Q1. Which of the following equations is dimensionally incorrect?
Where $t =$ time, $h =$ height, $s =$ surface tension, $\theta =$ angle, $\rho =$ density , $a, r =$ radius, $g =$ the acceleration due to gravity, $V =$ volume, $p =$ pressure, $W =$ work done, $\tau =$ torque, $\epsilon =$ permittivity, $E =$ electric field, $J =$ current density, $L =$ length.
(1) $W = \tau\theta$
(2) $V = \frac{\pi p a^4}{8\eta L}$
(3) $h = \frac{2s\cos\theta}{\rho r g}$
(4) $J = \epsilon \frac{\partial E}{\partial t}$

Q2. Match List - I with List - II.

List - I

a Torque
b Impulse
c Tension
d Surface Tension

List - II
MLT^{-1}
MT^{-2}
$ML^2\ T^{-2}$
MLT^{-2}

Choose the most appropriate answer from the option given below :
(1) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
(2) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
(4) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

Q3. A helicopter is flying horizontally with a speed v at an altitude h has to drop a food packet for a man on the ground. What is the distance of helicopter from the man when the food packet is dropped ?
(1) $\sqrt{\frac{2ghv^2+1}{h^2}}$
(2) $\sqrt{2ghv^2 + h^2}$
(3) $\sqrt{\frac{2gh}{v^2}} + h^2$
(4) $\sqrt{\frac{2v^2h}{g} + h^2}$

Q4. A body of mass M moving at speed V_0 collides elastically with a mass m at rest. After the collision, the two masses move at angles θ_1 and θ_2 with respect to the initial direction of motion of the body of mass M.. The largest possible value of the ratio $\frac{M}{m}$, for which the angles θ_1 and θ_2 will be equal, is :
(1) 3
(2) 4
(3) 2
(4) 1

Q5. Angular momentum of a single particle moving with constant speed along circular path :
(1) remains same in magnitude but changes in the direction
(3) is zero
(4) changes in magnitude but remains same in the direction

Q6. The masses and radii of the earth and moon are (M_1, R_1) and (M_2, R_2) respectively. Their centres are at a distance r apart. Find the minimum escape velocity for a particle of mass m to be projected from the middle of these two masses :
(1) $v_e = \sqrt{\frac{4G(M_1+M_2)}{r}}$
(2) $v_e = \frac{1}{2}\sqrt{\frac{2G(M_1+M_2)}{r}}$
(3) $v_e = \frac{1}{2}\sqrt{\frac{4G(M_1+M_2)}{r}}$
(4) $v_e = \frac{\sqrt{2G}(M_1+M_2)}{r}$

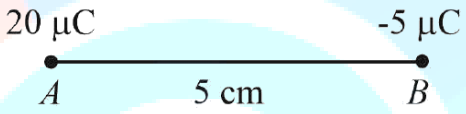
Q7. A uniform heavy rod of weight 10 kg m s^{-2}, cross-sectional area 100 cm^2 and length 20 cm is hanging from a fixed support. Young modulus of the material of the rod is 2×10^{11} N m^{-2}. Neglecting the lateral contraction, find the elongation of rod due to its own weight:
(1) 5×10^{-10} m
(2) 4×10^{-8} m
(3) 5×10^{-8} m
(4) 2×10^{-9} m

Q8. A reversible engine has an efficiency of $\frac{1}{4}$. If the temperature of the sink is reduced by $58^{\circ}C$, its efficiency becomes double. Calculate the temperature of the sink:

(1) 180.4°C
(2) 382°C
(3) 174 K
(4) 280°C

Q9. For an ideal gas the instantaneous change in pressure P with volume V is given by the equation $\frac{dP}{dV} = -aP$. If $P = P_0$ at $V = 0$ is the given boundary condition, then the maximum temperature one mole of gas can attain is: (Here R is the gas constant)
(1) $\frac{aP_0}{eR}$
(2) infinity
(3) 0°C
(4) $\frac{P_0}{aeR}$

Q10. Two particles A and B having charges $20\mu C$ and $-5\mu C$ respectively are held fixed with a separation of 5 cm At what position a third charged particle should be placed so that it does not experience a net electric force ?



(1) At 5 cm from $-5\mu C$ on the right side
(2) At 5 cm from $20\mu C$ on the left side of system
(3) At 1.25 cm from $-5\mu C$ between two charges
(4) At midpoint between two charges

Q11. Consider a galvanometer shunted with 5Ω resistance and 2% of current passes through it. What is the resistance of the given galvanometer?
(1) 245Ω
(2) 344Ω
(3) 300Ω
(4) 226Ω

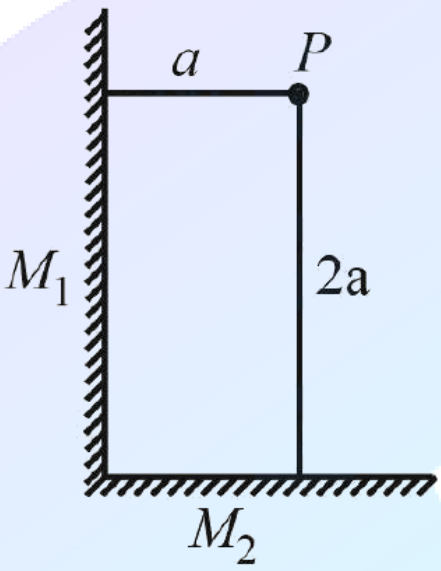
Q12. A coil having N turns is wound tightly in the form of a spiral with inner and outer radii a and b respectively.
Find the magnetic field at centre, when a current I passes through coil :
(1) $\frac{\mu_0 I}{8}\left[\frac{a+b}{a-b}\right]$
(2) $\frac{\mu_0 I}{4(a-b)}\left[\frac{1}{a}-\frac{1}{b}\right]$
(3) $\frac{\mu_0 I}{8}\left(\frac{a-b}{a+b}\right)$
(4) $\frac{\mu_0 IN}{2(b-a)}\log_e\left(\frac{b}{a}\right)$

Q13. A small square loop of side a and one turn is placed inside a larger square loop of side b and one turn ($b \gg a$). The two loops are coplanar with their centres coinciding. If a current I is passed in the square loop of side b, then the coefficient of mutual inductance between the two loops is :
(1) $\frac{\mu_0}{4\pi}8\sqrt{2}\frac{a^2}{b}$
(2) $\frac{\mu_0}{4\pi}8\sqrt{2}\frac{b^2}{a}$
(3) $\frac{\mu_0}{4\pi}\frac{8\sqrt{2}}{b}$
(4) $\frac{\mu_0}{4\pi}\frac{8\sqrt{2}}{a}$

Q14. In an ac circuit, an inductor, a capacitor and a resistor are connected in series with $X_L = R = X_C$. Impedance of this circuit is :
(1) Zero
(2) R
(3) $R\sqrt{2}$
(4) $2R^2$

Q15. An object is placed at the focus of concave lens having focal length f. What is the magnification and distance of the image from the optical centre of the lens?
(1) $\frac{1}{4}, \frac{f}{4}$
(2) $\frac{1}{2}, \frac{f}{2}$
(3) Very high, ∞
(4) $1, \infty$

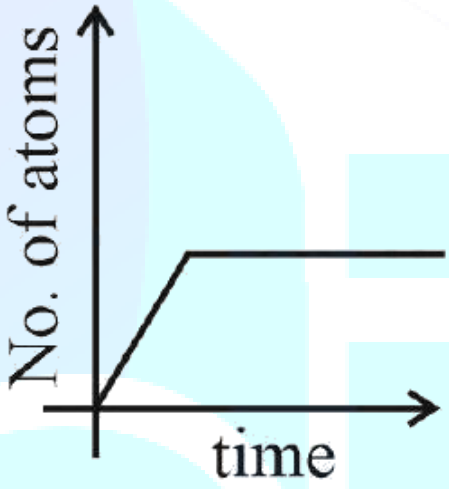
Q16. Two plane mirrors M_1 and M_2 are at right angle to each other shown. A point source P is placed at a and $2a$ meter away from M_1 and M_2 respectively. The shortest distance between the images thus formed is : (Take $\sqrt{5} = 2.3$)



(1) $2.3a$
(2) $2\sqrt{10}a$
(3) $4.6a$
(4) $3a$

Q17. A moving proton and electron have the same de-Broglie wavelength. If K and P denote the $K.E.$ and momentum respectively. Then choose the correct option :
(1) $K_p > K_e$ and $P_p = P_e$
(2) $K_p < K_e$ and $P_p = P_e$
(3) $K_p < K_e$ and $P_p < P_e$
(4) $K_p = K_e$ and $P_p = P_e$

Q18. A sample of a radioactive nucleus A disintegrates to another radioactive nucleus B, which in turn disintegrates to some other stable nucleus C. Plot of a graph showing the variation of number of atoms of nucleus B vesus time is : (Assume that at $t = 0$, there are no B atoms in the sample)
(1)



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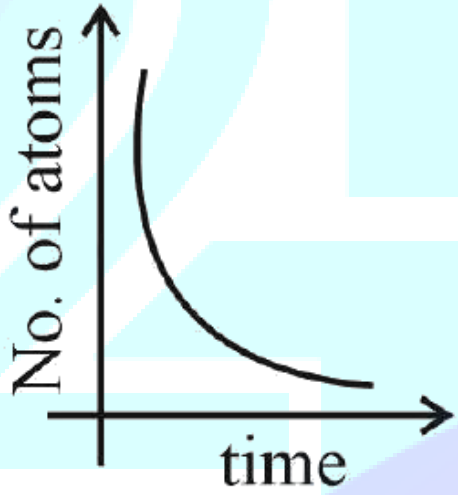

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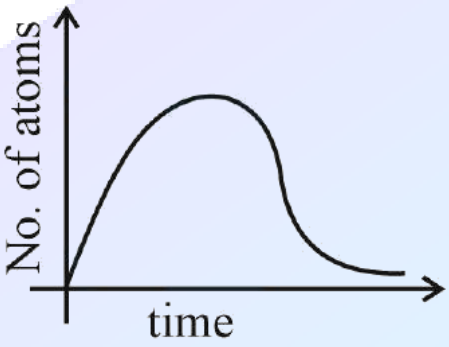

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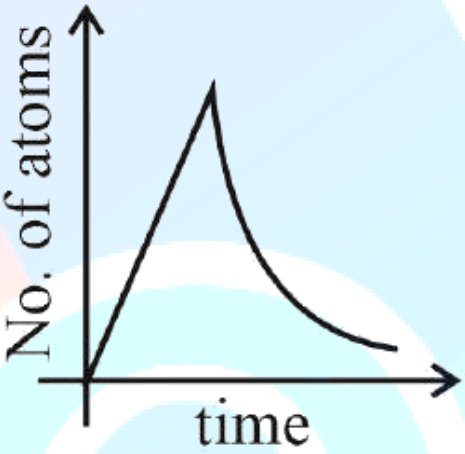
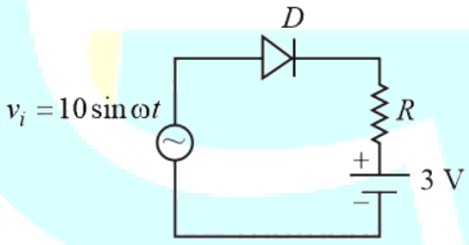
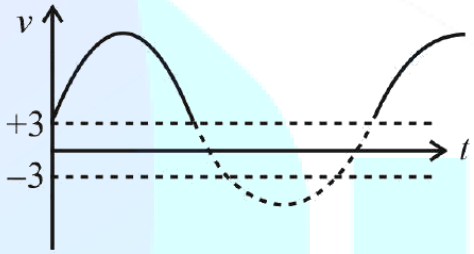


Q19. Choose the correct waveform that can represent the voltage across R of the following circuit, assuming the diode is ideal one:



(1)



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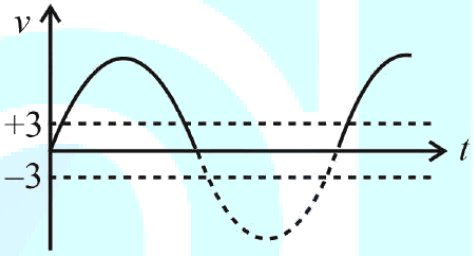

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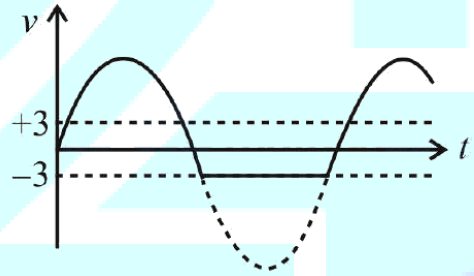

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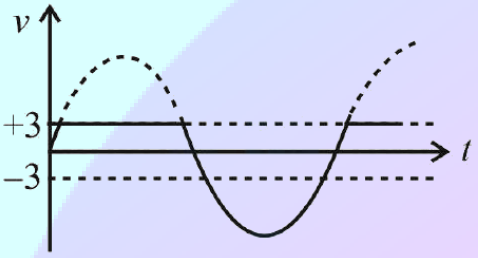
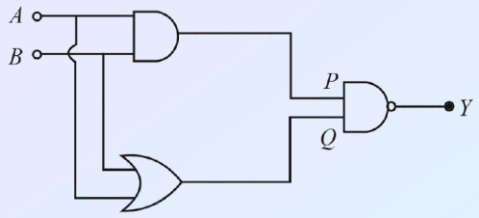


Q20. In the following logic circuit the sequence of the inputs A, B are $(0,0), (0,1), (1,0)$ and

(1,1). The output Y for this sequence will be :



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

Q21. A car is moving on a plane inclined at 30° to the horizontal with an acceleration of $10\ \text{m s}^{-2}$ parallel to the plane upward. A bob is suspended by a string from the roof of the car. The angle in degrees which the string makes with the vertical is (Take $g = 10\ \text{m s}^{-2}$)

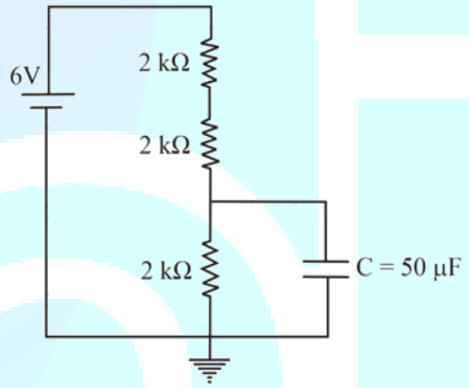
Q22. A block moving horizontally on a smooth surface with a speed of $40\ \text{m s}^{-1}$ splits into two equal parts. If one of the parts moves at $60\ \text{m s}^{-1}$ in the same direction, then the fractional change in the kinetic energy will be $x:4$ where $x =$.

Q23. When a rubber ball is taken to a depth of m in deep sea, its volume decreases by 0.5% (The bulk modulus of rubber $= 9.8 \times 10^{8}\ \text{N m}^{-2}$ Density of sea water $= 10^{3}\ \text{kg m}^{-3}$, $\text{g} = 9.8\ \text{m s}^{-2}$)

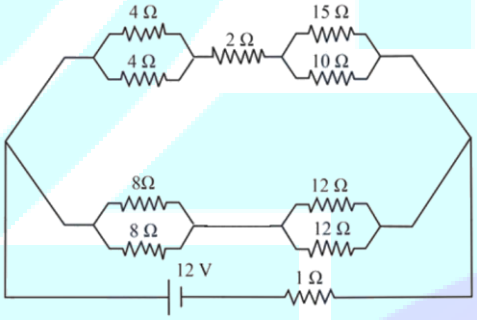
Q24. A particle of mass 1 kg is hanging from a spring of force constant $100\ \text{N m}^{-1}$. The mass is pulled slightly downward and released so that it executes free simple harmonic motion with time period T. The time when the kinetic energy and potential energy of the system will become equal, is $\frac{T}{n}$. The value of n is .

Q25. A wire having a linear mass density $9.0 \times 10^{-4}\ \text{kg m}^{-1}$ is stretched between two rigid supports with a tension of 900 N . The wire resonates at a frequency of 500 Hz . The next higher frequency at which the same wire resonates is 550 Hz . The length of the wire is m.

Q26. A capacitor of 50μ F is connected in a circuit as shown in figure. The charge on the upper plate of the capacitor is μC.



Q27. The voltage drop across 15Ω resistance in the given figure will be v.



Q28. A square-shaped wire with a resistance of each side 3Ω is bent to form a complete circle. The resistance between two diametrically opposite points of the circle in a unit of Ω will is, .

Q29. The electric field in an electromagnetic wave is given by

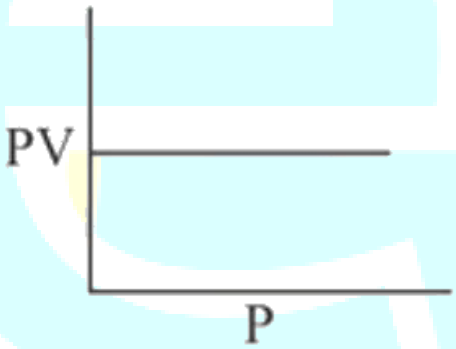
$E = (50\ \text{NC}^{-1})\sin\omega\left(t - \frac{x}{c}\right)$

The energy contained in a cylinder of volume V is 5.5×10^{-12} J. The value of V is cm^3. (given $\epsilon_0 = 8.8 \times 10^{-12}\text{C}^2\ \text{N}^{-1}\ \text{m}^{-2}$)

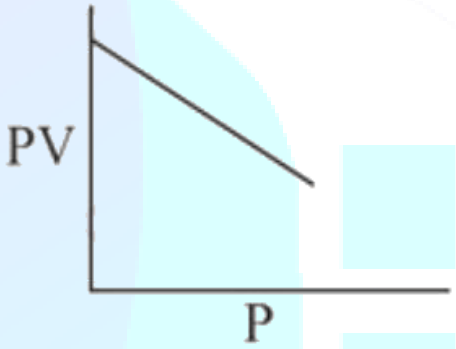
Q30. If the sum of the heights of transmitting and receiving antennas in the line of sight of communication is fixed at 160 m , then the maximum range of LOS communication is km (Take radius of Earth = 6400 km)

Q31. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : Metallic character decreases and non-metallic character increases on moving from left to right in a period.
Reason (R): It is due to increase in ionisation enthalpy and decrease in electron gain enthalpy, when one moves
from left to right in a period.
In the light of the above statements, choose the most appropriate 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) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(4) (A) is true but (R) is false.

Q32. Which one of the following is the correct PV vs P plot at constant temperature for an ideal gas ? (P and V stand for pressure and volume of the gas respectively)
(1)



(2)



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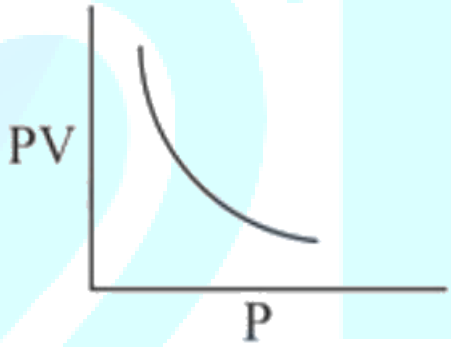
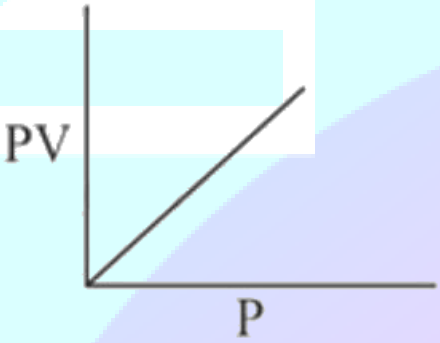


(4)

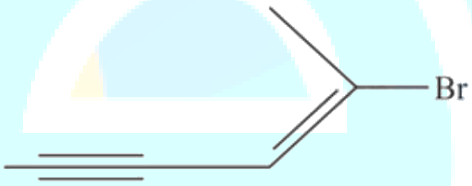


Q33. Monomer of Novolac is :
(1) 3-Hydroxybutanoic acid.
(2) 1, 3 -Butadiene and styrene.
(3) phenol and melamine.
(4) o-Hydroxymethylphenol.

Q34. The major component/ingredient of Portland Cement is :
(1) dicalcium silicate
(2) tricalcium aluminate
(3) dicalcium aluminate
(4) tricalcium silicate

Q35. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as
Assertion (A): A simple distillation can be used to separate a mixture of propanol and propanone.
Reason (R): Two liquids with a difference of more than $20^{\circ}C$ in their boiling points can be separated by simple distillations.
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 true but (R) is false.
(4) (A) is false but (R) is true.

Q36. Choose the correct name for compound given below :

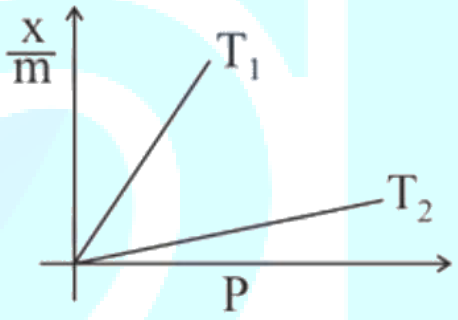


(1) (2E)-2-Bromo-hex-4-yn-2-ene
(2) (4E)-5-Bromo-hex-2-en-4-yne
(3) (4E)-5-Bromo-hex-4-en-2-yne
(4) (2E)-2-Bromohex-2-en-4-yne

Q37.BOD values (in ppm) for clean water (A) and polluted water (B) are expected respectively as:
(1) $A < 5, B > 17$
(2) $A > 50, B < 27$
(3) $A > 15, B > 47$
(4) $A > 25, B < 17$

Q38. Which one of the following 0.10 M aqueous solutions will exhibit the largest freezing point depression?
(1) glycine
(2) hydrazine
(3) $KHSO_4$
(4) glucose

Q39. Select the graph that correctly describes the adsorption isotherms at two temperatures T_1 and $T_2(T_1 > T_2)$ for a gas :
(x - mass of the gas adsorbed m − - mass of adsorbent P - pressure)
(1)



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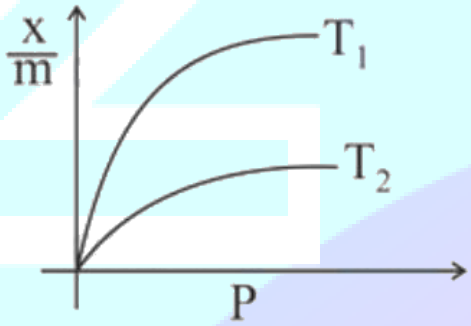

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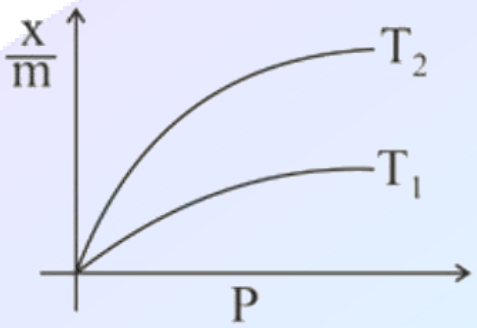
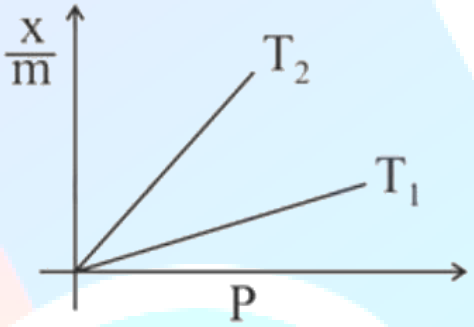


(4)



Q40. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Treatment of bromine water with propene yields 1-bromopropan-2-ol.
Reason (R) : Attack of water on bromonium ion follows Markovnikov rule and results in 1-bromopropan-2-ol.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(2) (A) is false but (R) is true.
(3) Both (A) and (R) are true and (R) is the correct explanation of (A).
(4) (A) is true but (R) is false.

Q41. In the structure of the dichromate ion, there is a :
(1) linear symmetrical $\mathrm{Cr-O-Cr}$ bond.
(2) non-linear unsymmetrical $\mathrm{Cr-O-Cr}$ bond.
(3) non-linear symmetrical $\mathrm{Cr-O-Cr}$ bond.
(4) linear unsymmetrical $\mathrm{Cr-O-Cr}$ bond.

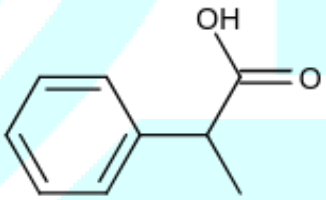
Q42. Which one of the following lanthanides exhibits +2 oxidation state with diamagnetic nature ? (Given Z for $\mathrm{Nd}=60, \mathrm{Yb}=70, \mathrm{La}=57, \mathrm{Ce}=58$)
(1) Nd
(2) Yb
(3) Ce
(4) La

Q43. The denticity of an organic ligand, biuret is :
(1) 2
(2) 3
(3) 4
(4) 6

Q44. The structure of product **C**, formed by the following sequence of reactions is :

$$\mathrm{CH_3COOH + SOCl_2 \longrightarrow A \xrightarrow[AlCl_3]{Benzene} B \xrightarrow[-OH]{KCN} \longrightarrow C}$$

(1)



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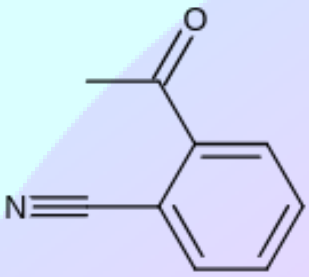

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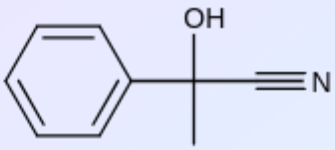

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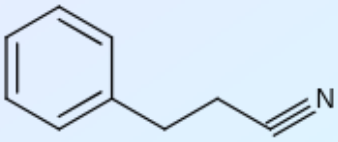
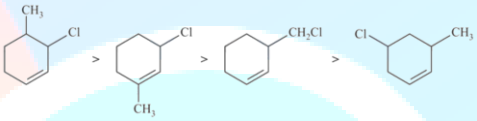
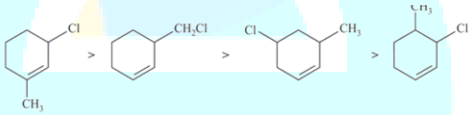


Q45. The correct order of reactivity of the given chlorides with acetate in acetic acid is :

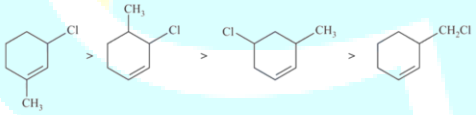
(1)



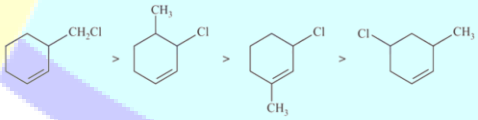
(2)



(3)



(4)



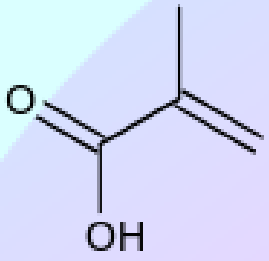
Q46. Given below are two statements :
Statement I : The process of producing syn-gas is called gasification of coal.
Statement II : The composition of syn-gas is $CO + CO_2 + H_2 (1:1:1)$.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both Statement I and Statement II are false.
(2) Statement I is true but Statement II is false
(3) Statement I is false but Statement II is true.
(4) Both Statement I and Statement II are true.

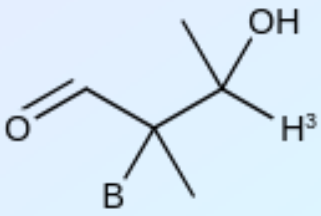
Q47. The major products A and B in the following set of reactions are:

(1)

$B =$

(2)

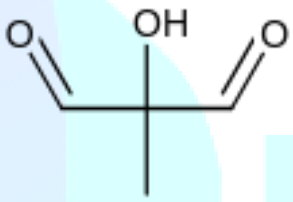




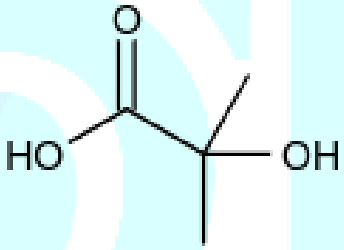
(3)

$B =$

(4)



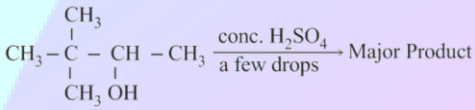
$B =$



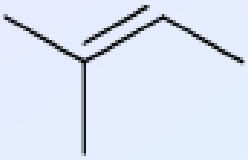
Q48. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion (A) : Aluminium is extracted from bauxite by the electrolysis of molten mixture of Al_2O_3 with cryolite.

Reason (R) : The oxidation state of Al in cryolite is +3 .
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the
(2) (A) is true but (R) is false. correct explanation of (A).
(3) Both (A) and (R) are correct but (R) is not the
(4) (A) is false but (R) is true.

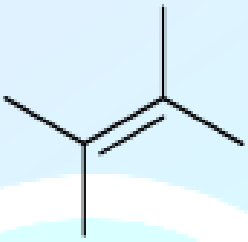
Q49. The major product formed in the following reaction is :



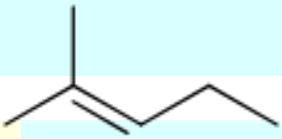
(1)



(3)



(2)

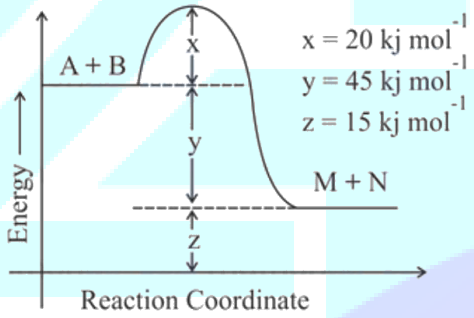


(4)

Q50. Which one of the following compounds contains $\beta - C_1 - C_4$ glycosidic linkage?
(1) Sucrose
(2) Amylose
(3) Lactose
(4) Maltose

Q51. $Ge(Z = 32)$ in its ground state electronic configuration has x completely filled orbitals with $m_1 = 0$. The value of x is .

Q52. According to the following figure, the magnitude of the enthalpy change of the reaction $A + B \rightarrow M + N$ in $kJmol^{-1}$ is equal to . (Integer answer)



Q53. $A_3 B_2$ is a sparingly soluble salt of molar mass $M(gmol^{-1})$ and solubility xgL^{-1}. The solubility product satisfies $K_{sp} = a\left(\frac{x}{M}\right)^5$. The value of a is . (Integer answer)

Q54. The number of hydrogen bonded water molecule(s) associated with stoichiometry $CuSO_4 \cdot 5H_2O$ is
.

Q55. The molarity of the solution prepared by dissolving 6.3 g of oxalic acid $(H_2C_2O_4 \cdot 2H_2O)$ in 250 mL of water in $molL^{-1}$ is $x \times 10^{-2}$. The value of x is . (Nearest integer)

[Atomic mass : H : 1.0, C : 12.0, 0: 16.0 J]

Q56. Consider the following cell reaction

$Cd_{(s)} + Hg_2SO_{4(s)} + \frac{9}{5}H_2O_{(l)} \rightleftharpoons CdSO_4 \cdot \frac{9}{5}H_2O_{(s)} + 2Hg_{(l)}$.

The value of E^0_{cell} is 4.315 V at 25°C. If $\Delta H^\circ = -825.2$ kJ mol^{-1}, the standard entropy change ΔS° in JK^{-1} is . (Nearest integer)

[Given : Faraday constant $= 96487 C mol^{-1}$]

Q57. For a first order reaction, the ratio of the time for 75% completion of a reaction to the time for 50% completion is . (Integer answer)

Q58. Consider the sulphides

$HgS, PbS, CuS, Sb_2S_3, As_2S_3$ and CdS . Number of these sulphides soluble in $50\% HNO_3$ is .

Q59. The number of halogen/(s) forming halic (V) acid is .

Q60. The total number of reagents from those given below, that can convert nitrobenzene into aniline is

. (Integer answer)

I. $Sn - HCl$

II. $Sn - NH_4OH$

III. $Fe - HCl$

IV. $Zn - HCl$

V. $H_2 - Pd$

VI. $H_2 -$ Raney Nickel

Q61. The sum of 10 terms of the series $\frac{3}{1^2\times2^2} + \frac{5}{2^2\times3^2} + \frac{7}{3^2\times4^2} + \cdots$ is :

(1) $\frac{143}{144}$

(2) $\frac{99}{100}$

(3) 1

(4) $\frac{120}{121}$

Q62. Three numbers are in an increasing geometric progression with common ratio r. If the middle number is doubled, then the new numbers are in an arithmetic progression with common difference d. If the fourth term of GP is $3r^2$, then $r^2 - d$ is equal to :

(1) $7 - \sqrt{3}$

(2) $7 + 3\sqrt{3}$

(3) $7 - 7\sqrt{3}$

(4) $7 + \sqrt{3}$

Q63. $\operatorname{cosec} 18^\circ$ is a root of the equation:

(1) $x^2 - 2x - 4 = 0$

(2) $4x^2 + 2x - 1 = 0$

(3) $x^2 + 2x - 4 = 0$

(4) $x^2 - 2x + 4 = 0$

Q64. If p and q are the lengths of the perpendiculars from the origin on the lines, $x\operatorname{cosec}\alpha - y\sec\alpha = k\cot 2\alpha$ and $x\sin\alpha + y\cos\alpha = k\sin 2\alpha$ respectively, then k^2 is equal to :

(1) $2p^2 + q^2$

(2) $p^2 + 2q^2$

(3) $4q^2 + p^2$

(4) $4p^2 + q^2$

Q65. The length of the latus rectum of a parabola, whose vertex and focus are on the positive x-axis at a distance R and $S(> R)$ respectively from the origin, is :

(1) $2(S - R)$

(2) $2(S + R)$

(3) $4(S - R)$

(4) $4(S + R)$

Q66. The line $12x\cos\theta + 5y\sin\theta = 60$ is tangent to which of the following curves ?

(1) $x^2 + y^2 = 30$

(2) $144x^2 + 25y^2 = 3600$

(3) $x^2 + y^2 = 169$

(4) $25x^2 + 12y^2 = 3600$

Q67. $\lim_{x\to0} \frac{\sin^2(\pi\cos^4 x)}{x^4}$ is equal to :

(1) $2\pi^2$

(2) π^2

(3) $4\pi^2$

(4) 4π

Q68. Let $*, \square \in \{\wedge, \vee\}$ be such that the Boolean expression $(p^* \sim q) \Rightarrow (p \square q)$ is a tautology. Then :

(1) $*=\vee, \square=\wedge$

(2) $*=\vee, \square=\vee$

(3) $*=\wedge, \square=\vee$

(4) $*=\wedge, \square=\wedge$

Q69. A vertical pole fixed to the horizontal ground is divided in the ratio 3: 7 by a mark on it with lower part shorter than the upper part. If the two parts subtend equal angles at a point on the

ground 18 m away from the base of the pole, then the height of the pole (in meters) is :
(1) $8\sqrt{10}$
(2) $6\sqrt{10}$
(3) $12\sqrt{10}$
(4) $12\sqrt{15}$

Q70. Which of the following is not correct for relation R on the set of real numbers?
(1) $(x,y) \in R \Leftrightarrow |x| - |y| \leq 1$ is reflexive but not symmetric.
(3) $(x,y) \in R \Leftrightarrow 0 < |x-y| \leq 1$ is symmetric and transitive.
(2) $(x,y) \in R \Leftrightarrow |x-y| \leq 1$ is reflexive and symmetric.
(4) $(x,y) \in R \Leftrightarrow 0 < |x| - |y| \leq 1$ is not transitive but symmetric.

Q71. If $a_r = \cos\frac{2r\pi}{9} + i\sin\frac{2r\pi}{9}, r = 1,2,3,\ldots, i = \sqrt{-1}$, then the determinant $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is equal to :
(1) a_9
(2) $a_1a_9 - a_3a_7$
(3) a_5
(4) $a_2a_6 - a_4a_8$

Q72. If the following system of linear equations

$$2x + y + z = 5$$
$$x - y + z = 3$$
$$x + y + az = b$$

has no solution, then :
(1) $a = -\frac{1}{3}, b \neq \frac{7}{3}$
(2) $a \neq \frac{1}{3}, b = \frac{7}{3}$
(3) $a \neq -\frac{1}{3}, b = \frac{7}{3}$
(4) $a = \frac{1}{3}, b \neq \frac{7}{3}$

Q73. The function $f(x) = |x^2 - 2x - 3| \cdot e^{9x^2-12x+4}$ is not differentiable at exactly:
(1) Four points
(2) Two points
(3) three points
(4) one point

Q74.
If the function $f(x) = \begin{cases} \frac{1}{x}\log_e\left(\frac{1+\frac{x}{a}}{1-\frac{x}{b}}\right) & , x < 0 \\ k & , x = 0 \\ \frac{\cos^2 x - \sin^2 x - 1}{\sqrt{x^2+1}-1} & , x > 0 \end{cases}$
is continuous at $x = 0$, then $\frac{1}{a} + \frac{1}{b} + \frac{4}{k}$ is equal to :
(1) 4
(2) 5
(3) -4
(4) -5

Q75. The number of real roots of the equation $e^{4x} + 2e^{3x} - e^x - 6 = 0$ is:
(1) 0
(2) 1
(3) 4
(4) 2

Q76. The integral $\int \frac{1}{\sqrt[4]{(x-1)^3(x+2)^5}}\,dx$ is equal to : (where C is a constant of integration)
(1) $\frac{3}{4}\left(\frac{x+2}{x-1}\right)^{\frac{5}{4}} + C$
(2) $\frac{4}{3}\left(\frac{x-1}{x+2}\right)^{\frac{1}{4}} + C$
(3) $\frac{4}{3}\left(\frac{x-1}{x+2}\right)^{\frac{5}{4}} + C$
(4) $\frac{3}{4}\left(\frac{x+2}{x-1}\right)^{\frac{1}{4}} + C$

Q77. Let f be a non-negative function in $[0,1]$ and twice differentiable in $(0,1)$. If $\int_0^x \sqrt{1-(f'(t))^2}dt = \int_0^x f(t)dt, 0 \leq x \leq 1$ and $f(0) = 0$, then $\lim_{x\to 0}\frac{1}{x^2}\int_0^x f(t)dt$:
(1) does not exist
(2) equals 0
(3) equals 1
(4) equals $\frac{1}{2}$

Q78. If $\frac{dy}{dx} = \frac{2^{x+y}-2^x}{2^y}, y(0) = 1$, then $y(1)$ is equal to :
(1) $\log_2(1+e^2)$
(2) $\log_2(2e)$
(3) $\log_2(2+e)$
(4) $\log_2(1+e)$

Q79. Let $\vec{a}$ and $\vec{b}$ be two vectors such that $|2\vec{a} + 3\vec{b}| = |3\vec{a} + \vec{b}|$ and the angle between $\vec{a}$ and $\vec{b}$ is $60°$. If $\frac{1}{8}\vec{a}$ is a unit vector, then $|\vec{b}|$ is equal to :
(1) 8
(2) 4
(3) 6
(4) 5

Q80. Let the equation of the plane, that passes through the point $(1,4,-3)$ and contains the line of intersection of the planes $3x - 2y + 4z - 7 = 0$ and $x + 5y - 2z + 9 = 0$, be $\alpha x + \beta y + \gamma z + 3 = 0$, then $\alpha + \beta + \gamma$ is equal to :
(1) -15
(2) 15
(3) -23
(4) 23

Q81. A point z moves in the complex plane such that $\arg\left(\frac{z-2}{z+2}\right) = \frac{\pi}{4}$, then the minimum value of $|z - 9\sqrt{2} - 2i|^2$ is equal to

Q82. The number of six letter words (with or without meaning), formed using all the letters of the word 'VOWELS', so that all the consonants never come together, is

Q83. If $\left(\frac{3^6}{4^4}\right)k$ is the term, independent of x, in the binomial expansion of $\left(\frac{x}{4} - \frac{12}{x^2}\right)^{12}$, then k is equal to

Q84. If the variable line $3x + 4y = \alpha$ lies between the two circles $(x-1)^2 + (y-1)^2 = 1$ and $(x-9)^2 + (y-1)^2 = 4$, without intercepting a chord on either circle, then the sum of all the integral values of α is

Q85. The mean of 10 numbers $7 \times 8, 10 \times 10, 13 \times 12, 16 \times 14, \ldots$ is

Q86. If R is the least value of a such that the function $f(x) = x^2 + ax + 1$ is increasing on $[1,2]$ and S is the greatest value of a such that the function $f(x) = x^2 + ax + 1$ is decreasing on $[1,2]$, then the value of $|R - S|$ is

Q87. Let $[t]$ denote the greatest integer $\leq$ t. Then the value of $8 \cdot \int_{-\frac{1}{2}}^{1} ([2x] + |x|)dx$ is

Q88. If $x\phi(x) = \int_5^x (3t^2 - 2\phi'(t))dt, x > -2, \phi(0) = 4$, then $\phi(2)$ is

Q89. The square of the distance of the point of intersection of the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+1}{6}$ and the plane $2x - y + z = 6$ from the point $(-1,-1,2)$ is

Q90. An electric instrument consists of two units. Each unit must function independently for the instrument to operate. The probability that the first unit functions is 0.9 and that of the second unit is 0.8 . The instrument is switched on and it fails to operate. If the probability that only the first unit failed and second unit is functioning is p, then $98p$ is equal to

ANSWER KEYS

1. (2) atho	2. (2)	3. (4)	4. (1)	5. (2) athoi	6. (1)	ma. (1)	8. (3)
9. (4)	10. (1)	11. (1)	12. (4)	13. (1)	14. (2)	15. (2)	16. (3)
17. (2)	18. (3)	mat 19. (1)	20. (3)	21. (30)	22. (1)	mo 23. (500)	24. (8) anca
25. (10)	26. (100)	27. (6)	28. (3)	29. (500)	30. (64)	31. (4)	32. (1)
33. (4)	34. (4)	35. (2)	36. (4)	37. (1)	38. (3)	39. (3)	40. (3)
41. (3)	42. (2)	43. (1)	44. (3)	45. (3)	46. (2)	47. (1)	48. (3)
49. (3)	50. (3)	51. (7)	52. (45)	53. (108)	54. (1)	55. (20)	56. (25)
57. (2)	58. (4)	59. (3)	60. (5)	61. (4)	62. (4)	63. (1)	64. (4) (
65. (3)	66. (2)	67. (3)	68. (3)	69. (3)	70. (4)	71. (2)	72. (4)
73. (2)	74. (4)	75. (2)	76. (2)	77. (4)	78. (4)	79. (4)	80. (3)
81. (98)	82. (576)	83. (55)	84. (165)	85. (398)	86. (2)	87. (5)	88. (4)
89. (61)	90. (28)						