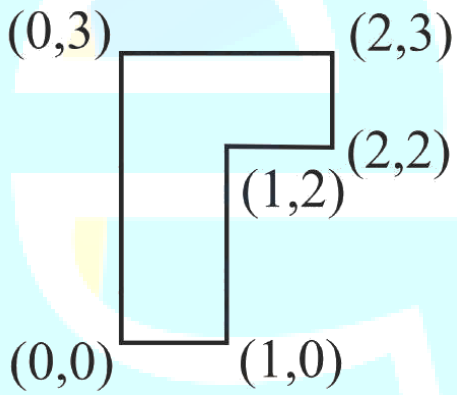
Q1. The dimension of stopping potential V_0 in photoelectric effect in units of Planck's constant ' h ', speed of light ' c ' and Gravitational constant ' G ' and ampere A is:
(1) $h^{\frac{1}{3}}G^{\frac{2}{3}}c^{\frac{1}{3}}A^{-1}$
(2) $h^{0}c^{5}G^{-1}A^{-1}$
(3) $h^{-\frac{2}{3}}c^{-\frac{1}{3}}G^{\frac{4}{3}}A^{-1}$
(4) $h^{2}G^{\frac{3}{2}}c^{\frac{1}{3}}A^{-1}$

Q2. A particle of mass m is fixed to one end of a light spring having force constant k and unstretched length l. The other end is fixed. The system is given an angular speed ω about the fixed end of the spring such that it rotates in a circle in gravity free space. Then the stretch in the spring is:
(1) $\frac{ml\omega^2}{k-\omega m}$
(2) $\frac{ml\omega^2}{k-m\omega^2}$
(3) $\frac{ml\omega^2}{k+m\omega^2}$
(4) $\frac{ml\omega^2}{k+m\omega}$

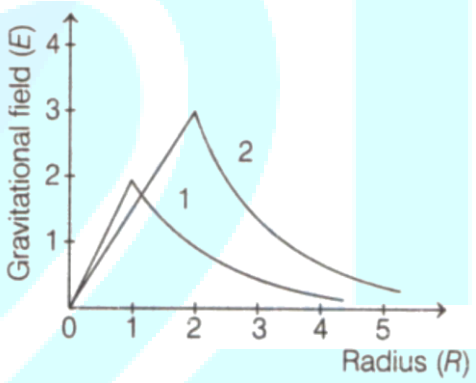
Q3. The coordinates of the centre of mass of a uniform flag-shaped lamina (thin flat plate) of mass 4 kg . (The coordinates of the same are shown in the figure) are:



(1) (1.25 m, 1.50 m)
(2) (0.75 m, 1.75 m)
(3) (0.75 m, 0.75 m)
(4) (1 m, 1.75 m)

Q4. Consider a uniform rod of mass $M = 4$ m and length l pivoted about its centre. A mass m moving with velocity v making angle $\theta = \frac{\pi}{4}$ to the rod's long axis collides with one end of the rod and sticks to it. The angular speed of the rod-mass system just after the collision is:
(1) $\frac{3}{7\sqrt{2}}\frac{v}{l}$
(2) $\frac{3}{7}\frac{v}{l}$
(3) $\frac{3\sqrt{2}}{7}\frac{v}{l}$
(4) $\frac{4}{7}\frac{v}{l}$

Q5. Consider two solid spheres of radii $R_1 = 1$ m, $R_2 = 2$ m and masses M_1 and M_2, respectively. The gravitational field due to sphere (1) and (2) are shown. The value of $\frac{M_1}{M_2}$ is:



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

Q6. A leak proof cylinder of length 1 m , made of a metal which has very low coefficient of expansion is floating vertically in water at $0^{\circ}C$ such that its height above the water surface is 20 cm . When the temperature of water is increased to $4^{\circ}C$, the height of the cylinder above the water surface becomes 21 cm . The density of water at $T = 4^{\circ}C$, relative to the density at $T = 0^{\circ}C$ is close to:
(1) 1.26
(2) 1.04
(3) 1.01
(4) 1.03

Q7. Consider a solid sphere of radius R and mass density $\rho(r) = \rho_0\left(1 - \frac{r^2}{R^2}\right), 0 < r \leq R$. The minimum density of a liquid in which it will float is:

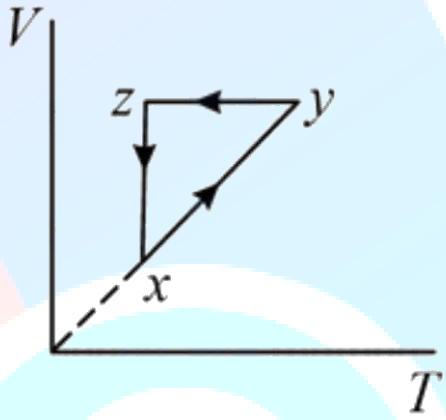
(1) $\frac{\rho_0}{3}$

(2) $\frac{\rho_0}{5}$

(3) $\frac{2\rho_0}{5}$

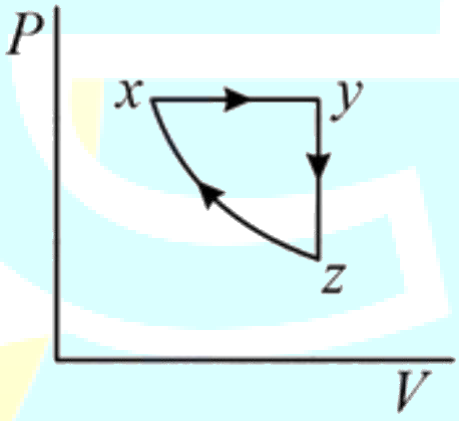
(4) $\frac{2\rho_0}{3}$

Q8. A thermodynamic cycle $xyzx$ is shown on a $V - T$ diagram.

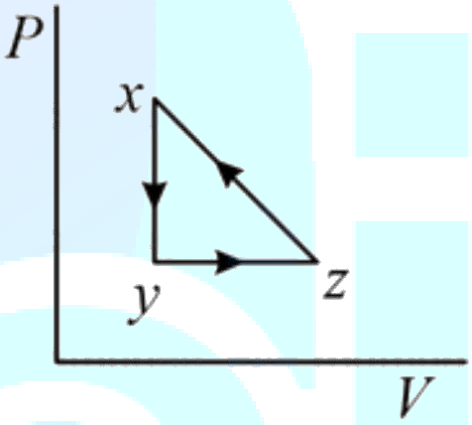


The P - V diagram that best describes this cycle is: (Diagrams are schematic and not to scale)

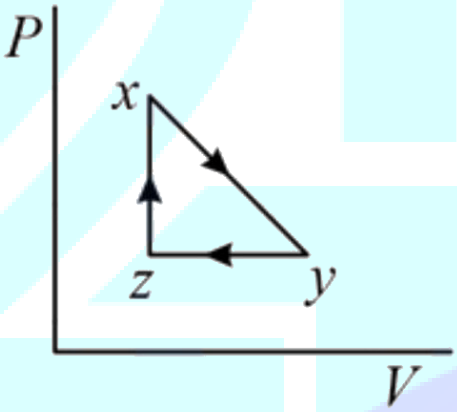
(1)



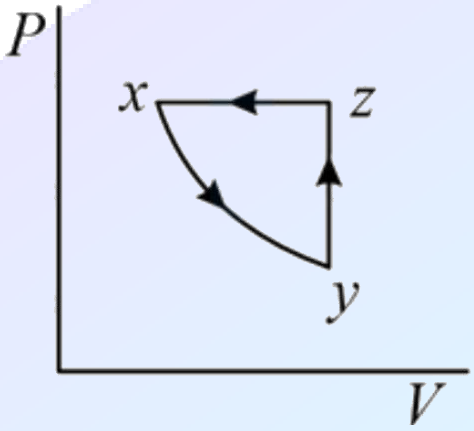
(2)



(3)

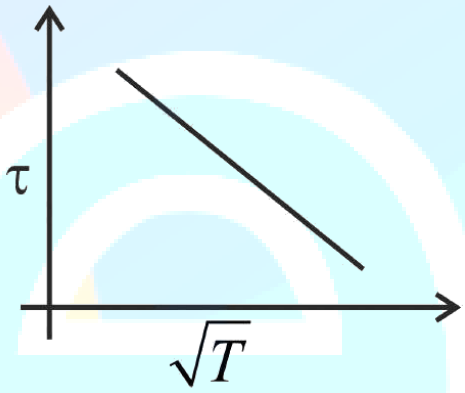


(4)

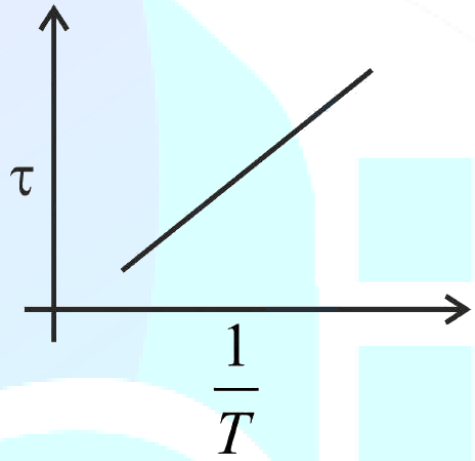


Q9. The plot that depicts the behavior of the mean free time τ (time between two successive collisions) for the molecules of an ideal gas, as a function of temperature (T), qualitatively, is: (Graphs are schematic and not drawn to scale)

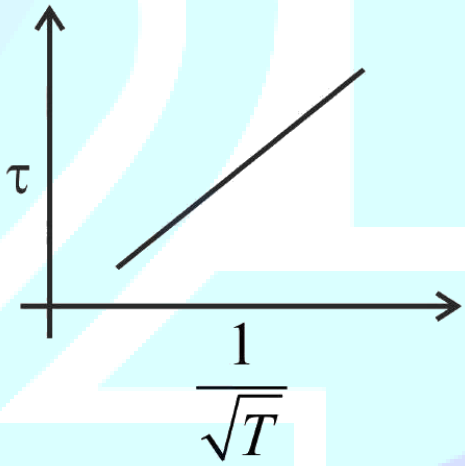
(1)



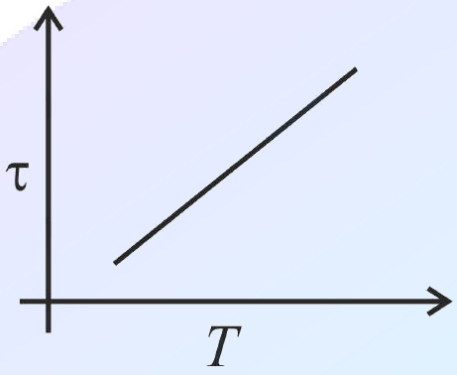
(2)



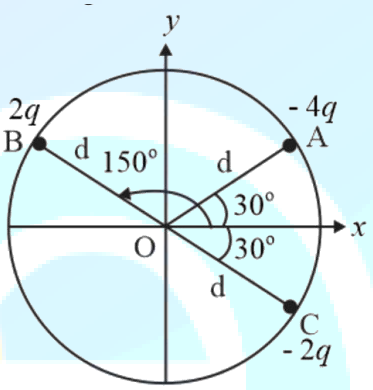
(3)



(4)



Q10. Three charged particles A, B and C with charges $-4q, 2q$ and $-2q$ are present on the circumference of a circle of radius d. The charged particles A, C and centre O of the circle formed an equilateral triangle as shown in the figure. The electric field at the point O is



(1) $\frac{\sqrt{3}q}{\pi\varepsilon_0 d^2}$
(2) $\frac{2\sqrt{3}q}{\pi\varepsilon_0 d^2}$
(3) $\frac{\sqrt{3}q}{4\pi\varepsilon_0 d^2}$
(4) $\frac{3\sqrt{3}q}{4\pi\varepsilon d^2}$

Q11. In finding the electric field using Gauss law the formula $|\vec{E}| = \frac{q_{\text{enc}}}{\varepsilon_0 |A|}$ is applicable. In the formula ε_0 is permittivity of free space, A is the area of Gaussian surface and q_{enc} is charge enclosed by the Gaussian surface. This equation can be used in which of the following situation?

(1) Only when the Gaussian surface is an equipotential surface
(3) Only when $|\vec{E}| =$ constant on the surface.
(2) Only when the Gaussian surface is an equipotential surface and $|\vec{E}|$ is constant on the surface.
(4) For any choice of Gaussian surface.

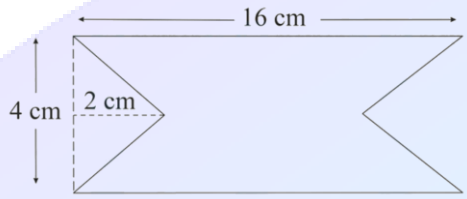
Q12. Effective capacitance of parallel combination of two capacitors C_1 and C_2 is 10μ F. When these capacitors are individually connected to a voltage source of 1 V , the energy stored in the capacitor C_2 is 4 times that of C_1. If these capacitors are connected in series, their effective capacitance will be:
(1) 4.2μ F
(2) 3.2μ F
(3) 1.6μ F
(4) 8.4μ F

Q13. The length of a potentiometer wire is 1200 cm and it carries a current of 60 mA For a cell of emf 5 V and internal resistance of 20Ω the null point on it is found to be at 1000 cm The resistance of whole wire is:
(1) 80Ω
(2) 120Ω
(3) 60Ω
(4) 100Ω

Q14. Proton with kinetic energy of 1 MeV moves from south to north. It gets an acceleration of 10^{12} m/s^2 by an applied magnetic field (west to east). The value of magnetic field: (Rest mass of proton is 1.6×10^{-27} kg)
(1) 0.71 mT
(2) 7.1 mT
(3) 0.071 mT
(4) 71 mT

Q15. At time $t = 0$ magnetic field of 1000 Gauss is passing perpendicularly through the area defined by the closed loop shown in the figure. If the magnetic field reduces linearly to 500 Gauss, in the next 5 s , then induced

EMF in the loop is:



(1) 56μ V
(2) 28μ V
(3) 48μ V
(4) 36μ V

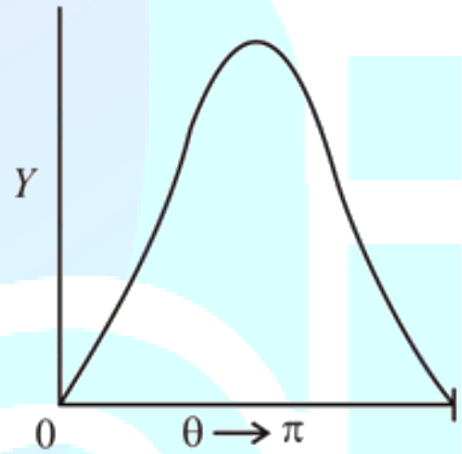
Q16. The critical angle of a medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability $\frac{4}{3}$ for this wavelength, will be:
(1) 15°
(2) 30°
(3) 45°
(4) 60°

Q17. The magnifying power of a telescope with tube length 60 cm is 5 . What is the focal length of its eye piece?
(1) 20 cm
(2) 40 cm
(3) 30 cm
(4) 10 cm

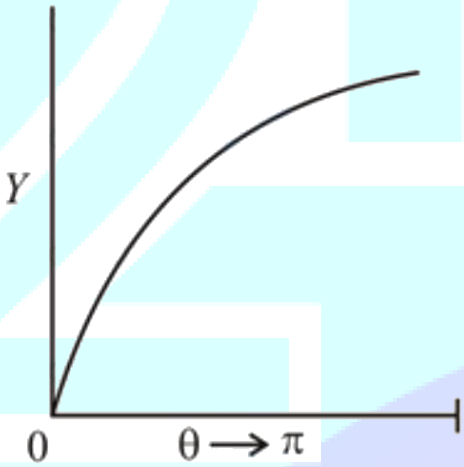
Q18. When photon of energy 4.0 eV strikes the surface of a metal A, the ejected photoelectrons have maximum kinetic energy T_AeV and de-Broglie wavelength λ_A. The maximum kinetic energy of photoelectrons liberated from another metal B by photon of energy 4.50 eV is $T_B = (T_A - 1.5)$eV. If the de-Broglie wavelength of these photoelectrons $\lambda_B = 2\lambda_A$, then the work function of metal B is:
(1) 4 eV
(2) 2 eV
(3) 1.5 eV
(4) 3 eV

Q19. The graph which depicts the results of Rutherford gold foil experiment with α-particles is:
θ : Scattering angle
Y: Number of scattered α-particles detected
(Plots are schematic and not to scale)

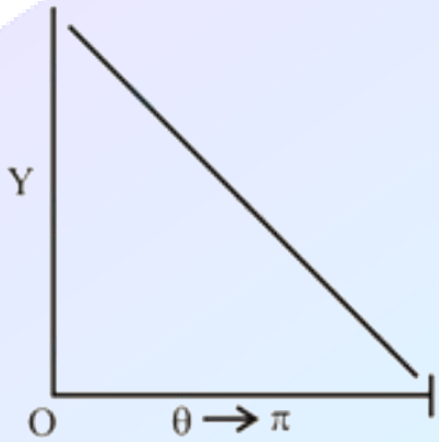
(1)



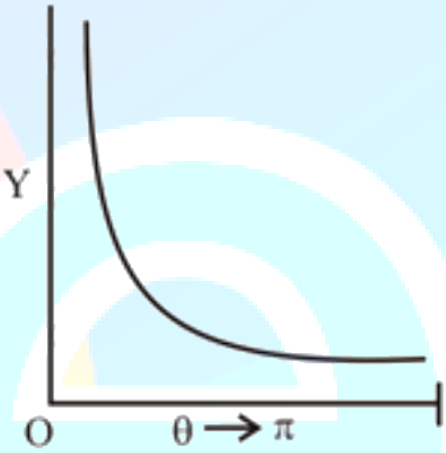
(2)



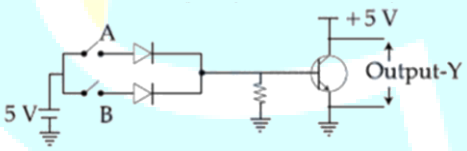
(3)



(4)



Q20.Boolean relation at the output stage- Y for the following circuit is:



(1) $\bar{A} + \bar{B}$
(2) $A + B$
(3) $A \cdot B$
(4) $\bar{A} \cdot \bar{B}$

Q21. A particle is moving along the x-axis with its coordinate with time t given by $x(t) = 10 + 8t - 3t^2$. Another particle is moving along the y-axis with its coordinate as a function of time given by $y(t) = 5 - 8t^3$. At $t = 1$ s, the speed of the second particle as measured in the frame of the first particle is given as $\sqrt{v}$. Then $v($ in m s $^{-1}$) is .

Q22. A body A of mass $m = 0.1$ kg has an initial velocity of $3\hat{i}ms^{-1}$. It collides elastically with another body B of the same mass which has an initial velocity of $5\hat{j}$ m s^{-1}. After the collision, A moves with a velocity $\vec{v} = 4(\hat{i} + \hat{j})ms^{-1}$. The energy of B after the collision is written as $\frac{x}{10}$ J. The value of x is

Q23. A one metre long (both ends open) organ pipe is kept in a gas that has double the density of air at STP. Assuming the speed of sound in air at STP is 300 m/s, the frequency difference between the fundamental and second harmonic of this pipe is Hz .

Q24. Four resistances of $15\Omega, 12\Omega, 4\Omega$ and 10Ω respectively in cyclic order to form Wheatstone's network. The resistance that is to be connected in parallel with the resistance of 10Ω to balance the network is
Ω.

Q25. A point object in air is in front of the curved surface of a plano-convex lens. The radius of curvature of the curved surface is 30 cm and the refractive index of the lens material is 1.5 , then the focal length of the lens (in cm) is .

Q26. For the Balmer series, in the spectrum of H atom, $\bar{\nu} = R_H\left\{\frac{1}{n_1^2} - \frac{1}{n_2^2}\right\}$, the correct statements among (I) to (IV) are,
(I) As wavelength decreases, the lines in the series converge.
(II) The integer n_1 is equal to $2/$
(III) The lines of the longest wavelength correspond to $n_2 = 3$.
(IV) The ionization energy of hydrogen can be calculated from the wave number of these lines.
(1) (I), (III), (IV)
(2) (I), (II), (III)

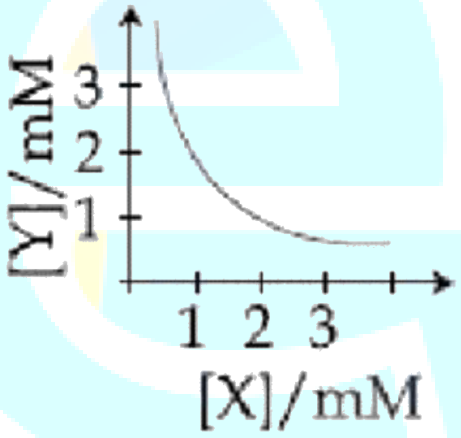
(3) (I), (II), (IV)
(4) (II), (III), (IV)

Q27. The first ionization energy (in kJ/mol) of Na, Mg, Al and Si respectively are:
(1) 496,737,577,786
(2) 496,577,737,786
(3) 786,737,577,496
(4) 496,577,786,737

Q28. The third ionization enthalpy is minimum for:
(1) Co
(2) Fe
(3) Ni
(4) Mn

Q29. The predominant intermolecular forces present in ethyl acetate, a liquid, are:
(1) London dispersion and dipole-dipole
(2) hydrogen bonding and London dispersion
(3) Dipole-dipole and hydrogen bonding
(4) London dispersion, dipole-dipole and hydrogen bonding

Q30. The stoichiometry and solubility product of a salt with the solubility curve given below is, respectively:



(1) $X_2Y, 2 \times 10^{-9}M^3$
(2) $XY_2, 4 \times 10^{-9}M^3$
(3) $XY_2, 1 \times 10^{-9}M^3$
(4) $XY, 2 \times 10^{-6}M^3$

Q31. The strength of an aqueous NaOH solution is most accurately determined by titrating: (Note: consider that an appropriate indicator is used)
(1) Aq. NaOH in a pipette and aqueous oxalic acid in a burette
(3) Aq. NaOH in a burette and concentrate H_2SO_4 in a conical flask
(2) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask
(4) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask

Q32. When gypsum is heated to 393 K , it forms:
(1) Anhydrous $CaSO_4$
(2) $CaSO_4 \cdot 5H_2O$
(3) $CaSO_4 \cdot 0.5H_2O$
(4) Dead burnt plaster

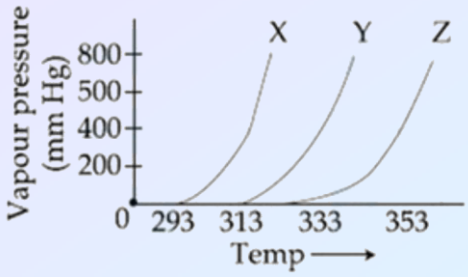
Q33. Arrange the following compounds in increasing order of $C-OH$ bond length:
methanol, phenol, $p-$ ethoxyphenol
(1) methanol $<$ p -ethoxyphenol $<$ phenol
(2) phenol $<$ methanol $<$ p -ethoxyphenol
(3) phenol $<$ p -ethoxyphenol $<$ methanol
(4) methanol < phenol $<$ p -ethoxyphenol

Q34. A flask contains a mixture of isohexane and 3 -methylpentane. One of the liquids boils at $63^{\circ}C$ while the other boils at $60^{\circ}C$. What is the best way to separate the two liquids and which one will be distilled out first?
(1) fractional distillation, isohexane
(2) simple distillation, 3 -methylpentane
(3) simple distillation, isohexane
(4) fractional distillation, 3 -methylpentane

Q35. Among the gases (a) $-$ (e), the gases that cause greenhouse effect are:
(a) CO_2
(b) H_2O
(c) CFCs
(d) O_2
(e) O_3
(1) (a), (b), (c) and (d)
(2) (a), (b), (c) and (e)
(3) (a) and (d)
(4) (a), (c), (d) and (e)

Q36. A graph of vapour pressure and temperature for three different liquids X, Y and Z

is shown below:



The following inferences are made:
(A) X has higher intermolecular interactions compared to Y .
(B) X has lower intermolecular interactions compared to Y .
(C)Z has lower intermolecular interactions compared to Y .

The correct inferences is/are:
(1) (A) and (C)
(2) (A)
(3) (B)
(4) (C)

Q37. The rate of a certain biochemical reaction at physiological temperature (T) occurs 10^6 times faster with enzyme than without. The change in the activation energy upon adding enzyme is:
(1) $-6(2.303)RT$
(2) -6 RT
(3) $+6(2.303)RT$
(4) +6 RT

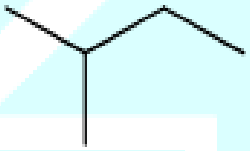
Q38. As per Hardy-Schulze formulation, the flocculation values of the following for ferric hydroxide sol are in the order:
(1) $K_3[Fe(CN)_6] < K_2CrO_4 < KBr = KNO_3 =$ $A(2)lK_3[Fe(CN)_6] < K_2CrO_4 < AlCl_3 <$ $KBr < KNO_3$
(3) $AlCl_3 > K_3[Fe(CN)_6] > K_2CrO_4 > KBr =$ $KAHOK_3[Fe(CN)_6] > AlCl_3 > K_2CrO_4 >$ $KBr > KNO_3$

Q39. The number of bonds between sulphur and oxygen atoms in $S_2O_8^{2-}$ and the number of bonds between sulphur and sulphur atoms in rhombic sulphur, respectively are:
(1) 4 and 6
(2) 8 and 8
(3) 8 and 6
(4) 4 and 8

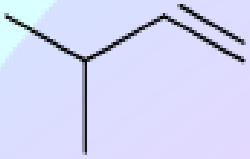
Q40. The complex that can show fac-and mer - isomers is:
(1) $[Co(NH_3)_4Cl_2]^+$
(2) $[Pt(NH_3)_2Cl_2]$
(3) $[CoCl_2(en)_2]$
(4) $[Co(NH_3)_3(NO_2)_3]$

Q41. The decreasing order of reactivity towards dehydrohalogenation (E_1) reaction of the following compounds is:
(A) Cl
(B) Cl

(C) Cl



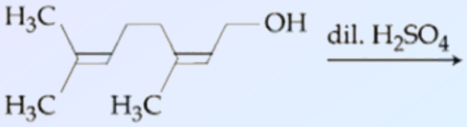
(D) Cl



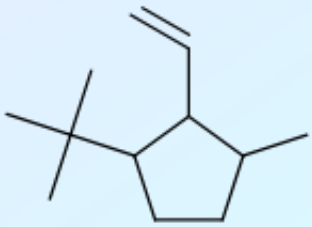
(1) $D > B > C > A$
(2) $B > D > A > C$

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

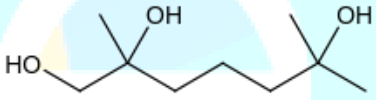
Q42. The major product of the following reaction is:



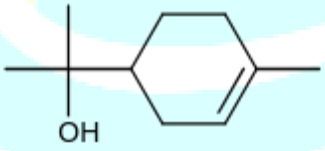
(1)



(2) H_3C



(3)

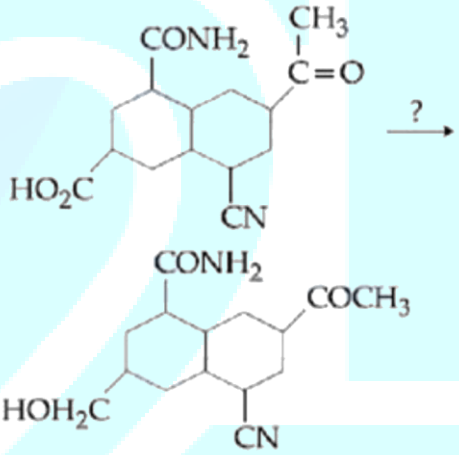


(4)

C
H

H_3CHOCH

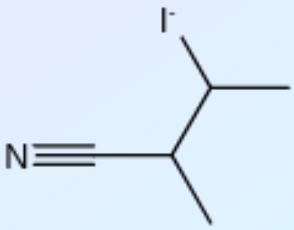
Q43. The most suitable reagent for the given conversion is:



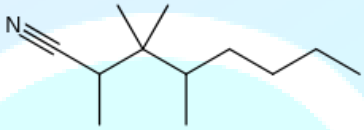
(1) B_2H_6
(2) $NaBH_4$
(3) $LiAlH_4$
(4) H_2/Pd

Q44. The major products A and B in the following reactions are

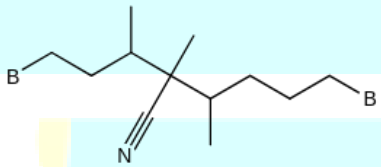
(1)



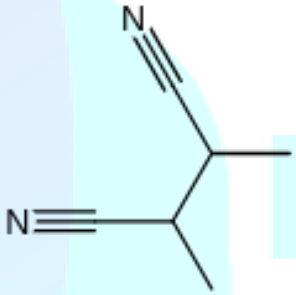
(2)

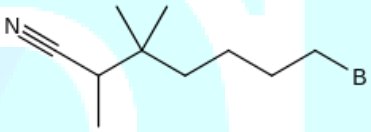


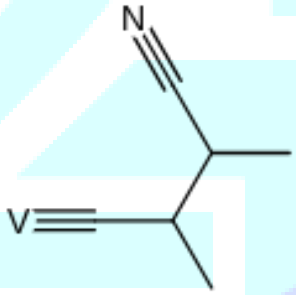
(3)

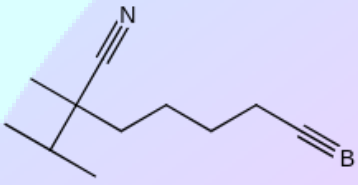


(4)

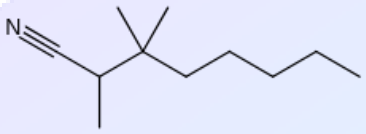








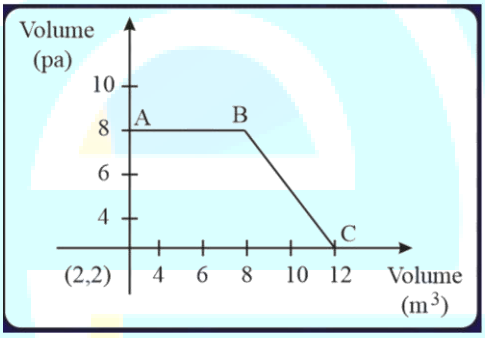
$B =$



Q45. Which of the following statement is not true for glucose?
(1) Glucose exists in two crystalline forms α and β
(2) Glucose gives Schiff's test for aldehyde
(3) Glucose reacts with hydroxylamine to form oxime
(4) The pentaacetate of glucose does not react with hydroxylamine to give oxime

Q46. The volume (in mL) of $0.125 \mathrm{M} AgNO_3$ required to quantitatively precipitate chloride ions in 0.3 g of $[Co(NH_3)_6]Cl_3$ is .
$^{M}[Co(NH_3)_6]Cl_3 = 267.46\ g/mol$
$^{M}AgNO_3 = 169.87\ g/mol$
Report the nearest integer as the answer.

Q47. The magnitude of work done by a gas that undergoes a reversible expansion along the path ABC shown in the figure is



Q48. Ferrous sulphate heptahydrate is used to fortify foods with iron. The amount (in grams) of the salt required to achieve 10 ppm of iron in 100 kg of wheat is _.
Atomic weight: $Fe = 55.85; S = 32.00; O = 16.00$

Q49. What would be the electrode potential for the given half-cell reaction at $pH = 5$? -.
$2H_2O \rightarrow O_2 + 4\overset{\oplus}{H} + 4e^-; E^0_{red} = 1.23\ V$
($R = 8.314 Jmol^{-1}\ K^{-1}$; Temp = 298 K; oxygen under stan dard. atm. pressureof 1 bar)

Q50. The number of chiral centres in penicillin is .

Q51. If the equation $x^2 + bx + 45 = 0, b \in R$ has conjugate complex roots and they satisfy $|z + 1| = 2\sqrt{10}$, then
(1) $b^2 - b = 30$
(2) $b^2 + b = 72$
(3) $b^2 - b = 42$
(4) $b^2 + b = 12$

Q52. Let $f: R \rightarrow R$ be such that for all $x \in R(2^{1+x} + 2^{1-x}), f(x)$ and $(3^x + 3^{-x})$ are in A.P., then the minimum value of $f(x)$ is
(1) 2
(2) 3
(3) 0
(4) 4

Q53. If a, b and c are the greatest values of $^{19}C_p$, $^{20}C_q$ and $^{21}C_r$ respectively, then:
(1) $\frac{a}{11} = \frac{b}{22} = \frac{c}{21}$
(2) $\frac{a}{10} = \frac{b}{11} = \frac{c}{21}$
(3) $\frac{a}{11} = \frac{b}{22} = \frac{c}{42}$
(4) $\frac{a}{10} = \frac{b}{11} = \frac{c}{42}$

Q54. Let two points be $A(1, -1)$ and $B(0,2)$. If a point $P(x', y')$ be such that the area of $\Delta PAB = 5$ sq. units and it lies on the line $3x + y - 4\lambda = 0$, then a value of λ is
(1) 4
(2) 3
(3) 1
(4) -3

Q55. The locus of a point which divides the line segment joining the point $(0, -1)$ and a point on the parabola $x^2 = 4y$ internally in the ratio 1: 2 is:
(1) $9x^2 - 12y = 8$
(2) $9x^2 - 3y = 2$
(3) $x^2 - 3y = 2$
(4) $4x^2 - 3y = 2$

Q56. For $a > 0$, let the curves $C_1: y^2 = ax$ and $C_2: x^2 = ay$ intersect at origin O and a point P. Let the line $x = b(0 < b < a)$ intersect the chord OP and the x-axis at points Q and R, respectively. If the line $x = b$ bisects the area

bounded by the curves, C_1 and C_2, and the area of $\triangle OQR = \frac{1}{2}$, then ' a ' satisfies the equation:
(1) $x^6 - 6x^3 + 4 = 0$
(2) $x^6 - 12x^3 + 4 = 0$
(3) $x^6 + 6x^3 - 4 = 0$
(4) $x^6 - 12x^3 - 4 = 0$

Q57. Let the line $y = mx$ and the ellipse $2x^2 + y^2 = 1$ intersect at a point P in the first quadrant. If the normal to this ellipse at P meets the co-ordinate axes at $\left(-\frac{1}{3\sqrt{2}}, 0\right)$ and $(0, \beta)$, then β is equal to
(1) $\frac{2\sqrt{2}}{3}$
(2) $\frac{2}{\sqrt{3}}$
(3) $\frac{2}{3}$
(4) $\frac{\sqrt{2}}{3}$

Q58. $\lim_{x\to 0}\left(\frac{3x^2+2}{7x^2+2}\right)^{\frac{1}{x^2}}$ is equal to
(1) $\frac{1}{e}$
(2) $\frac{1}{e^2}$
(3) e^2
(4) e

Q59. Which one of the following is a tautology?
(1) $(p \wedge (p \to q)) \to q$
(2) $q \to (p \wedge (p \to q))$
(3) $p \wedge (p \vee q)$
(4) $p \vee (p \wedge q)$

Q60. The mean and the standard deviation (s.d.) of 10 observations are 20 and 2 respectively. Each of these 10 observations is multiplied by p and then reduced by q, where $p \neq 0$ and $q \neq 0$. If the new mean and new s.d. become half of their original values, then q is equal to
(1) -5
(2) 10
(3) -20
(4) -10

Q61. For which of the following ordered pairs (μ, δ), the system of linear equations
$x + 2y + 3z = 1$
$3x + 4y + 5z = \mu$
$4x + 4y + 4z = \delta$
is inconsistent?
(1) (4,3)
(2) (4,6)
(3) (1,0)
(4) (3,4)

Q62. The inverse function of $f(x) = \frac{8^{2x}-8^{-2x}}{8^{2x}+8^{-2x}}, x \in (-1,1)$, is .
(1) $\frac{1}{4}\log_e\left(\frac{1+x}{1-x}\right)$
(2) $\frac{1}{4}\log_e\left(\frac{1-x}{1+x}\right)$
(3) $\frac{1}{4}(\log_e)\log_e\left(\frac{1-x}{1+x}\right)$
(4) $\frac{1}{4}\log_8\left(\frac{1+x}{1-x}\right)$

Q63. Let $f(x) = \left(\sin(\tan^{-1} x) + \sin(\cot^{-1} x)\right)^2 - 1, |x| > 1$. If $\frac{dy}{dx} = \frac{1}{2}\frac{d}{dx}(\sin^{-1}(f(x)))$ and $y(\sqrt{3}) = \frac{\pi}{6}$, then $y(-\sqrt{3})$ is equal to:
(1) $\frac{2\pi}{3}$
(2) $-\frac{\pi}{6}$
(3) $\frac{5\pi}{6}$
(4) $\frac{\pi}{3}$

Q64. If c is a point at which Rolle's theorem holds for the function, $f(x) = \log_e\left(\frac{x^2+\alpha}{7x}\right)$ in the interval [3,4], where $\alpha \in R$, then $f''(c)$ is equal to
(1) $-\frac{1}{12}$
(2) $\frac{1}{12}$
(3) $-\frac{1}{24}$
(4) $\frac{\sqrt{3}}{7}$

Q65. Let $f(x) = x\cos^{-1}(-\sin|x|), x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, then which of the following is true?
(1) f' is increasing in $\left(-\frac{\pi}{2}, 0\right)$ and decreasing in
(2) $f'(0) = -\frac{\pi}{2}\left(0, \frac{\pi}{2}\right)$
(4) f' ' is decreasing in $\left(-\frac{\pi}{2}, 0\right)$ and increasing in $\left(0, \frac{\pi}{2}\right)$

Q66. If $\int \frac{\cos x dx}{\sin^3 x(1+\sin^6 x)^{\frac{2}{3}}} = f(x)(1+\sin^6 x)^{\frac{1}{\lambda}} + c$, where c is a constant of integration, then $\lambda f\left(\frac{\pi}{3}\right)$ is equal to

(1) $-\frac{9}{8}$
(2) 2
(3) $\frac{9}{8}$
(4) -2

Q67. Let $y = y(x)$ be a solution of the differential equation, $\sqrt{1-x^2}\frac{dy}{dx} + \sqrt{1-y^2} = 0, |x| < 1$. If $y\left(\frac{1}{2}\right) = \frac{\sqrt{3}}{2}$, then $y\left(\frac{-1}{\sqrt{2}}\right)$ is equal to
(1) $\frac{\sqrt{3}}{2}$
(2) $-\frac{1}{\sqrt{2}}$
(3) $\frac{1}{\sqrt{2}}$
(4) $-\frac{\sqrt{3}}{2}$

Q68. Let the volume of a parallelepiped whose coterminous edges are given by $\vec{u} = \hat{\imath} + \hat{\jmath} + \lambda\hat{k}, \vec{v} = \hat{\imath} + \hat{\jmath} + 3\hat{k}$ and $\vec{w} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$ be 1 cu. unit. If θ be the angle between the edges $\vec{u}$ and $\vec{w}$, then the value of $\cos\theta$ can be
(1) $\frac{7}{6\sqrt{6}}$
(2) $\frac{7}{6\sqrt{3}}$
(3) $\frac{5}{7}$
(4) $\frac{5}{3\sqrt{3}}$

Q69. The shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ is
(1) $2\sqrt{30}$
(2) $\frac{7}{2}\sqrt{30}$
(3) $3\sqrt{30}$
(4) 3

Q70. Let A and B be two independent events such that $P(A) = \frac{1}{3}$ and $P(B) = \frac{1}{6}$. Then, which of the following is true?
(1) $P\left(\frac{A}{B}\right) = \frac{2}{3}$
(2) $P\left(\frac{A}{B'}\right) = \frac{1}{3}$
(3) $P\left(\frac{A'}{B'}\right) = \frac{1}{3}$
(4) $P\left(\frac{A}{(A \cup B)}\right) = \frac{1}{4}$

Q71. The least positive value of ' a ' for which the equation, $2x^2 + (a-10)x + \frac{33}{2} = 2a$ has real roots is
.

Q72. An urn contains 5 red marbles, 4 black marbles and 3 white marbles. Then, the number of ways in which 4 marbles can be drawn so that at the most three of them are red is .

Q73. The sum $\sum_{k=1}^{20}(1 + 2 + 3 + \cdots + k)$ is .

Q74. The number of all 3×3 matrices A, with entries from the set $\{-1,0,1\}$ such that the sum of the diagonal elements of AA^T is 3 , is .

Q75. Let the normal at a point P on the curve $y^2 - 3x^2 + y + 10 = 0$ intersect the y-axis at $\left(0, \frac{3}{2}\right)$. If m is the slope of the tangent at P to the curve, then $|m|$ is equal to .

ANSWER KEYS

1. (2)	**2.** (2)	**3.** (2)	**4.** (3)	**5.** (2)	**6.** (3)	**7.** (3)	**8.** (1)
9. (3)	**10.** (1)	**11.** (2)	**12.** (3)	**13.** (4)	**14.** (1)	**15.** (1)	**16.** (2)
17. (4)	**18.** (1)	**19.** (4)	**20.** (4)	**21.** (580)	**22.** (1)	**23.** (106)	**24.** (10)
25. (60)	**26.** (2)	**27.** (1)	**28.** (2)	**29.** (1)	**30.** (2)	**31.** (2)	**32.** (3)
33. (3)	**34.** (1)	**35.** (2)	**36.** (3)	**37.** (1)	**38.** (1)	**39.** (2)	**40.** (4)
41. (1)	**42.** (3)	**43.** (1)	**44.** (4)	**45.** (2)	**46.** (27)	**47.** (48)	**48.** (4.95)
49. (0.93)	**50.** (3)	**51.** (1)	**52.** (2)	**53.** (3)	**54.** (2)	**55.** (1)	**56.** (2)
57. (4)	**58.** (2)	**59.** (1)	**60.** (3)	**61.** (1)	**62.** (4)	**63.** (3)	**64.** (2)
65. (4)	**66.** (4)	**67.** (3)	**68.** (2)	**69.** (3)	**70.** (2)	**71.** (8)	**72.** (490)
73. (1540)	**74.** (672)	**75.** (4)					