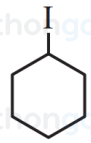
Choose the correct answer from the options given below:

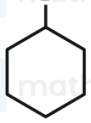
(1) (A)-(IV), (B)-(I), (C)-(III), (D)-(II) (2) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

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

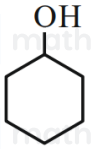
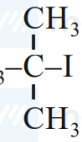
Q49. Major product formed in the following reaction is a mixture of:



(1)  and $(CH_3)_3CI$

(2)  and $(CH_3)_3COH$

(3)  and $(CH_3)_3COH$

(4)  and 

Q50. Which structure of protein remains intact after coagulation of egg white on boiling?

(1) Primary (2) Tertiary

(3) Secondary (4) Quaternary

Q51. Volume of 3M NaOH (formula weight 40 g mol^{-1}) which can be prepared from 84 g of NaOH is ____ $\times 10^{-1} dm^3$.

Q52. 9.3 g of aniline is subjected to reaction with excess of acetic anhydride to prepare acetanilide. The mass of acetanilide produced if the reaction is 100% completed is _____ $\times 10^{-1}$ g.

(Given molar mass in g mol^{-1} $N = 14, O = 16, C = 12, H = 1$)

Q53. 1 mole of PbS is oxidised by X moles of O_3 to get Y moles of O_2. $X + Y =$

Q54. Total number of ions from the following with noble gas configuration is

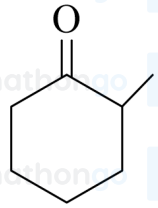
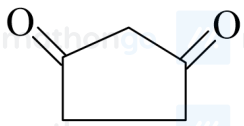
$Sr^{2+}(Z = 38), Cs^{+}(Z = 55), La^{2+}(Z = 57) Pb^{2+}(Z = 82), Yb^{2+}(Z = 70)$ and $Fe^{2+}(Z = 26)$

Q55. The number of non-polar molecules from the following is

$HF, H_2O, SO_2, H_2, CO_2, CH_4, NH_3, HCl, CHCl_3, BF_3$

Q56. For a certain thermochemical reaction M → N at T = 400 K, $\Delta H^o = 77.2$ kJ mol^{-1}, $\Delta S^o = 122 JK^{-1}$, log equilibrium constant (logK) is - _____ $\times 10^{-1}$.

Q57. Total number of compounds with Chiral carbon atoms from following is

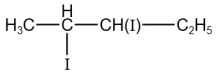



$CH_3 - CH_2 - CHNO_2 - COOH$

$CH_3 - CH(I) - CH_2 - NO_2$

$CH_3 - CH_2 - CHBr - CH_2 - CH_3$

$CH_3 - CH_2 - CH(OH) - CH_2OH$



Q58. The hydrogen electrode is dipped in a solution of pH = 3 at 25°C. The potential of the electrode will be - _____ $\times 10^{-2}$ V. $\frac{2.303RT}{F} = 0.059$ V Round off the answer to the nearest integer.

Q59. Time required for completion of 99.9% of first order reaction is _____ times of half life $\left(t_{1/2}\right)$ of the reaction

Q60. The Spin only magnetic moment value of square planar complex $PtNH_3{}_2ClNH_2CH_3Cl$ is _____ B.M. (Nearest integer)
(Given atomic number for Pt = 78)

Q61. If α, β are the roots of the equation, $x^2 - x - 1 = 0$ and $S_n = 2023\alpha^n + 2024\beta^n$, then

(1) 2 $S_{12} = S_{11} + S_{10}$ (2) $S_{12} = S_{11} + S_{10}$

(3) 2 $S_{11} = S_{12} + S_{10}$ (4) $S_{11} = S_{10} + S_{12}$

Q62. Let $\alpha = \frac{(4!)!}{(4!)^{3!}}$ and $\beta = \frac{(5!)!}{(5!)^{4!}}$. Then :

(1) $\alpha \in N$ and $\beta \notin N$ (2) $\alpha \notin N$ and $\beta \in N$

(3) $\alpha \in N$ and $\beta \in N$ (4) $\alpha \notin N$ and $\beta \notin N$

Q63. The 20^{th} term from the end of the progression $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots, -129\frac{1}{4}$ is :-

(1) -118 (2) -110

(3) -115 (4) -100

Q64. If $2\tan^2\theta - 5\sec\theta = 1$ has exactly 7 solutions in the interval $0, \frac{n\pi}{2}$, for the least value of $n \in N$ then $\sum_{k=1}^{n} \frac{k}{2^k}$ is equal to :

(1) $\frac{1}{2^{15}}2^{14} - 14$ (2) $\frac{1}{2^{14}}2^{15} - 15$

(3) $1 - \frac{15}{2^{13}}$ (4) $\frac{1}{2^{13}}2^{14} - 15$

Q65. Let A and B be two finite sets with m and n elements respectively. The total number of subsets of the set A is 56 more than the total number of subsets of B. Then the distance of the point P(m, n) from the point Q(-2, -3) is

(1) 10 (2) 6

(3) 4 (4) 8

Q66. Let R be the interior region between the lines $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin. The set of all values of a, for which the points $a^2, a+1$ lie in R, is :

(1) $\left(-3, -1\right) \cup -\frac{1}{3}, 1$ (2) $\left(-3, 0\right) \cup \frac{1}{3}, 1$

(3) $\left(-3, 0\right) \cup \frac{2}{3}, 1$ (4) $\left(-3, -1\right) \cup \frac{1}{3}, 1$

Q67. Let e_1 be the eccentricity of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ and e_2 be the eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$, which passes through the foci of the hyperbola. If $e_1e_2 = 1$, then the length of the chord of the ellipse parallel to the x-axis and passing through $(0, 2)$ is :

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

(3) $\frac{10\sqrt{5}}{3}$ (4) $3\sqrt{5}$

Q68. If $\lim_{x \to 0} \frac{3 + \alpha \sin x + \beta \cos x + \log_e(1 - x)}{3\tan^2 x} = \frac{1}{3}$, then $2\alpha - \beta$ is equal to :

(1) 2 (2) 7

(3) 5 (4) 1

Q69. The values of α, for which $\begin{vmatrix} 1 & \frac{3}{2} & \alpha + \frac{3}{2} \\ 1 & \frac{1}{3} & \alpha + \frac{1}{3} \\ 2\alpha + 3 & 3\alpha + 1 & 0 \end{vmatrix} = 0$, lie in the interval

(1) $(-2, 1)$ (2) $(-3, 0)$

(3) $-\frac{3}{2}, \frac{3}{2}$ (4) $(0, 3)$

Q70. Considering only the principal values of inverse trigonometric functions, the number of positive real values of x satisfying $\tan^{-1}(x) + \tan^{-1}(2x) = \frac{\pi}{4}$ is :

(1) More than 2 (2) 1

(3) 2 (4) 0

Q71. Let f: $R - \frac{-1}{2} \to R$ and g: $R - \frac{-5}{2} \to R$ be defined as $f(x) = \frac{2x + 3}{2x + 1}$ and $g(x) = \frac{|x| + 1}{2x + 5}$. Then the domain of the function fog is :

(1) $R - -\frac{5}{2}$ (2) R

(3) $R - -\frac{7}{4}$ (4) $R - -\frac{5}{2}, -\frac{7}{4}$

Q72. Consider the function f: $(0, 2) \to R$ defined by $f(x) = \frac{x}{2} + \frac{2}{x}$ and the function $g(x)$ defined by $g(x) = \begin{cases} \min\{f(t)\}, & 0 < t \le x \text{ and } 0 < x \le 1 \\ \frac{3}{2} + x, & 1 < x < 2 \end{cases}$. Then

(1) g is continuous but not differentiable at $x = 1$ (2) g is not continuous for all $x \in (0, 2)$

(3) g is neither continuous nor differentiable at $x = 1$ (4) g is continuous and differentiable for all $x \in (0, 2)$

Q73. Let $g(x) = 3f\frac{x}{3} + f(3 - x)$ and $f''(x) > 0$ for all $x \in (0, 3)$. If g is decreasing in $(0, \alpha)$ and increasing in $(\alpha, 3)$, then 8α is

(1) 24 (2) 0

(3) 18 (4) 20

Q74. The integral $\int \frac{x^8 - x^2 dx}{x^{12} + 3x^6 + 1\tan^{-1}x^3 + \frac{1}{x^3}}$ is equal to :

(1) $\log\tan^{-1}x^3 + \frac{1}{x^3}^{\frac{1}{3}} + C$ (2) $\log_e\tan^{-1}x^3 + \frac{1}{x^3}^{\frac{1}{2}} + C$

(3) $\log_e\tan^{-1}x^3 + \frac{1}{x^3} + C$ (4) $\log_e\tan^{-1}x^3 + \frac{1}{x^3}^{3} + C$

Q75. For $0 < a < 1$, the value of the integral $\int_0^{\pi} \frac{dx}{1 - 2a\cos x + a^2}$ is :

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

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

Q76. If $y = y(x)$ is the solution curve of the differential equation $x^2 - 4dy - y^2 - 3ydx = 0, x > 2, y(4) = \frac{3}{2}$ and the slope of the curve is never zero, then the value of $y(10)$ equals :

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

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

Q77. The position vectors of the vertices A, B and C of a triangle are $2\hat{i} - 3\hat{j} + 3\hat{k}$, $2\hat{i} + 2\hat{j} + 3\hat{k}$ and $-\hat{i} + \hat{j} + 3\hat{k}$ respectively. Let l denotes the length of the angle bisector AD of $\angle BAC$ where D is on the line segment BC, then $2l^2$ equals :

(1) 49 (2) 42

(3) 50 (4) 45

Q78. Let the position vectors of the vertices A, B and C of a triangle be $2\hat{i} + 2\hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} + 2\hat{k}$ and $2\hat{i} + \hat{j} + 2\hat{k}$ respectively. Let l_1, l_2 and l_3 be the lengths of perpendiculars drawn from the ortho centre of the triangle on the sides AB, BC and CA respectively, then $l_1^2 + l_2^2 + l_3^2$ equals :

(1) $\frac{1}{5}$ (2) $\frac{1}{2}$

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

Q79. Let the image of the point $(1, 0, 7)$ in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ be the point (α, β, γ). Then which one of the following points lies on the line passing through (α, β, γ) and making angles $\frac{2\pi}{3}$ and $\frac{3\pi}{4}$ with y - axis and z - axis respectively and an acute angle with x - axis?

(1) $(1, -2, 1+\sqrt{2})$ (2) $(1, 2, 1-\sqrt{2})$

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

Q80. An urn contains 6 white and 9 black balls. Two successive draws of 4 balls are made without replacement. The probability, that the first draw gives all white balls and the second draw gives all black balls, is :

(1) $\frac{5}{256}$ (2) $\frac{5}{715}$

(3) $\frac{3}{715}$ (4) $\frac{3}{256}$

Q81. Let the complex numbers α and $\frac{1}{\alpha}$ lie on the circles $|z - z_0|^2 = 4$ and $|z - z_0|^2 = 16$ respectively, where $z_0 = 1 + i$. Then, the value of $100\,|\alpha|^2$ is_____.

Q82. The coefficient of x^{2012} in the expansion of $(1 - x^{2008})(1 + x + x^2)^{2007}$ is equal to _____.

Q83. If the sum of squares of all real values of α, for which the lines $2x - y + 3 = 0$, $6x + 3y + 1 = 0$ and $\alpha x + 2y - 2 = 0$ do not form a triangle is p, then the greatest integer less than or equal to p is _____.

Q84. Consider a circle $(x - \alpha)^2 + (y - \beta)^2 = 50$, where $\alpha, \beta > 0$. If the circle touches the line $y + x = 0$ at the point P, whose distance from the origin is $4\sqrt{2}$, then $(\alpha + \beta)^2$ is equal to _____.

Q85. The mean and standard deviation of 15 observations were found to be 12 and 3 respectively. On rechecking it was found that an observation was read as 10 in place of 12. If μ and σ^2 denote the mean and variance of the correct observations respectively, then $15\mu + \mu^2 + \sigma^2$ is equal to _____.

Q86. Let A be a 2×2 real matrix and I be the identity matrix of order 2. If the roots of the equation $|A - xI| = 0$ be -1 and 3, then the sum of the diagonal elements of the matrix A^2 is _____.

Q87. Let $f(x) = \int_0^x g(t)\log_e\frac{1-t}{1+t}dt$, where g is a continuous odd function. If $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} f(x) + \frac{x^2\cos x}{1+e^x}dx = \frac{\pi^2}{\alpha} - \alpha$, then α is equal to _____.

Q88. If the area of the region $\{(x, y) : 0 \le y \le \min(2x, 6x - x^2)\}$ is A, then $12A$ is equal to _____.

Q89. If the solution curve, of the differential equation $\frac{dy}{dx} = \frac{x+y-2}{x-y}$ passing through the point $(2, 1)$ is $\tan^{-1}\frac{y-1}{x-1} - \frac{1}{\beta}\log_e\alpha + \left(\frac{y-1}{x-1}\right)^2 = \log_e(x-1)$, then $5\beta + \alpha$ is equal to

Q90. The lines $\frac{x-2}{2} = \frac{y}{-2} = \frac{z-7}{16}$ and $\frac{x+3}{4} = \frac{y+2}{3} = \frac{z+2}{1}$ intersect at the point P. If the distance of P from the line $\frac{x+1}{2} = \frac{y-1}{3} = \frac{z-1}{1}$ is l, then $14l^2$ is equal to _____.

ANSWER KEYS

1. (2)	**2.** (1)	**3.** (2)	**4.** (2)	**5.** (3)	**6.** (2)	**7.** (3)	**8.** (2)
9. (3)	**10.** (4)	**11.** (4)	**12.** (3)	**13.** (4)	**14.** (3)	**15.** (3)	**16.** (4)
17. (4)	**18.** (3)	**19.** (2)	**20.** (2)	**21.** (45)	**22.** (7)	**23.** (50)	**24.** (294)
25. (8)	**26.** (2)	**27.** (3)	**28.** (1)	**29.** (30)	**30.** (144)	**31.** (1)	**32.** (2)
33. (4)	**34.** (1)	**35.** (3)	**36.** (4)	**37.** (4)	**38.** (1)	**39.** (1)	**40.** (3)
41. (2)	**42.** (2)	**43.** (4)	**44.** (1)	**45.** (2)	**46.** (2)	**47.** (1)	**48.** (4)
49. (4)	**50.** (1)	**51.** (7)	**52.** (135)	**53.** (8)	**54.** (2)	**55.** (4)	**56.** (37)
57. (5)	**58.** (18)	**59.** (10)	**60.** (0)	**61.** (2)	**62.** (3)	**63.** (3)	**64.** (4)
65. (1)	**66.** (2)	**67.** (3)	**68.** (3)	**69.** (2)	**70.** (2)	**71.** (1)	**72.** (1)
73. (3)	**74.** (1)	**75.** (3)	**76.** (1)	**77.** (4)	**78.** (2)	**79.** (3)	**80.** (3)
81. (20)	**82.** (0)	**83.** (32)	**84.** (100)	**85.** (2521)	**86.** (10)	**87.** (2)	**88.** (304)
89. (11)	**90.** (108)						