Q1. In the equation $X+\frac{a}{Y^2}\left[Y-b\right]=RT$, X is pressure, Y is volume, R is universal gas constant and T is temperature. The physical quantity equivalent to the ratio $\frac{a}{b}$ is:

(1) Pressure gradient (2) Energy

(3) Impulse (4) Coefficient of viscosity

Q2. The distance travelled by an object in time t is given by $s=2.5t^2$. The instantaneous speed of the object at $t=5$ s will be :

(1) 25 m s^{-1} (2) 5 m s^{-1}

(3) 62.5 m s^{-1} (4) 12.5 m s^{-1}

Q3. A passenger sitting in a train A moving at 90 km h^{-1} observes another train B moving in the opposite direction for 8 s. If the velocity of the train B is 54 km h^{-1}, then length of train B is:

(1) 120 m (2) 320 m

(3) 80 m (4) 200 m

Q4. A vehicle of mass 200 kg is moving along a levelled curved road of radius 70 m with angular velocity of 0.2 rad s^{-1}. The centripetal force acting on the vehicle is:

(1) 560 N (2) 2800 N

(3) 2240 N (4) 14 N

Q5. Two planets A and B of radii R and 1.5 R have densities ρ and $\frac{\rho}{2}$ respectively. The ratio of acceleration due to gravity at the surface of B to A is:

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

(3) 3 : 4 (4) 4 : 3

Q6. Given below are two statements:

Statement I : For a planet, if the ratio of mass of the planet to its radius increase, the escape velocity from the planet also increase.

Statement II : Escape velocity is independent of the radius of the planet.

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

(1) Statement I is incorrect but Statement II is correct (2) Statement I is correct but statement II is incorrect

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

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

Assertion A : A spherical body of radius (5 ± 0.1) mm having a particular density is falling through a liquid of constant density. The percentage error in the calculation of its terminal velocity is 4%.

Reason R : The terminal velocity of the spherical body falling through the liquid is inversely proportional to its radius. In the light of the above statements, choose the correct answer from the options given below

(1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true 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

Q8. The initial pressure and volume of an ideal gas are P_0 and V_0. The final pressure of the gas when the gas is suddenly compressed to volume $\frac{V_0}{4}$ will be:

(Given γ= ratio of specific heats at constant pressure and at constant volume.)

(1) $P_0\left(4\right)^{\gamma}$ (2) $4P_0$

(3) P_0 (4) $P_0\left(4\right)^{\frac{1}{\gamma}}$

Q9. The mean free path of molecules of a certain gas at STP is $1500d$, where d is the diameter of the gas molecules. While maintaining the standard pressure, the mean free path of the molecules at 373 K is approximately:

(1) $750d$
(2) $1098d$
(3) $2049d$
(4) $1500d$

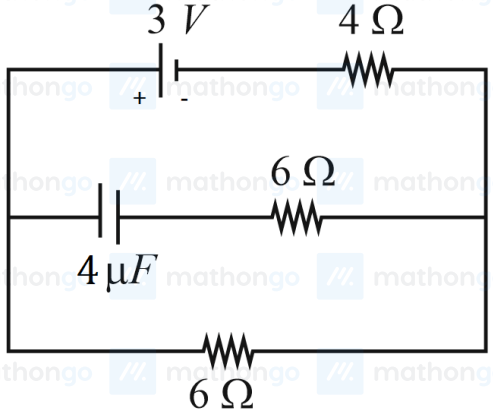
Q10. A particle executes SHM of amplitude A. The distance from the mean position when its kinetic energy becomes equal to its potential energy is:

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

Q11. A $10\ \mu C$ charge is divided into two parts and placed at 1 cm distance so that the repulsive force between them is maximum. The charges of the two parts are:

(1) $7\mu C, 3\mu C$
(2) $8\mu C, 2\mu C$
(3) $5\mu C, 5\mu C$
(4) $9\mu C, 1\mu C$

Q12. In the network shown below, the charge accumulated in the capacitor in steady state will be:



(1) $10.3\ \mu C$
(2) $4.8\ \mu C$
(3) $12\ \mu C$
(4) $7.2\mu C$

Q13. An electron is moving along the positive x-axis. If uniform magnetic field is applied parallel to the negative z-axis, then

A.The electron will experience magnetic force along positive y-axis
B.The electron will experience magnetic force along negative y-axis
C.The electron will not experience any force in magnetic field
D.The electron will continue to move along the positive x-axis
E.The electron will move along circular path in magnetic field

Choose the correct answer from the option given below:

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

Q14. Given below are two statements:

Statement I : An AC circuit undergoes electrical resonance if it contains either a capacitor or an inductor.

Statement II: An AC circuit containing a pure capacitor or a pure inductor consumes high power due to its non-zero power factor. In the light of above statements, choose the correct answer 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 false
(4) Both Statement I and Statement II are true

Q15. Given below are two statements:

Statement I : Out of microwaves, infrared rays and ultraviolet rays, ultraviolet rays are the most effective for the emission of electrons from a metallic surface

Statement II : Above the threshold frequency, the maximum kinetic energy of photoelectrons is inversely proportional to the frequency of the incident light

In the light of above statements, choose the correct answer 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

Q16. In an electromagnetic wave, at an instant and at a particular position, the electric field is along the negative z-axis and magnetic field is along the positive x-axis. Then the direction of propagation of electromagnetic wave is:

(1) positive z-axis (2) positive y-axis

(3) at 45°angle from positive y -axis (4) negative y-axis

Q17. In a Young's double slit experiment, the ratio of amplitude of light coming from slits is 2 : 1. The ratio of the maximum to minimum intensity in the interference pattern is

(1) 9 : 4 (2) 25 : 9

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

Q18. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A : The binding energy per nucleon is practically independent of the atomic number for nuclei of mass number in the range 30 to 170.

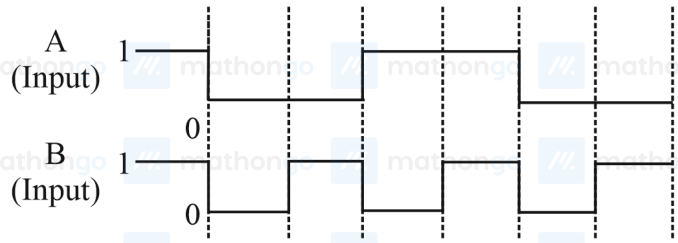
Reason R : Nuclear force is short ranged.

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

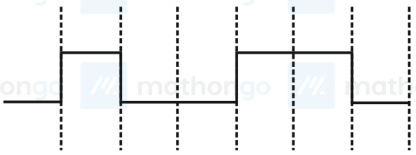
(1) **A** is false but **R** is true (2) Both **A** and **R** are true and **R** is the correct explanation of **A**

(3) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A** (4) **A** is true but **R** is false.

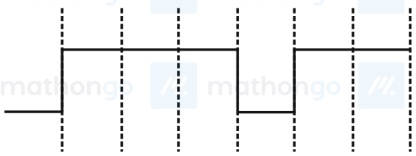
Q19. The output from a NAND gate having inputs A and B given below will be,



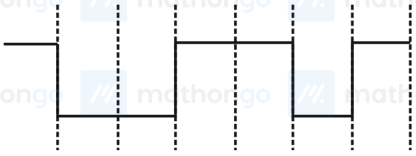
(1)



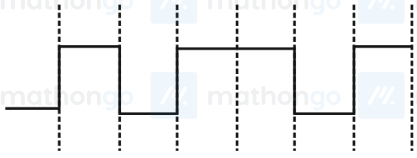
(2)



(3)



(4)



Q20. To radiate EM signal of wavelength λ with high efficiency, the antennas should have a minimum size equal to:

(1) 2λ (2) $\frac{\lambda}{2}$

(3) $\frac{\lambda}{4}$ (4) λ

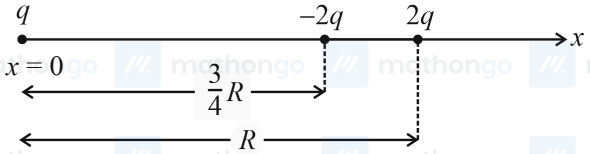
Q21. A car accelerates from rest of u m s^{-1}. The energy spent in this process is E J. The energy required to accelerate the car from u m s^{-1} to $2u$ m s^{-1} is nE J. The value of n is _____.

Q22. A light rope is wound around a hollow cylinder of mass 5 kg and radius 70 cm. The rope is pulled with a force of 52.5 N. The angular acceleration of the cylinder will be _____ rad s^{-2}.

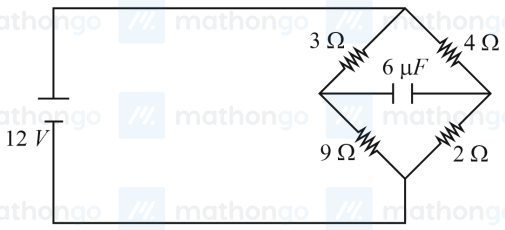
Q23. Two plates A and B have thermal conductivities 84 W m^{-1} K^{-1} and 126 W m^{-1} K^{-1} respectively. They have same surface area and same thickness. They are placed in contact along their surfaces. If the temperatures of the outer surfaces of A and B are kept at 100°C and 0°C respectively, then the temperature of the surface of contact in steady state is_____ °C.

Q24. In an experiment with sonometer when a mass of 180 g is attached to the string, it vibrates with fundamental frequency of 30 Hz. When a mass m is attached, the string vibrates with fundamental frequency of 50 Hz. The value of m is _____ g.

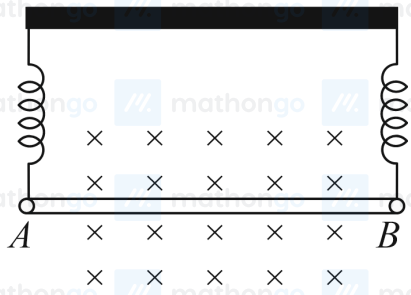
Q25. Three point charges q, $-2q$ and $2q$ are placed on x axis at a distance $x = 0, x = \frac{3}{4}R$ and $x = R$ respectively from origin as shown. If $q = 2 \times 10^{-6}$ C and $R = 2$ cm, the magnitude of net force experienced by the charge $-2q$ is _____ N.



Q26. In the circuit shown, the energy stored in the capacitor is n μJ. The value of n is _____.



Q27. A straight wire AB of mass 40 g and length 50 cm is suspended by a pair of flexible leads in uniform magnetic field of magnitude 0.40 T as shown in the figure. The magnitude of the current required in the wire to remove the tension in the supporting leads is _____ A. (Take $g = 10$ m s^{-2}.



Q28. An insulated copper wire of 100 turns is wrapped around a wooden cylindrical core of the cross-sectional area 24 cm^2. The two ends of the wire are connected to a resistor. The total resistance in the circuit is 12 Ω. If an externally applied uniform magnetic field in the core along its axis changes from 1.5 T in one direction to 1.5 T in the opposite direction, the charge flowing through a point in the circuit during the change of magnetic field will be _____ mC.

Q29. A bi convex lens of focal length 10 cm is cut in two identical parts along a plane perpendicular to the principal axis. The power of each lens after cut is _____ D.

Q30. An atom absorbs a photon of wavelength 500 nm and emits another photon of wavelength 600 nm. The net energy absorbed by the atom in this process is $n \times 10^{-4}$eV. The value of n is [Assume the atom to be

stationary during the absorption and emission process] (Take $h = 6.6 \times 10^{-34}$ J s and $c = 3 \times 10^{8}$ m s^{-1}).

Q31. . Identify the correct order of standard enthalpy of formation of sodium halides.

(1) NaI < NaBr < NaF < NaCl (2) NaI < NaBr < NaCl < NaF

(3) NaF < NaCl < NaBr < NaI (4) NaCl < NaF < NaBr < NaI

Q32. Match Lis-I with List-II.

List-1	List-II
A. Weak intermolecular forces of attraction	I. Hexamethylenediamine + adipic acid
B. Hydrogen bonding	II. $AlEt_3 + TiCl_4$
C. Heavily branched polymer	III. 2 - chloro - 1, 3 - butadiene
D. High density polymer	IV. Phenol + formaldehyde

Choose the correct answer from the options given below

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

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

Q33. Given below are two statements :

Statement I : SO_2 and H_2O both possess V-shaped structure

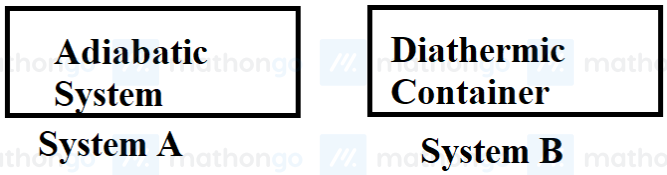
Statement II : The bond angle of SO_2 is less than that of H_2O.

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

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

(3) Statement I is incorrect but Statement II is correct (4) Statement I is correct but Statement II is incorrect

Q34. What happens when methane undergoes combustion in systems A and B respectively?



(1) System A: Temperature rises; System B: Temperature remains same

(2) System A: Temperature remains same; System B: Temperature rises

(3) System A: Temperature falls; System B: Temperature remains same

(4) System A: Temperature falls; System B: Temperature rises

Q35. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Isotopes of hydrogen have almost same chemical properties, but difference in their rates of reactions.

Reason R: Isotopes of hydrogen have different enthalpy of bond dissociation.

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

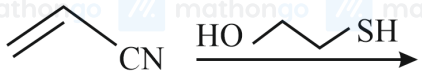
(3) A is not correct but R is correct (4) A is correct but R is not correct

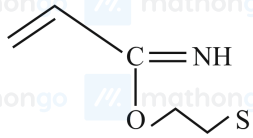
Q36. Better method for preparation of BeF_2, among the following is

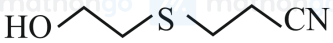
(1) $BeO + C + F_2 \xrightarrow{\Delta} BeF_2$ (2) $NH_4{}_2BeF_4 \xrightarrow{\Delta} BeF_2$

(3) $Be + F_2 \xrightarrow{\Delta} BeF_2$ (4) $BeH_2 + F_2 \xrightarrow{\Delta} BeF_2$

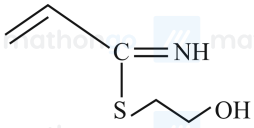
Q37. The major product for the following reaction is :



(1) 

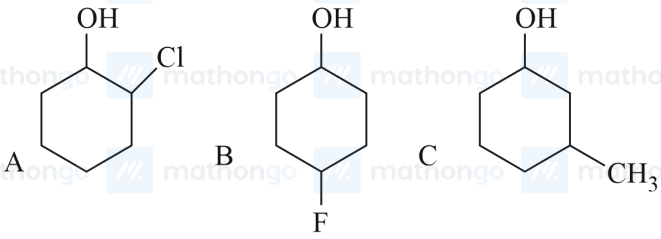
(2) 

(3) 

(4) 

Q38. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Order of acidic nature of the following compounds is A > B > C.



Reason R: Fluoro is a stronger electron withdrawing group than Chloro group.

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

(3) A is true but R is false

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

Q39. Given below are two statements :

Statement I : Tropolone is an aromatic compound and has 8π electrons.

Statement II : π electrons of $>C=O$ group in tropolone is involved in aromaticity. In the light of the above statements choose the correct answer from the options given below:

(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are false

(4) Both Statement I and Statement II are true

Q40. Which of the following are the Green house gases?

A. Water vapour

B.Ozone

C.I_2

D.Molecular hydrogen

Choose the most appropriate answer from the options given below :

(1) A and D only

(2) B and C only

(3) A and B only

(4) C and D only

Q41. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : The diameter of colloidal particles in solution should not be much smaller than wavelength of light to show Tyndall effect.

Reason R : The light scatters in all directions when the size of particles is large enough.

In the light of the above statements, choose the correct 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 true but R is false
(3) A is false but R is true
(4) Both A and R are correct and R is the correct explanation of A

Q42. Given below are two statements related to Ellingham diagram :
Statement I : Ellingham diagrams can be constructed for formation of oxides, sulphides and halides of metals.
Statement II : It consists of plots of ΔH° vs T for formation of oxides of elements.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

Q43. The correct group of halide ions which can be oxidised by oxygen in acidic medium is
(1) Br^- and I^- only
(2) Br^- only
(3) I^- only
(4) Cl^- , Br^- and I^- only

Q44. The covalency and oxidation state respectively of boron in BF_4^-, are
(1) 3 and 5
(2) 3 and 4
(3) 4 and 4
(4) 4 and 3

Q45. Which of the following complexes will exhibit maximum attraction to an applied magnetic field?
(1) $[Ni(H_2O)_6]^{2+}$
(2) $[Co(en)_3]^{3+}$
(3) $[Zn(H_2O)_6]^{2+}$
(4) $[Co(H_2O)_6]^{2+}$

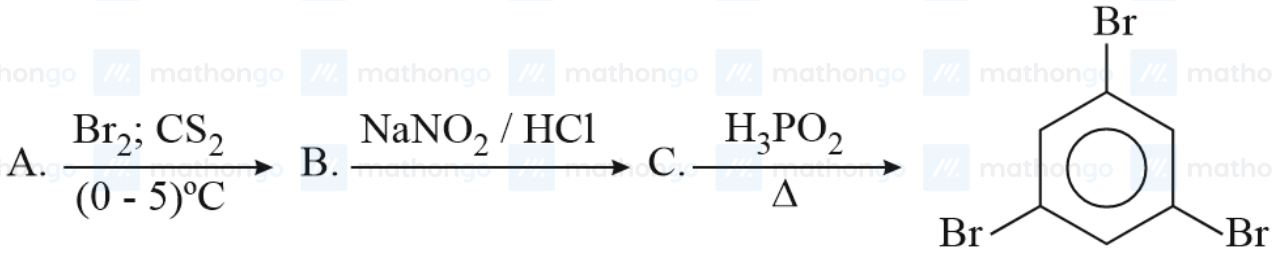
Q46. The total number of stereoisomers for the complex $[Cr(ox)_2ClBr]^{3-}$ (where ox = oxalate) is
(1) 3
(2) 2
(3) 4
(4) 1

Q47. Match List-I with List-II.
1-Bromopropane is reacted with reagents in List-I to give product in List-II

	List-I Reagent		List-II Product
A.	KOH (alc)	I.	Nitrile
B.	KCN (alc)	II.	Ester
C.	$AgNO_2$	III.	Alkene
D	$H_3CCOOAg$	IV.	Nitroalkane

Choose the correct answer from the options given below
(1) A-III, B-I, C-IV, D-II
(2) A-I, B-II, C-III, D-IV
(3) A-I, B-III, C-IV, D-II
(4) A-IV, B-III, C-II, D-I

Q48. Compound A from the following reaction sequence is :



(1) Benzoic Acid
(2) Aniline
(3) Salicylic Acid
(4) Phenol

Q49. In the wet tests for detection of various cations by precipitation, Ba^{2+} cations are detected by obtaining precipitate of

(1) Ba(ox) : Barium oxalate (2) $BaCO_3$

(3) $Ba(OAc)_2$ (4) $BaSO_4$

Q50. The naturally occurring amino acid that contains only one basic functional group in its chemical structure is

(1) asparagine (2) histidine

(3) arginine (4) lysine

Q51. 1 g of a carbonate M_2CO_3 on treatment with excess HCl produces 0.01 mol of CO_2. The molar mass of M_2CO_3 is $gmol^{-1}$. (Nearest integer)

Q52. The orbital angular momentum of an electron in 3 s orbital is $\frac{xh}{2\pi}$. The value of x is (nearest integer)

Q53. 20 mL of 0.1MNaOH is added to 50 mL of 0.1M acetic acid solution. The pH of the resulting solution is $\times 10^{-2}$. (Nearest integer) Given : $pKa CH_3COOH = 4.76$

log 2 = 0.30

log 3 = 0.48

Q54. See the following chemical reaction:

$Cr_2O_7^{2-} + XH^+ + 6Fe^{2+} \rightarrow YCr^{3+} + 6Fe^{3+} + ZH_2O$

The sum of X, Y and Z is

Q55. If the formula of Borax is $Na_2 B_4O_x(OH)_y \cdot zH_2O$, then x + y + z = _____

Q56. 0.400 g of an organic compound (X) gave 0.376 g of AgBr in Carius method for estimation of bromine. % of bromine in the compound (X) is (Given: Molar mass AgBr = 188 g mol^{-1} Br = 80 g mol^{-1}

Q57. Sodium metal crystallises in a body centred cubic lattice with unit cell edge length of 4 Å. The radius of sodium atom is __ $\times 10^{-1}$Å. (Nearest integer)

Q58. Sea water contains 29.25 % NaCl and 19 % $MgCl_2$ by weight of solution. The normal boiling point of the sea water is °C (Nearest integer) Assume 100% ionization for both NaCl and $MgCl_2$ Given:
$K_b H_2O = 0.52$ K kg mol^{-1} Molar mass of NaCl and $MgCl_2$ is 58.5 and 95 g mol^{-1} respectively.

Q59. At 298 K, the standard reduction potential for Cu^{2+}/Cu electrode is 0.34 V. Given :
$K_{sp}Cu(OH)_2 = 1 \times 10^{-20}$ Take $\frac{2.303RT}{F} = 0.059$ V The reduction potential at pH = 14 for the above couple is $(-)x \times 10^{-2}$ V. The value of x is

Q60. $A(g) \rightarrow 2B(g) + C(g)$ is a first order reaction. The initial pressure of the system was found to be 800 mm Hg which increased to 1600 mm Hg after 10 min. The total pressure of the system after 30 min will be mm Hg. (Nearest integer)

Q61. Let α, β be the roots of the equation $x^2 - \sqrt{2x} + 2 = 0$ Then $\alpha^{14} + \beta^{14}$ is equal to

(1) -64 (2) $-64\sqrt{2}$

(3) -128 (4) $-128\sqrt{2}$

Q62. Let $S = z \in \mathbb{C}: \bar{z} = iz^2 + \text{Re}(\bar{z})$. Then $\sum_{z \in S} |z|^2$ is equal to

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

(3) $\frac{7}{2}$ (4) 3

Q63. All words, with or without meaning, are made using all the letters of the word $MONDAY$. These words are written as in a dictionary with serial numbers. The serial number of the word $MONDAY$ is

(1) 327 (2) 328
(3) 324 (4) 326

Q64. Let $a_1, a_2, a_3, \ldots$ be a G.P. of increasing positive numbers. Let the sum of its 6^{th} and 8^{th} terms be 2 and the product of its 3^{rd} and 5^{th} terms be $\frac{1}{9}$. Then $6a_2 + a_4a_4 + a_6$ is equal to
(1) 3 (2) $3\sqrt{3}$
(3) 2 (4) $2\sqrt{2}$

Q65. The coefficient of x^5 in the expansion of $2x^3 - \frac{1}{3x^2}^5$ is
(1) $\frac{80}{9}$ (2) 9
(3) 8 (4) $\frac{26}{3}$

Q66. Let (α, β) be the centroid of the triangle formed by the lines $15x - y = 82$, $6x - 5y = -4$ and $9x + 4y = 17$. Then $\alpha + 2\beta$ and $2\alpha - \beta$ are the roots of the equation
(1) $x^2 - 7x + 12 = 0$ (2) $x^2 - 14x + 48 = 0$
(3) $x^2 - 13x + 42 = 0$ (4) $x^2 - 10x + 25 = 0$

Q67. Let the centre of a circle C be α, β and its radius $r < 8$. Let $3x + 4y = 24$ and $3x - 4y = 32$ be two tangents and $4x + 3y = 1$ be a normal to C. Then $(\alpha - \beta + r)$ is equal to
(1) 7 (2) 5
(3) 6 (4) 9

Q68. If $\lim_{x \to 0} \frac{e^{ax} - \cos(bx) - \frac{cxe^{-cx}}{2}}{1 - \cos(2x)} = 17$, then $5a^2 + b^2$ is equal to
(1) 64 (2) 72
(3) 68 (4) 76

Q69. The statement $(p \wedge (\sim q)) \vee ((\sim p) \wedge q) \vee ((\sim p) \wedge (\sim q))$ is equivalent to ____
(1) $\sim p \vee q$ (2) $\sim p \vee \sim q$
(3) $p \vee \sim q$ (4) $p \vee q$

Q70. Let for $A = \begin{matrix} 1 & 2 & 3 \\ \alpha & 3 & 1 \\ 1 & 1 & 2 \end{matrix}$, $A = 2$. If $|2 \text{ adj } (2 \text{ adj } (2A))| = 32^n$, then $3n + \alpha$ is equal to
(1) 9 (2) 11
(3) 12 (4) 10

Q71. If the system of equations
$2x + y - z = 5$
$2x - 5y + \lambda z = \mu$
$x + 2y - 5z = 7$
has infinitely many solutions, then $(\lambda + \mu)^2 + (\lambda - \mu)^2$ is equal to
(1) 904 (2) 916
(3) 912 (4) 920

Q72. The range of $fx = 4\sin^{-1}\frac{x^2}{x^2+1}$ is
(1) $[0, 2\pi]$ (2) $[0, \pi]$
(3) $[0, 2\pi)$ (4) $[0, \pi)$

Q73. The value of $\frac{e^{-\frac{\pi}{4}} + \int_0^{\frac{\pi}{4}} e^{-x}\tan^{50} x dx}{\int_0^{\frac{\pi}{4}} e^{-x}\left(\tan^{49} x + \tan^{51} x\right)dx}$
(1) 51 (2) 50
(3) 25 (4) 49

Q74. The area of the region $x, y: x^2 \leq y \leq x^2 - 4, y \geq 1$ is

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

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

Q75. Let $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3$ and the angle between the vectors $\vec{a}$ and $\vec{b}$ be $\frac{\pi}{4}$. Then $\left|\left(\vec{a} + 2\vec{b}\right) \times \left(2\vec{a} - 3\vec{b}\right)\right|^2$ is equal to

(1) 441 (2) 482

(3) 841 (4) 882

Q76. Let for a triangle ABC

$\overrightarrow{AB} = -2\hat{i} + \hat{j} + 3\hat{k}$

$\overrightarrow{CB} = \alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$

$\overrightarrow{CA} = 4\hat{i} + 3\hat{j} + \delta\hat{k}$

If $\delta > 0$ and the area of the triangle ABC is $5\sqrt{6}$ then $\overrightarrow{CB} \cdot \overrightarrow{CA}$ is equal to

(1) 60 (2) 54

(3) 108 (4) 120

Q77. The plane, passing through the points $(0, -1, 2)$ and $(-1, 2, 1)$ and parallel to the line passing through $(5, 1, -7)$ and $(1, -1, -1)$, also passes through the point

(1) -2, 5, 0 (2) 1, -2, 1

(3) 2, 0, 1 (4) 0, 5, -2

Q78. The line, that is coplanar to the line $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$, is

(1) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{4}$ (2) $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$

(3) $\frac{x-1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ (4) $\frac{x+1}{1} = \frac{y-2}{2} = \frac{z-5}{5}$

Q79. Let N be the foot of perpendicular from the point $P(1, -2, 3)$ on the line passing through the points $(4, 5, 8)$ and $(1, -7, 5)$. Then the distance of N from the plane $2x - 2y + z + 5 = 0$ is

(1) 8 (2) 6

(3) 9 (4) 7

Q80. The random variable X follows binomial distribution $B(n, p)$, for which the difference of the mean and the variance is 1.

If $2P(X = 2) = 3P(X = 1)$, then $n^2P(X > 1)$ is equal to

(1) 15 (2) 11

(3) 12 (4) 16

Q81. Total numbers of 3-digit numbers that are divisible by 6 and can be formed by using the digits 1, 2, 3, 4, 5 with repetition, is _____

Q82. Let α denote the greatest integer $\leq \alpha$. Then $\sqrt{1} + \sqrt{2} + \sqrt{3} + \ldots\ldots\ldots\ldots + \sqrt{120}$ is equal to

Q83. Let $f x = \sum_{k=1}^{10} k \cdot x^k, \quad x \in \mathbb{R}$, if $2f2 + f'2 = 1192^n + 1$ then n is equal to _____.

Q84. The remainder, when 7^{103} is divided by 17, is

Q85. The foci of a hyperbola are $(\pm 2, 0)$ and its eccentricity is $\frac{3}{2}$. A tangent, perpendicular to the line $2x + 3y = 6$, is drawn at a point in the first quadrant on the hyperbola. If the intercepts made by the tangent on the x- and y-axes are a and b respectively, then $|6a| + |5b|$ is equal to

Q86. The mean and standard deviation of the marks of 10 students were found to be 50 and 12 respectively. Later, it was observed that two marks 20 and 25 were wrongly read as 45 and 50 respectively. Then the correct variance is

Q87. Let $A = \{-4, -3, -2, 0, 1, 3, 4\}$ and $R = \{(a, b) \in A \times A : b = |a| \text{ or } b^2 = a + 1\}$ be a relation on A. Then the minimum number of elements, that must be added to the relation R so that it becomes reflexive and symmetric, is

Q88. For $x \in (-1, 1]$, the number of solutions of the equation $\sin^{-1}x = 2\tan^{-1}x$ is equal to

Q89. Let $f_n = \int_0^{\frac{\pi}{2}} \sum_{k=1}^{n} \sin^{k-1}x \sum_{k=1}^{n} (2k-1)\sin^{k-1}x \cos x\,dx, \quad n \in \mathbb{N}$. Then $f_{21} - f_{20}$ is equal to

Q90. If $y = y(x)$ is the solution of the differential equation $\frac{dy}{dx} + \frac{4x}{x^2-1}y = \frac{x+2}{x^2-1^{\frac{5}{2}}}, x > 1$ such that $y(2) = \frac{2}{9}\log_e 2 + \sqrt{3}$ and $y\sqrt{2} = \alpha\log_e\sqrt{\alpha} + \beta + \beta - \sqrt{\gamma}, \alpha, \beta, \gamma \in \mathbb{N}$, then $\alpha\beta\gamma$ is equal to

ANSWER KEYS

1. (2)	**2.** (1)	**3.** (2)	**4.** (1)	**5.** (3)	**6.** (2)	**7.** (3)	**8.** (1)
9. (3)	**10.** (1)	**11.** (3)	**12.** (4)	**13.** (3)	**14.** (3)	**15.** (2)	**16.** (4)
17. (4)	**18.** (2)	**19.** (2)	**20.** (3)	**21.** (3)	**22.** (15)	**23.** (40)	**24.** (500)
25. (5440)	**26.** (75)	**27.** (2)	**28.** (60)	**29.** (5)	**30.** (4125)	**31.** (2)	**32.** (4)
33. (4)	**34.** (1)	**35.** (2)	**36.** (2)	**37.** (2)	**38.** (4)	**39.** (1)	**40.** (3)
41. (4)	**42.** (3)	**43.** (3)	**44.** (4)	**45.** (4)	**46.** (1)	**47.** (1)	**48.** (4)
49. (2)	**50.** (1)	**51.** (100)	**52.** (0)	**53.** (458)	**54.** (23)	**55.** (17)	**56.** (40)
57. (17)	**58.** (116)	**59.** (25)	**60.** (2200)	**61.** (3)	**62.** (2)	**63.** (1)	**64.** (1)
65. (1)	**66.** (3)	**67.** (1)	**68.** (3)	**69.** (2)	**70.** (2)	**71.** (2)	**72.** (3)
73. (2)	**74.** (1)	**75.** (4)	**76.** (1)	**77.** (1)	**78.** (2)	**79.** (4)	**80.** (2)
81. (16)	**82.** (825)	**83.** (10)	**84.** (12)	**85.** (12)	**86.** (269)	**87.** (7)	**88.** (2)
89. (41)	**90.** (6)						