Q1. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of the wire is

(1) 6% (2) zero

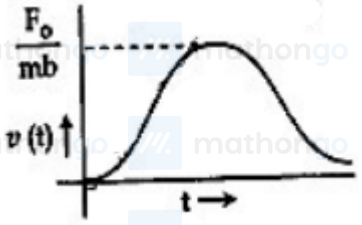
(3) 1% (4) 3%

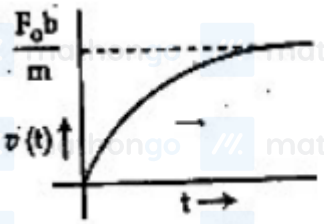
Q2. A boy can throw a stone up to a maximum height of 10 m. The maximum horizontal distance that the boy can throw the same stone up to will be

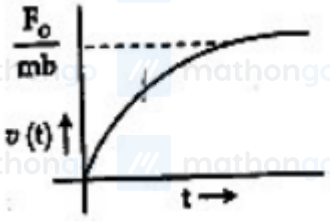
(1) $20\sqrt{2}$ m (2) 10 m

(3) $10\sqrt{2}$ m (4) 20 m

Q3. A particle of mass m is at rest at the origin at time $t = 0$. It is subjected to a force $F(t) = F_0 e^{-bt}$ in the x direction. Its speed $v(t)$ is depicted by which of the following curves?

(1) 

(2) 

(3) 

(4) 

Q4. This question has statement 1 and statement 2. Of the four choices given after the statements, choose the one that best describes the two statements. If two springs S_1 and S_2 of force constants k_1 and k_2, respectively, are stretched by the same force, it is found that more work is done on spring S_1 than on spring S_2. Statement 1 : If stretched by the same amount, work done on S_1, will be more than that on S_2 Statement 2 : $k_1 < k_2$

(1) Statement 1 is false, Statement 2 is true

(2) Statement 1 is true, Statement 2 is false

(3) Statement 1 is true, Statement 2 is the correct explanation for statement 1

(4) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation for statement 1.

Q5. Two cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2, respectively. Their speeds are such that they make complete circles in the same time t. The ratio of their centripetal acceleration is

(1) $m_1 r_1 : m_2 r_2$ (2) $m_1 : m_2$

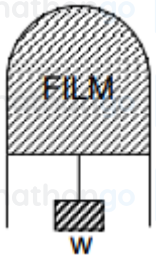
(3) $r_1 : r_2$ (4) 1 : 1

Q6. The mass of a spaceship is 1000 kg. It is to be launched from the earth's surface out into free space. The value of ' g ' and ' R ' (radius of earth) are 10 m/s^2 and 6400 km respectively. The required energy for this work will be ;

(1) 6.4×10^{11} Joules (2) 6.4×10^{8} Joules

(3) 6.4×10^{9} Joules (4) 6.4×10^{10} Joules

Q7. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of 1.5×10^{-2} N (see figure). The length of the slider is 30 cm and its weight negligible. The surface tension of the liquid film is



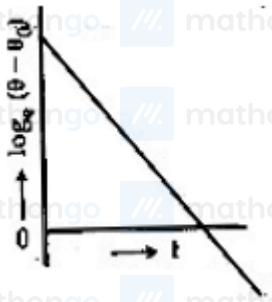
(1) $0.0125\ \mathrm{Nm}^{-1}$
(2) $0.1\ \mathrm{Nm}^{-1}$
(3) $0.05\ \mathrm{Nm}^{-1}$
(4) $0.025\ \mathrm{Nm}^{-1}$

Q8. A wooden wheel of radius R is made of two semicircular parts (see figure); The two parts are held together by a ring made of a metal strip of cross sectional area S and length L. L is slightly less than $2\pi R$. To fit the ring on the wheel, it is heated so that its temperature rises by ΔT and it just steps over the wheel. As it cools down to surrounding temperature, it presses the semicircular parts together. If the coefficient of linear expansion of the metal is α, and its Youngs' modulus is Y, the force that one part of the wheel applies on the other part is :

(1) $2\pi SY\alpha\Delta T$
(2) $SY\alpha\Delta T$
(3) $\pi SY\alpha\Delta T$
(4) $2SY\alpha\Delta T$

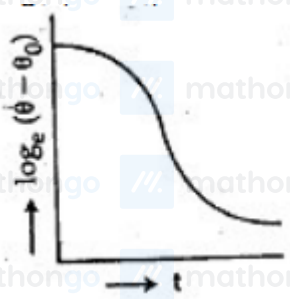
Q9. A liquid in a beaker has temperature $\theta(t)$ at time t and θ_0 is temperature of surroundings, then according to Newton's law of cooling the correct graph between $\log_e(\theta - \theta_0)$ and t is

(1)

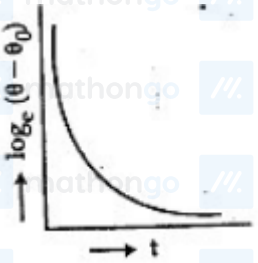


(2)

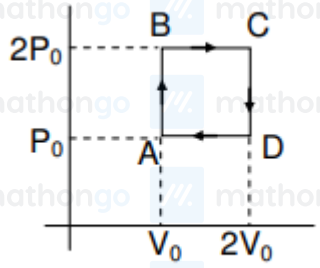
(3)



(4)



Q10. Helium gas goes through a cycle ABCDA (consisting of two isochoric and two isobaric lines) as shown in figure. Efficiency of this cycle is nearly: (Assume the gas to be close to ideal gas)



(1) 15.4%
(2) 9.1%
(3) 10.5%
(4) 12.5%

Q11. A Carnot engine, whose efficiency is 40%, takes in heat from a source maintained at a temperature of 500 K It is desired to have an engine of efficiency 60%. Then, the intake temperature for the same exhaust (sink) temperature must be

(1) efficiency of Carnot engine cannot be made larger than 50%
(2) 1200 K
(3) 750 K
(4) 600 K

Q12. If a simple pendulum has significant amplitude (up to a factor of $1/e$ of original) only in the period between $t = 0s$ to $t = \tau s$, then τ may be called the average life of the pendulum. When the spherical bob of the pendulum suffers a retardation (due to viscous drag) proportional to its velocity, with 'b' as the constant of proportionality, the average life time of the pendulum is (assuming damping is small) in seconds:

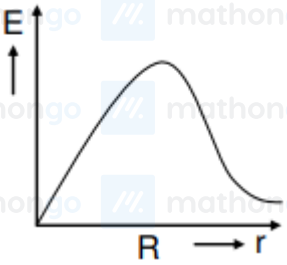
(1) $\frac{0.693}{b}$
(2) b
(3) $\frac{1}{b}$
(4) $\frac{2}{b}$

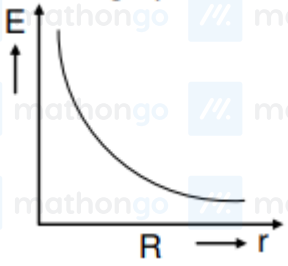
Q13. A cylindrical tube, open at both ends, has a fundamental frequency, f, in air. The tube is dipped vertically in water so that half of it is in water. The fundamental frequency of the air-column is now

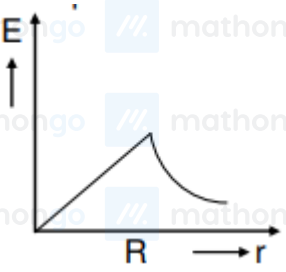
(1) f (2) $\frac{f}{2}$

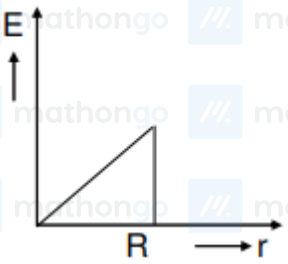
(3) $\frac{3f}{4}$ (4) $2f$

Q14. In a uniformly charged sphere of total charge Q and radius R, the electric field E is plotted as a function of distance from the centre. The graph which would correspond to the above will be

(1) 

(2) 

(3) 

(4) 

Q15. This question has statement 1 and statement 2 . Of the four choices given after the statements, choose the one that best describes the two statements. An insulating solid sphere of radius R has a uniformly positive charge density ρ. As a result of this uniform charge distribution there is a finite value of electric potential at the centre of the sphere, at the surface of the sphere and also at a point out side the sphere. The electric potential at infinity is zero. Statement 1: When a charge q is taken from the centre to the surface of the sphere, its potential energy changes by $\frac{\mathrm{qp}}{3\varepsilon_0}$ Statement 2: The electric field at a distance $r(r < R)$ from the centre of the sphere is $\frac{\rho r}{3\varepsilon_0}$

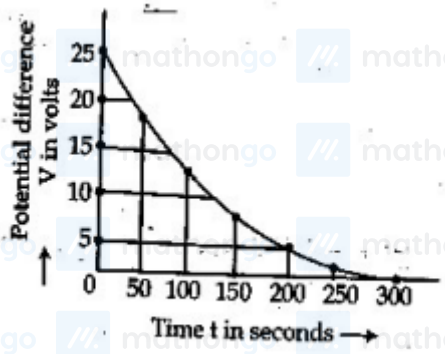
(1) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation for statement 1.

(2) Statement 1 is true, Statement 2 is false

(3) Statement 1 is false, Statement 2 is true

(4) Statement 1 is true, Statement 2 is the correct explanation for statement 1

Q16. The figure shows an experimental plot for discharging of a capacitor in an $R-C$ circuit. The time constant τ



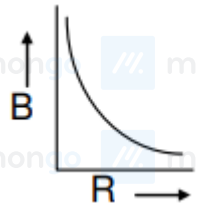
of this circuit lies between:

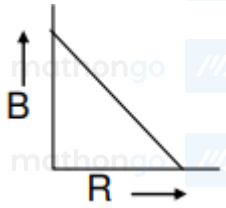
(1) 150 sec and 200 sec
(2) 0 and 50 sec
(3) 50 sec and 100 sec
(4) 100 sec and 150 sec

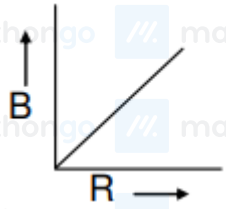
Q17. Two electric bulbs marked 25 W $-$ 220 V and 100 W $-$ 220 V are connected in series to a 440 V supply. Which of the bulbs will fuse?

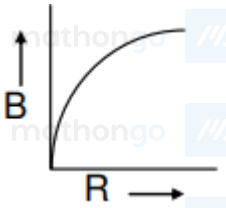
(1) both
(2) 100 W
(3) 25 W
(4) neither

Q18. A charge Q is uniformly distributed over the surface of non conducting disc of radius R. The disc rotates about an axis perpendicular to its plane and passing through its centre with an angular velocity ω. As a result of this rotation a magnetic field of induction B is obtained at the centre of the disc. If we keep both the amount of charge placed on the disc and its angular velocity to be constant and vary the radius of the disc then the variation of the magnetic induction at the centre of the disc will be represented by the figure

(1)


(2)


(3)


(4)


Q19. Proton, Deuteron and alpha particle of the same kinetic energy are moving in circular trajectories in a constant magnetic field. The radii of proton, deuteron and alpha particle are respectively r_p, r_d and r_α. Which one of the following relations is correct?

(1) $r_\alpha = r_p = r_d$
(2) $r_\alpha = r_p < r_d$
(3) $r_\alpha > r_d > r_p$
(4) $r_\alpha = r_d > r_p$

Q20. A coil is suspended in a uniform magnetic field, with the plane of the coil parallel to the magnetic lines of force. When a current is passed through the coil it starts oscillating; it is very difficult to stop. But if an aluminium plate is placed near to the coil, it stops. This is due to :

(1) development of air current when the plate is placed.
(2) induction of electrical charge on the plate
(3) shielding of magnetic lines of force as aluminium is a paramagnetic material.
(4) electromagnetic induction in the aluminium plate giving rise to electromagnetic damping.

Q21. An electromagnetic wave in vacuum has the electric and magnetic fields $\vec{E}$ and $\vec{B}$, which are always perpendicular to each other. The direction of polarization is given by $\vec{X}$ and that of wave propagation by $\vec{k}$. Then :
(1) $\vec{X} \| \vec{B}$ and $\vec{k} \| \vec{B} \times \vec{E}$
(2) $\vec{X} \| \vec{E}$ and $\vec{k} \| \vec{E} \times \vec{B}$
(3) $\vec{X} \| \vec{B}$ and $\vec{k} \| \vec{E} \times \vec{B}$
(4) $\vec{X} \| \vec{E}$ and $\vec{k} \| \vec{B} \times \vec{E}$

Q22. An object 2.4 m in front of a lens forms a sharp image on a film 12 cm behind the lens. A glass plate 1 cm thick, of refractive index 1.50 is interposed between lens and film with its plane faces parallel to film. At what distance (from lens) should object be shifted to be in sharp focus on film?
(1) 7.2 m
(2) 2.4 m
(3) 3.2 m
(4) 5.6 m

Q23. In Young's double slit experiment, one of the slit is wider than other, so that the amplitude of the light from one slit is double of that from other slit. If I_m be the maximum intensity, the resultant intensity I when they interfere at phase difference ϕ is given by
(1) $\frac{I_m}{9}(4+5\cos\phi)$
(2) $\frac{\mathrm{I_m}}{3}\left(1+2\cos^2\frac{\phi}{2}\right)$
(3) $\frac{I_m}{5}\left(1+4\cos^2\frac{\phi}{2}\right)$
(4) $\frac{I_m}{9}\left(1+8\cos^2\frac{\phi}{2}\right)$

Q24. This question has statement 1 and statement 2. Of the four choices given after the statements, choose the one that best describes the two statements Statement 1 : Davisson - germer experiment established the wave nature of electrons. Statement 2 : If electrons have wave nature, they can interfere and show diffraction.
(1) Statement 1 is false, Statement 2 is true
(2) Statement 1 is true, Statement 2 is false
(3) Statement 1 is true, Statement 2 is the correct explanation for statement 1
(4) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation for statement 1.

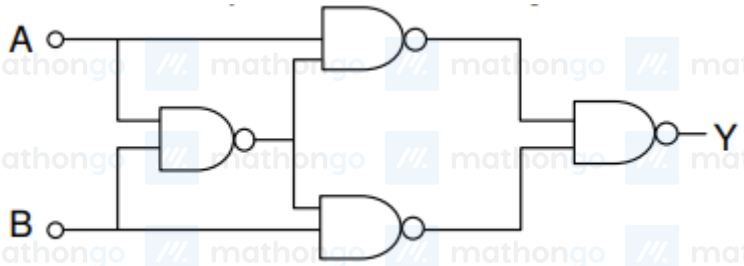
Q25. Hydrogen atom is excited from ground state to another state with principal quantum number equal to 4. Then the number of spectral lines in the emission spectra will be
(1) 2
(2) 3
(3) 5
(4) 6

Q26. A diatomic molecule is made of two masses m_1 and m_2 which are separated by a distance r. If we calculate its rotational energy by applying Bohr's rule of angular momentum quantization, its energy will be given by (n is an integer)
(1) $\frac{(m_1+m_2)^2n^2h^2}{2m_1^2m_2^2r^2}$
(2) $\frac{n^2h^2}{2(m_1+m_2)r^2}$
(3) $\frac{2n^2h^2}{(m_1+m_2)r^2}$
(4) $\frac{(m_1+m_2)n^2h^2}{2m_1m_2r^2}$

Q27. Assume that a neutron breaks into a proton and an electron. The energy released during this process is (Mass of neutron $= 1.6725 \times 10^{-27}$ kg; mass of proton $= 1.6725 \times 10^{-27}$ kg; mass of electron $= 9 \times 10^{-31}$ kg)

(1) 0.73 MeV
(2) 7.10 MeV
(3) 6.30 MeV
(4) 5.4 MeV

Q28. Truth table for system of four NAND gates as shown in figure is



(1)

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

(2)

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

Q29. A radar has a power of 1 Kw and is operating at a frequency of 10 GHz. It is located on a mountain top of height 500 m. The maximum distance upto which it can detect object located on the surface of the earth (Radius of earth $= 6.4 \times 10^6$ m) is

(1) 80 km
(2) 16 km
(3) 40 km
(4) 64 km

Q30. A spectrometer gives the following reading when used to measure the angle of a prism. Main scale reading: 58.5 degree Vernier scale reading : 09 divisions Given that 1 division on main scale corresponds to 0.5 degree. Total divisions on the vernier scale is 30 and match with 29 divisions of the main scale. The angle of the prism from the above data

(1) 58.59°
(2) 58.77°
(3) 58.65°
(4) 59°

Q31. The density of a solution prepared by dissolving 120 g of urea (mol. Mass $= 60$u) in 1000 g of water is 1.15 g/mL. The molarity of this solution is :

(1) 0.50 M
(2) 1.78 M
(3) 1.02 M
(4) 2.05 M

Q32. The electrons identified by quantum numbers n and I : (a) $n = 4, I = 1$ (b) $n = 4, l = 0$ (c) $n = 3, I = 2$ (d) $n = 3, I = 1$ Can be placed in order of increasing energy as:

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

Q33. The increasing order of the ionic radii of the given isoelectronic species is :

(1) $Cl^-, Ca^{2+}, K^+, S^{2-}$
(2) $S^{2-}, Cl^-, Ca^{2+}, K^+$
(3) $Ca^{2+}, K^+, Cl^-, S^{2-}$
(4) $K^+, S^{2-}, Ca^{2+}, Cl^-$

Q34. The molecule having smallest bond angle is :

(1) NCl_3
(2) $AsCl_3$
(3) $SbCl_3$
(4) PCl_3

Q35. In which of the following pairs the two species are not isostructural?

(1) CO_3^{2-} and NO_3^-
(2) PCl_4^+ and $SiCl_4$
(3) PF_5 and BrF_5
(4) AlF_6^{3-} and SF_6

Q36. The compressibility factor for a real gas at high pressure is :

(1) $1 + RT/pb$
(2) 1
(3) $1 + pb/RT$
(4) $1 - pb/RT$

Q37. The incorrect expression among the following is :

(1) $\frac{\Delta G_{system}}{\Delta S_{total}} = -T$
(2) In isothermal process $w_{reversible} = -nRT \ln \frac{V_f}{V_i}$
(3) $\ln K = \frac{\Delta H^0 - T\Delta S^0}{RT}$
(4) $K = e^{-\Delta G^0/RT}$

Q38. The equilibrium constant (K_c) for the reaction $N_2(g) + O_2(g) \rightarrow 2NO(g)$ at temperature T is 4×10^{-4}. The value of K_c for the reaction, $NO(g) \rightarrow 1/2\ N_2(g) + 1/2\ O_2(g)$ at the same temperature is :

(1) 0.02
(2) 2.5×10^2
(3) 4×10^{-4}
(4) 50.0

Q39. The pH of a 0.1 molar solution of the acid HQ is 3 . The value of the ionization constant, Ka of this acid is :

(1) 3×10^{-1}
(2) 1×10^{-3}
(3) 1×10^{-5}
(4) 1×10^{-7}

Q40. Very pure hydrogen (99.9%) can be made by which of the following processes?

(1) Reaction of methane with steam
(2) Mixing natural hydrocarbons of high molecular weight
(3) Electrolysis of water
(4) Reaction of salt like hydrides with water

Q41. Which of the following on thermal decomposition yields a basic as well as an acidic oxide ?

(1) $NaNO_3$
(2) $KClO_3$
(3) $CaCO_3$
(4) NH_4NO_3

Q42. Ortho-Nitrophenol is less soluble in water than p− and m− Nitrophenols because :

(1) o−Nitrophenol is more volatile in steam than those of m− and p− isomers
(2) o−Nitrophenol shows Intramolecular H− bonding
(3) o− Nitrophenol shows Intermolecular H− bonding
(4) Melting point of o−Nitrophenol is lower than those of m− and p− isomers.

Q43. 2− Hexyne gives trans−2−Hexene on treatment with :
(1) Pt/H_2
(2) Li/NH_3
(3) $Pd/BaSO_4$
(4) $LiAlH_4$

Q44. What is DDT among the following :
(1) Greenhouse gas
(2) A fertilizer
(3) Biodegradable pollutant
(4) Non-biodegradable pollutant

Q45. Lithium forms body centred cubic structure. The length of the side of its unit cell is 351pm. Atomic radius of the lithium will be:
(1) 75 pm
(2) 300 pm
(3) 240 pm
(4) 152 pm

Q46. K_f for water is 1.86 K kg mol^{-1}. If your automobile radiator holds 1.0 kg of water, how many grams of ethylene glycol $(C_2H_6O_2)$ must you add to get the freezing point of the solution lowered to $-2.8^\circ C$?
(1) 72 g
(2) 93 g
(3) 39 g
(4) 27 g

Q47. The standard reduction potentials for Zn^{2+}/Zn, Ni^{2+}/Ni, and Fe^{2+}/Fe are -0.76, -0.23 and -0.44 V respectively. The reaction $X + Y^{2+} \rightarrow X^{2+} + Y$ will be spontaneous when:
(1) $X = Ni, Y = Fe$
(2) $X = Ni, Y = Zn$
(3) $X = Fe, Y = Zn$
(4) $X = Zn, Y = Ni$

Q48. For a first order reaction, $(A) \rightarrow$ products, the concentration of A changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M is :
(1) $1.73 \times 10^{-5} M/min$
(2) $3.47 \times 10^{-4} M/min$
(3) $3.47 \times 10^{-5} M/min$
(4) $1.73 \times 10^{-4} M/min$

Q49. According to Freundlich adsorption isotherm, which of the following is correct ?
(1) $\frac{x}{m} \propto P^0$
(2) $\frac{x}{m} \propto p^1$
(3) $\frac{x}{m} \propto p^{1/n}$
(4) All the above are correct for different ranges of pressure

Q50. Which method of purification is represented by the following equation:
$Ti(s) + 2I_2(g) \xrightarrow{523\,K} TiI_4(g) \xrightarrow{1700\,K} Ti(s) + 2I_2(g)$
(1) zone refining
(2) cupellation
(3) Poling
(4) Van Arkel

Q51. Iron exhibits +2 and +3 oxidation states. Which of the following statements about iron is incorrect?

(1) Ferrous oxide is more basic in nature than the ferric oxide.
(2) Ferrous compounds are relatively more ionic than the corresponding ferric compounds
(3) Ferrous compounds are less volatile than the corresponding ferric compounds.
(4) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds.

Q52. Which among the following will be named as dibromidobis (ethylene diamine)chromium(III) bromide?
(1) $[Cr(en)_3]Br_3$
(2) $[Cr(en)_2Br_2]Br$
(3) $[Cr(\ en\ )Br_4]^-$
(4) $[Cr(en)Br_2]Br$

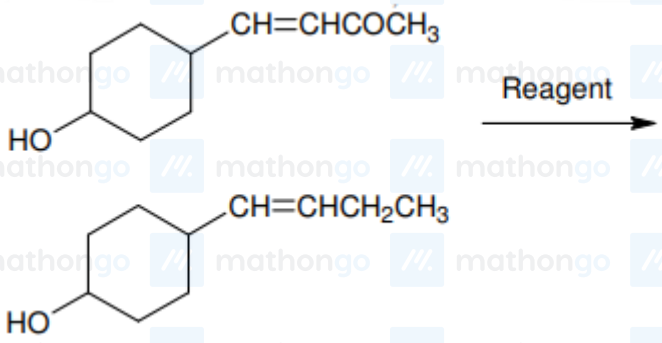
Q53. How many chiral compounds are possible on monochlorination of $2-$methyl butane ?
(1) 8
(2) 2
(3) 4
(4) 6

Q54. Which branched chain isomer of the hydrocarbon with molecular mass 72 u gives only one isomer of mono substituted alky halide?
(1) Tertiary butyl chloride
(2) Neopentane
(3) Isohexane
(4) Neohexane

Q55. Which of the following compounds can be detected by Molisch's test ?
(1) Nitro compounds
(2) Sugars
(3) Amines
(4) Primary alcohols

Q56. Iodoform can be prepared from all except :
(1) Ethyl methyl ketone
(2) Isopropyl alcohol
(3) $3-$Methyl$-2-$ butanone
(4) Isobutyl alcohol

Q57. In the given transformation, which of the following is the most appropriate reagent?



(1) $NH_2NH_2, \overset{(-)}{O}H$
(2) $Zn - Hg/HCl$
(3) Na, Liq. NH_3
(4) $NaBH_4$

Q58. The species which can best serve as an initiator for the cationic polymerization is :
(1) $LiAlH_4$
(2) HNO_3
(3) $AlCl_3$
(4) BuLi

Q59. Aspirin is known as:
(1) Acetyl salicylic acid
(2) Phenyl salicylate
(3) Acetyl salicylate
(4) Methyl salicylic acid

Q60. Which one of the following statements is correct?

(1) All amino acids except lysine are optically active (2) All amino acids are optically active

(3) All amino acids except glycine are optically active (4) All amino acids except glutamic acid are optically active

Q61. If $z \neq 1$ and $\frac{z^2}{z-1}$ is real, then the point represented by the complex number z lies

(1) either on the real axis or on a circle passing through the origin (2) on a circle with centre at the origin

(3) either on the real axis or on a circle not passing through the origin (4) on the imaginary axis

Q62. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is

(1) 880 (2) 629

(3) 630 (4) 879

Q63. Let $X = \{1, 2, 3, 4, 5\}$. The number of different ordered pairs (Y, Z) that can be formed such that $Y \subseteq X, Z \subseteq$ X and Y $\cap$ Z is empty, is

(1) 5^2 (2) 3^5

(3) 2^5 (4) 5^3

Q64. Statement 1: The sum of the series $1 + (1 + 2 + 4) + (4 + 6 + 9) + (9 + 12 + 16) + \ldots\ldots + (361 + 380 + 400)$ is 8000. Statement 2: $\sum_{k=1}^{n} \left(k^3 - (k-1)^3\right) = n^3$ for any natural number n.

(1) Statement 1 is false, statement 2 is true. (2) Statement 1 is true, statement 2 is true; statement 2 is a correct explanation for statement 1

(3) Statement 1 is true, statement 2 is true; statement 2 is not a correct explanation for statement 1 (4) Statement 1 is true, statement 2 is false

Q65. If 100 times the 100^{th} term of an AP with non zero common difference equals the 50 times its 50^{th} term, then the 150^{th} term of this AP is

(1) -150 (2) 150 times its 50^{th} term

(3) 150 (4) zero

Q66. If n is a positive integer, then $(\sqrt{3}+1)^{2n} - (\sqrt{3}-1)^{2n}$ is

(1) an irrational number (2) an odd positive integer

(3) an even positive integer (4) a rational number other than positive integers

Q67. The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has

(1) infinite number of real roots (2) no real roots

(3) exactly one real root (4) exactly four real roots

Q68. If the line $2x + y = k$ passes through the point which divides the line segment joining the points $(1, 1)$ and $(2, 4)$ in the ratio $3 : 2$, then k equals

(1) $\frac{29}{5}$ (2) 5
(3) 6 (4) $\frac{11}{5}$

Q69. A line is drawn through the point $(1, 2)$ to meet the coordinate axes at P and Q such that it forms a triangle OPQ, where O is the origin. If the area of the triangle OPQ is least, then the slope of the line PQ is
(1) $-\frac{1}{4}$ (2) -4
(3) -2 (4) $-\frac{1}{2}$

Q70. The length of the diameter of the circle which touches the x-axis at the point $(1, 0)$ and passes through the point $(2, 3)$ is
(1) $\frac{10}{3}$ (2) $\frac{3}{5}$
(3) $\frac{6}{5}$ (4) $\frac{5}{3}$

Q71. Statement 1: An equation of a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$ is $y = 2x + 2\sqrt{3}$. Statement 2: If the line $y = mx + \frac{4\sqrt{3}}{m}, (m \neq 0)$ is a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$, then m satisfies $m^4 + 2m^2 = 24$.
(1) Statement 1 is false, statement 2 is true
(2) Statement 1 is true, statement 2 is true; statement 2 is a correct explanation for statement 1
(3) Statement 1 is true, statement 2 is true; statement 2 is not a correct explanation for statement 1
(4) Statement 1 is true, statement 2 is false

Q72. An ellipse is drawn by taking a diameter of the circle $(x - 1)^2 + y^2 = 1$ as its semiminor axis and a diameter of the circle $x^2 + (y - 2)^2 = 4$ as its semi-major axis. If the centre of the ellipse is the origin and its axes are the coordinate axes, then the equation of the ellipse is
(1) $4x^2 + y^2 = 4$ (2) $x^2 + 4y^2 = 8$
(3) $4x^2 + y^2 = 8$ (4) $x^2 + 4y^2 = 16$

Q73. The negation of the statement "If I become a teacher, then I will open a school" is
(1) I will become a teacher and I will not open a school
(2) Either I will not become a teacher or I will not open a school
(3) Neither I will become a teacher nor I will open a school
(4) I will not become a teacher or I will open a school

Q74. Let $\mathrm{x}_1, \mathrm{x}_2, \ldots\ldots, \mathrm{x}_\mathrm{n}$ be n observations, and let $\bar{\mathrm{x}}$ be their arithematic mean and σ^2 be their variance. Statement 1: Variance of $2x_1, 2x_2, \ldots\ldots, 2x_n$ is $4\sigma^2$. Statement 2: Arithmetic mean of $2\mathrm{x}_1, 2\mathrm{x}_2, \ldots\ldots, 2\mathrm{x}_\mathrm{n}$ is $4\bar{\mathrm{x}}$.
(1) Statement 1 is false, statement 2 is true
(2) Statement 1 is true, statement 2 is true; statement 2 is a correct explanation for statement 1
(3) Statement 1 is true, statement 2 is true; statement 2 is not a correct explanation for statement 1
(4) Statement 1 is true, statement 2 is false

Q75. In a $\Delta\mathrm{PQR}$, if $3\sin\mathrm{P} + 4\cos\mathrm{Q} = 6$ and $4\sin\mathrm{Q} + 3\cos\mathrm{P} = 1$, then the angle R is equal to
(1) $\frac{5\pi}{6}$ (2) $\frac{\pi}{6}$
(3) $\frac{\pi}{4}$ (4) $\frac{3\pi}{4}$

Q76. Let $A=\begin{pmatrix}1 & 0 & 0\\ 2 & 1 & 0\\ 3 & 2 & 1\end{pmatrix}$. If u_1 and u_2 are column matrices such that $Au_1=\begin{pmatrix}1\\0\\0\end{pmatrix}$ and $Au_2=\begin{pmatrix}0\\1\\0\end{pmatrix}$, then u_1+u_2 is equal to

(1) $\begin{pmatrix}-1\\1\\0\end{pmatrix}$ (2) $\begin{pmatrix}-1\\1\\-1\end{pmatrix}$

(3) $\begin{pmatrix}-1\\-1\\0\end{pmatrix}$ (4) $\begin{pmatrix}1\\-1\\-1\end{pmatrix}$

Q77. Let P and Q be 3×3 matrices with $P\neq Q$. If $P^3=Q^3$ and $P^2Q=Q^2P$, then determinant of $\left(P^2+Q^2\right)$ is equal to

(1) -2 (2) 1

(3) 0 (4) -1

Q78. If f : R $\rightarrow$ R is a function defined by $f(x)=[\mathrm{x}]\cos\left(\frac{2x-1}{2}\right)\pi$, where [x] denotes the greatest integer function, then f is

(1) continuous for every real x (2) discontinuous only at $x=0$

(3) discontinuous only at non-zero integral values of x (4) continuous only at $x=0$

Q79. Consider the function $f(x)=|x-2|+|x-5|, x\in R$. Statement 1: $f'(4)=0$ Statement 2: f is continuous in $[2,5]$, differentiable in $(2,5)$ and $f(2)=f(5)$.

(1) Statement 1 is false, statement 2 is true (2) Statement 1 is true, statement 2 is true; statement 2 is a correct explanation for statement 1

(3) Statement 1 is true, statement 2 is true; statement 2 is not a correct explanation for statement 1 (4) Statement 1 is true, statement 2 is false

Q80. A spherical balloon is filled with 4500 π cubic meters of helium gas. If a leak in the balloon causes the gas to escape at the rate of 72 π cubic meters per minute, then the rate (in meters per minute) at which the radius of the balloon decreases 49 minutes after the leakage began is

(1) $\frac{9}{7}$ (2) $\frac{7}{9}$

(3) $\frac{2}{9}$ (4) $\frac{9}{2}$

Q81. Let $a, b\in R$ be such that the function f given by $f(x)=\ln|x|+bx^2+ax, x\neq 0$ has extreme values at $x=-1$ and $x=2$. Statement 1: f has local maximum at $x=-1$ and at $x=2$. Statement 2: a $=\frac{1}{2}$ and b $=\frac{-1}{4}$

(1) Statement 1 is false, statement 2 is true (2) Statement 1 is true, statement 2 is true; statement 2 is a correct explanation for statement 1

(3) Statement 1 is true, statement 2 is true; statement 2 is not a correct explanation for statement 1 (4) Statement 1 is true, statement 2 is false

Q82. If the integral $\int\frac{5\tan x}{\tan x-2}dx=x+a\ln|\sin x-2\cos x|+k$, then a is equal to

(1) -1 (2) -2
(3) 1 (4) 2

Q83. If $g(x)=\int_0^x \cos 4t\ dt$, then $g(x+\pi)$ equals
(1) $\frac{g(x)}{g(\pi)}$ (2) $g(x)+g(\pi)$
(3) $g(x)-g(\pi)$ (4) None of these

Q84. The area bounded between the parabolas $x^2=\frac{y}{4}$ and $x^2=9y$, and the straight line $y=2$ is
(1) $20\sqrt{2}$ (2) $\frac{10\sqrt{2}}{3}$
(3) $\frac{20\sqrt{2}}{3}$ (4) $10\sqrt{2}$

Q85. The population $\mathrm{p(t)}$ at time t of a certain mouse species satisfies the differential equation $\frac{\mathrm{dp(t)}}{\mathrm{dt}}=0.5\ \mathrm{p(t)}-450$. If $p(0)=850$, then the time at which the population becomes zero is
(1) $2\ln 18$ (2) $\ln 9$
(3) $\frac{1}{2}\ln 18$ (4) $\ln 18$

Q86. Let $\hat{a}$ and $\hat{b}$ be two unit vectors. If the vectors $\vec{c}=\hat{a}+2\hat{b}$ and $\vec{d}=5\hat{a}-4\hat{b}$ are perpendicular to each other, then the angle between $\hat{\mathrm{a}}$ and $\hat{\mathrm{b}}$ is
(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{2}$
(3) $\frac{\pi}{3}$ (4) $\frac{\pi}{4}$

Q87. Let $ABCD$ be a parallelogram such that $\overrightarrow{AB}=\overrightarrow{\mathrm{q}}, \overrightarrow{AD}=\vec{p}$ and $\angle BAD$ be an acute angle. If $\vec{r}$ is the vector that coincides with the altitude directed from the vertex B to the side AD, then $\vec{r}$ is given by
(1) $\vec{r}=3\vec{q}-\frac{3(\vec{p}\cdot\vec{q})}{(\vec{p}\cdot\vec{p})}\vec{p}$ (2) $\vec{r}=-\overrightarrow{\mathrm{q}}+\left(\frac{\overrightarrow{\mathrm{p}}\cdot\overrightarrow{\mathrm{q}}}{\overrightarrow{\mathrm{p}}\cdot\overrightarrow{\mathrm{p}}}\right)\overrightarrow{\mathrm{p}}$
(3) $\vec{r}=\vec{q}-\left(\frac{\vec{p}\cdot\vec{q}}{\vec{p}\cdot\vec{p}}\right)\vec{p}$ (4) $\vec{r}=-3\vec{q}+\frac{3(\vec{p}\cdot\vec{q})}{(\vec{p}\cdot\vec{p})}\vec{p}$

Q88. An equation of a plane parallel to the plane $x-2y+2z-5=0$ and at a unit distance from the origin is
(1) $x-2y+2z-3=0$ (2) $x-2y+2z+1=0$
(3) $x-2y+2z-1=0$ (4) $x-2y+2z+5=0$

Q89. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then k is equal to
(1) -1 (2) $\frac{2}{9}$
(3) $\frac{9}{2}$ (4) 0

Q90. Three numbers are chosen at random without replacement from $\{1,2,3,\ldots..8\}$. The probability that their minimum is 3 , given that their maximum is 6 , is
(1) $\frac{3}{8}$ (2) $\frac{1}{5}$
(3) $\frac{1}{4}$ (4) $\frac{2}{5}$

ANSWER KEYS

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