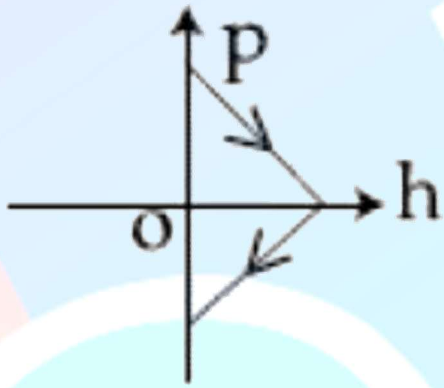
Q1. In the density measurement of a cube, the mass and edge length are measured as (10.00 ± 0.10)kg and (0.10 ± 0.01)m, respectively. The error in the measurement of density is:
(1) 0.31
(2) 0.10
(3) 0.07
(4) 0.01

Q2. A ball is thrown vertically up (taken as +z - axis) from the ground. The correct momentum-height ($p - h$) diagram is:
(1)

)



(2)

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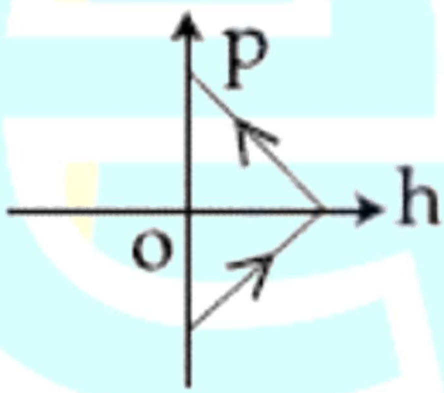
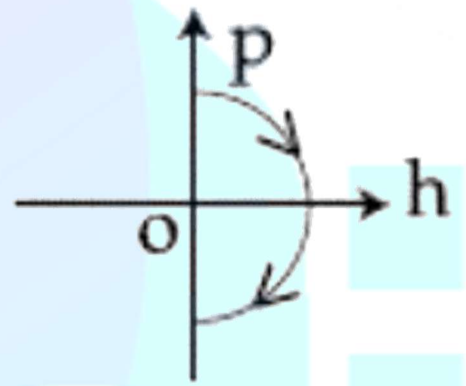


(3)



(4)

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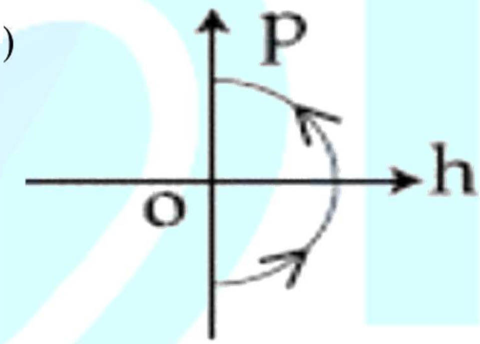


Q3. The stream of a river is flowing with a speed of 2 km h^{-1}. A swimmer can swim at a speed of 4 km h^{-1}. The direction of the swimmer with respect to the flow of the river, to cross the river straight, is
(1) $150°$
(2) $90°$
(3) $120°$
(4) $60°$

Q4. A uniform cable of mass M and length L is placed on a horizontal surface such that its $\left(\frac{1}{n}\right)^{\text{th}}$ part is hanging below the edge of the surface. To lift the hanging part of the cable upto the surface, the work done should be:
(1) $\frac{MgL}{2n^2}$
(2) $\frac{MgL}{n^2}$
(3) $nMgL$
(4) $\frac{2MgL}{n^2}$

Q5. A body of mass 2 kg makes an elastic collision with a second body at rest and continues to move in the original direction but with one fourth of its original speed. What is the mass of the second body?
(1) 1.8 kg
(2) 1.2 kg
(3) 1.0 kg
(4) 1.5 kg

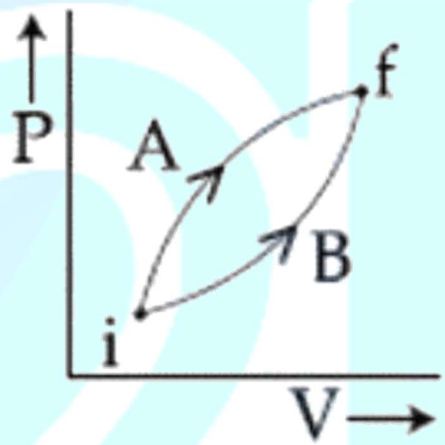
Q6. A stationary horizontal disc is free to rotate about its axis. When a torque is applied on it, its kinetic energy as a function of θ, where θ is the angle by which it has rotated, is given as $k\theta^2$. If its moment of inertia is I then the angular acceleration of the disc is:
(1) $\frac{2k}{I}\theta$
(2) $\frac{k}{2I}\theta$
(3) $\frac{k}{4I}\theta$
(4) $\frac{k}{I}\theta$

Q7. The following bodies are made to roll up (without slipping) the same inclined plane from a horizontal plane: (i) a ring of radius R, (ii) a solid cylinder of radius $\frac{R}{2}$ and (iii) a solid sphere of radius $\frac{R}{4}$. If, in each case, the speed of the center of mass at the bottom of the incline is same, the ratio of the maximum heights they climb is:
(1) $2:3:4$
(2) $20:15:14$
(3) $4:3:2$
(4) $14:15:20$

Q8. A solid sphere of mass M and radius a is surrounded by a uniform concentric spherical shell of thickness 2 a and mass 2 M . The gravitational field at distance 3a from the centre will be:
(1) $\frac{GM}{9a^2}$
(2) $\frac{GM}{3a^2}$
(3) $\frac{2GM}{3a^2}$
(4) $\frac{2GM}{9a^2}$

Q9. If ' M ' is the mass of water that rises in a capillary tube of radius ' r ', then mass of water which will rise in a capillary tube of radius ' 2 r ' is:
(1) 4 M
(2) 2 M
(3) $\frac{M}{2}$
(4) M

Q10. Following figure shows two processes A and B for a gas. If ΔQ_A and ΔQ_B are the amount of heat absorbed by the system in two cases, and ΔU_A and ΔU_B are changes in internal energies, respectively, then:



(1) $\Delta Q_A < \Delta Q_B; \Delta U_A < \Delta U_B$
(2) $\Delta Q_A = \Delta Q_B; \Delta U_A = \Delta U_B$
(3) $\Delta Q_A > \Delta Q_B; \Delta U_A = \Delta U_B$
(4) $\Delta Q_A > \Delta Q_B; \Delta U_A > \Delta U_B$

Q11.For given gas at 1 atm pressure, rms speed of the molecules is $200\ m/s$ at $127°C$. At 2 atm pressure and at $227°C$, the rms speed of the molecules will be:
(1) $100\ m/s$
(2) $80\ m/s$
(3) $80\sqrt{5}\ m/s$
(4) $100\sqrt{5}\ m/s$

Q12. An HCl molecule has rotational, translational and vibrational motions. If the rms velocity of HCl molecules in its gaseous phase is $\bar{v}, m$ is its mass and k_B is Boltzmann's constant, then its temperature will be:
(1) $\frac{m^2}{5k_B}$

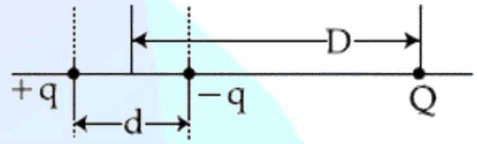
(2) $\frac{\bar{m}^{-2}}{6k_B}$
(4) $\frac{m^2}{7k_B}$

Q13. A simple pendulum oscillating in air has period T. The bob of the pendulum is completely immersed in a nonviscous liquid. The density of the liquid is $\frac{1}{16}$ th of the material of the bob. If the bob is inside liquid all the time, its period of oscillation in this liquid is:
(1) $2\,T\sqrt{\frac{1}{10}}$
(2) $2\,T\sqrt{\frac{1}{14}}$
(3) $4\,T\sqrt{\frac{1}{15}}$
(4) $4\,T\sqrt{\frac{1}{14}}$

Q14. A string is clamped at both the ends and it is vibrating in its 4^{th} harmonic. The equation of the stationary wave is $y = 0.3\sin(0.157x)\cos(200\pi t)$. The length of the string is
(All quantities are in SI units.)
(1) 20 m
(2) 60 m
(3) 40 m
(4) 80 m

Q15. The pressure wave, $P = 0.01\sin[1000t - 3x]\,Nm^{-2}$, corresponds to the sound produced by a vibrating blade on a day when atmospheric temperature is $0^\circ C$. On some other day when temperature is T, the speed of sound produced by the same blade and at the same frequency is found to be $336\ m\ s^{-1}$. Approximate value of T is:
(1) $12^\circ C$
(2) $15^\circ C$
(3) $4^\circ C$
(4) $11^\circ C$

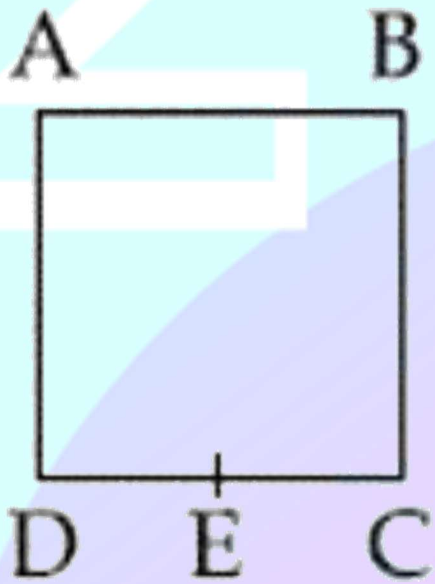
Q16. A system of three charges are placed as shown in the figure:



If $D \gg d$, the potential energy of the system is best given by:
(1) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d} - \frac{qQd}{D^2}\right]$
(2) $\frac{1}{4\pi\epsilon_0}\left[+\frac{q^2}{d} + \frac{qQd}{D^2}\right]$
(3) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d} - \frac{qQd}{2D^2}\right]$
(4) $\frac{1}{4\pi\epsilon_0}\left[-\frac{q^2}{d} + \frac{2qQd}{D^2}\right]$

Q17. A capacitor with capacitance 5μ F is charged to $5\mu C$. If the plates are pulled apart to reduce the capacitance to 2μ F, how much work is done?
(1) 6.25×10^{-6} J
(2) 2.55×10^{-6} J
(3) 2.16×10^{-6} J
(4) 3.75×10^{-6} J

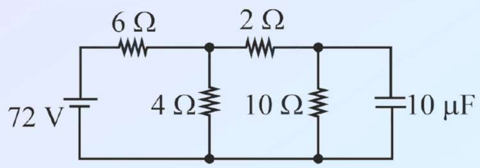
Q18. A wire of resistance R is bent to form a square $ABCD$ as shown in the figure. The effective resistance between E and C is:
(E is mid-point of arm CD)



(1) R

(2) $\frac{7}{64}R$
(3) $\frac{1}{16}R$
(4) $\frac{3}{4}R$

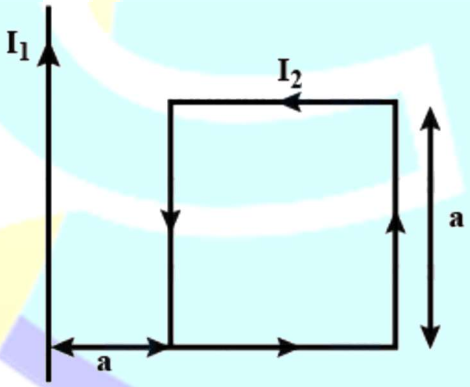
Q19. Determine the charge on the capacitor in the following circuit:



(1) 2μC
(2) 60μC
(3) 10μC
(4) 200μC

Q20. A moving coil galvanometer has resistance 50Ω and it indicates full deflection at 4 mA current. A voltmeter is made using this galvanometer and a 5kΩ resistance. The maximum voltage, that can be measured using this voltmeter, will be close to:
(1) 40 V
(2) 15 V
(3) 20 V
(4) 10 V

Q21. A rigid square loop of side ' a ' and carrying current I_2 is lying on a horizontal surface near a long current I_1 carrying wire in the same plane as shown in figure. The net force on the loop due to the wire will be:



(1) Attractive and equal to $\frac{\mu_0 I_1 I_2}{3\pi}$
(2) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{4\pi}$
(3) Repulsive and equal to $\frac{\mu_0 I_1 I_2}{2\pi}$
(4) Zero

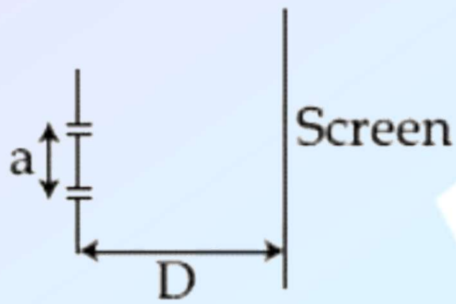
Q22. A rectangular coil (Dimension 5 cm × 2.5 cm) with 100 turns, carrying a current of 3 A in the clock-wise direction, is kept centered at the origin and in the $X-Z$ plane. A magnetic field of 1 T is applied along X - axis. If the coil is tilted through 45° about Z - axis, then the torque on the coil is:
(1) 0.42 N m
(2) 0.55 N m
(3) 0.38 N m
(4) 0.27 N m

Q23. The total number of turns and cross-section area in a solenoid is fixed. However, its length L is varied by adjusting the separation between windings. The inductance of solenoid will be proportional to:
(1) L
(2) $\frac{1}{L^2}$
(3) $\frac{1}{L}$
(4) L^2

Q24. The magnetic field of a plane electromagnetic wave is given by $\vec{B} = B_0\hat{i}[\cos(kz-\omega t)] + B_1\hat{j}\cos(kz+\omega t)$, where $B_0 = 3\times10^{-5}$ T and $B_1 = 2\times10^{-6}$ T. The RMS value of the force experienced by a stationary charge $Q = 10^{-4}$C at $z = 0$ is closest to
(1) 0.1 N
(2) 0.9 N
(3) 3×10^{-2} N
(4) 0.6 N

Q25. A concave mirror for face viewing has a focal length of 0.4 m . The distance at which you hold the mirror from your face in order to see your image upright with a magnification of 5 is
(1) 1.60 m
(2) 0.16 m
(3) 0.32 m
(4) 0.24 m

Q26. The figure shows a Young's double slit experimental setup. It is observed that when a thin transparent sheet of thickness t and refractive index μ is put in front of one of the slits, the central maximum gets shifted by a distance equal to n fringe width. If the wavelength of light used is λ then t will be:



(1) $\frac{D\lambda}{a(\mu-1)}$
(2) $\frac{n\lambda}{(\mu-1)}$
(3) $\frac{2n\lambda}{(\mu-1)}$
(4) $\frac{2D\lambda}{a(\mu-1)}$

Q27. The electric field of light wave is given as $\vec{E} = 10^{-3}\cos\left(\frac{2\pi}{5\times10^{-7}} - 2\pi \times 6 \times 10^{14}t\right)\hat{x}\,\frac{N}{C}$.
This light falls on a metal plate of work function 2 eV . The stopping potential of the photo-electrons is:
Given, $E(\text{ in eV}) = \frac{12375}{\lambda(\text{ in Å})}$
(1) 0.72 V
(2) 2.0 V
(3) 2.48 V
(4) 0.48 V

Q28. Taking the wavelength of first Balmer line in hydrogen spectrum ($n = 3$ to $n = 2$) as 660 nm , the wavelength of the 2^{nd} Balmer line ($n = 4$ to $n = 2$) will be :
(1) 889.2 nm
(2) 488.9 nm
(3) 388.9 nm
(4) 642.7 nm

Q29. An NPN transistor is used in common emitter configuration as an amplifier with $1k\Omega$ load resistance. Signal voltage of 10 mV is applied across the base-emitter. This produces a 3 mA change in the collector current and 15μ A change in the base current of the amplifier. The input resistance and voltage gain are:
(1) $0.33k\Omega, 1.5$
(2) $0.67k\Omega, 300$
(3) $0.67k\Omega, 200$
(4) $0.33k\Omega, 300$

Q30. A signal $A\cos\omega t$ is transmitted using $v_0\sin\omega_0 t$ as carrier wave. The correct amplitude modulated (AM) signal is:
(1) $v_0\sin[\omega_0(1 + 0.01A\sin\omega t)t]$
(2) $(v_0 + A)\cos\omega t\sin\omega_0 t$
(3) $v_0\sin\omega_0 t + A\cos\omega t$
(4) $v_0\sin\omega_0 t + \frac{A}{2}\sin(\omega_0 - \omega)t + \frac{A}{2}\sin(\omega_0 + \omega)t$

Q31. For a reaction, $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$, identify di-hydrogen ($H_2$) as a limiting reagent in the following reaction mixtures.
(1) 28 g of N_2 + 6 g of H_2
(2) 35 g of N_2 + 8 g of H_2
(3) 56 g of N_2 + 10 g of H_2
(4) 14 g of N_2 + 4 g of H_2

Q32. For any given series of spectral lines of atomic hydrogen, let $\Delta\bar{v} = \bar{v}_{max} - \bar{v}_{min}$ be the difference in maximum and minimum wave number in cm^{-1}.
The ratio $\Delta\bar{v}_{Lyman}/\Delta\bar{v}_{Balmar}$ is
(1) 5: 4
(2) 27: 5
(3) 4: 1
(4) 9: 4

Q33. The element having the greatest difference between its first and second ionization energies, is
(1) Ba
(2) K
(3) Ca
(4) Sc

Q34. Among the following, the molecule expected to be stabilized by anion formation is:
C_2, O_2, NO, F_2
(1) F_2

(2) C_2
(3) O_2
(4) NO

Q35. Consider the van der Waal's constants, a and b , for the following gases.

Gas	Ar	Ne	Kr	Xe
$a/(atm\,dm^6\,mol^{-2})$	1.3	0.2	5.1	4.1
$b/(10^{-2}\,dm^3\,mol^{-1})$	3.2	1.7	1.0	5.0

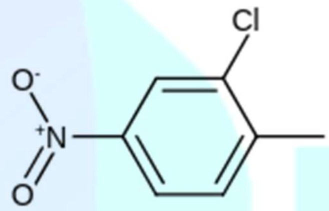
Which gas is expected to have the highest critical temperature?
(1) Kr
(2) Ar
(3) Xe
(4) Ne

Q36. Among the following, the set of parameters that represents path functions, is:
i) $q+w$
ii) q
iii) w
iv) $H-TS$
(1) (ii) and (iii)
(2) (i), (ii), and (iii)
(3) (ii), (iii) and (iv)
(4) (i) and (iv)

Q37. Magnesium powder burns in air to give
(1) MgO and $Mg_3\ N_2$.
(2) MgO only.
(3) $Mg(NO_3)_2$ and $Mg_3\ N_2$.
(4) MgO and $Mg(NO_3)_2$.

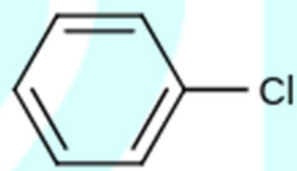
Q38. C_{60}, an allotrope of carbon contains
(1) 12 hexagons and 20 pentagons.
(2) 16 hexagons and 16 pentagons.
(3) 18 hexagons and 14 pentagons.
(4) 20 hexagons and 12 pentagons.

Q39. The correct IUPAC name of the following compound is:

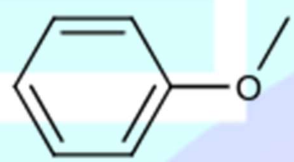


(1) 5-chloro-4-methyl-1-nitrobenzene.
(2) 2-chloro-1-methyl-4-nitrobenzene.
(3) 2-methyl-5-nitro-1-chlorobenzene.
(4) 3-chloro-4-methyl-1-nitrobenzene.

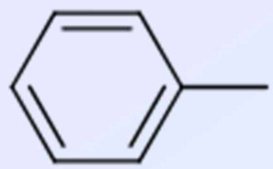
Q40. The increasing order of reactivity of the following compounds towards aromatic electrophilic substitution reaction is:

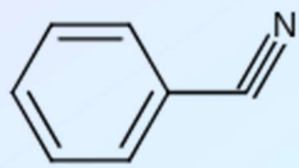


A



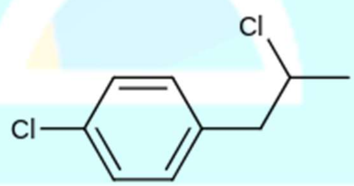
B





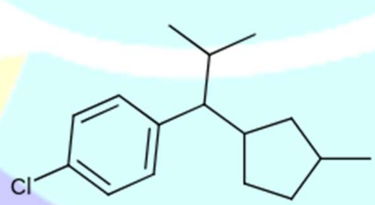
(1) A < B < C < D
(2) B < C < A < D
(3) D < B < A < C
(4) D < A < C < B

Q41. The major product of the following reaction is

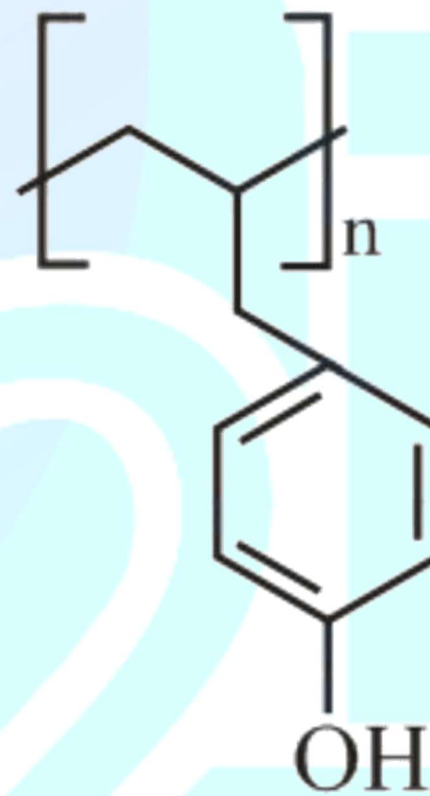


(1) KOH (alc.)
(2) Free radical polymeristaion

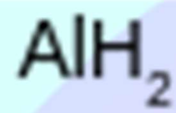
(1)



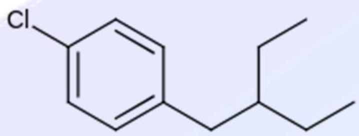
(2)



(3)
CH_3



(4)



Q42. The major product of the following reaction is

$$CH_3C \equiv CH \xrightarrow[\text{(ii) DI}]{\text{(i) DCl (1 equiv.)}}$$

(1) $CH_3CD(I)CHD(Cl)$
(2) $CH_3CD(Cl)CHD(I)$
(3) $CH_3CD_2CH(Cl)(I)$
(4) $CH_3C(I)(Cl)CHD_2$

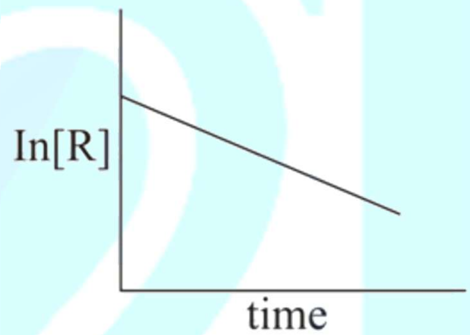
Q43. Excessive release of CO_2 into the atmosphere results in
(1) global warming.
(2) polar vortex.
(3) depletion of ozone.
(4) formation of smog.

Q44. The osmotic pressure of a dilute solution of an ionic compound XY in water is four times that of a solution $0.01 M BaCl_2$ in water. Assuming complete dissociation of the given ionic compounds in water, the concentration of XY(in $mol L^{-1}$) in solution is
(1) 4×10^{-2}
(2) 16×10^{-4}
(3) 4×10^{-4}
(4) 6×10^{-2}

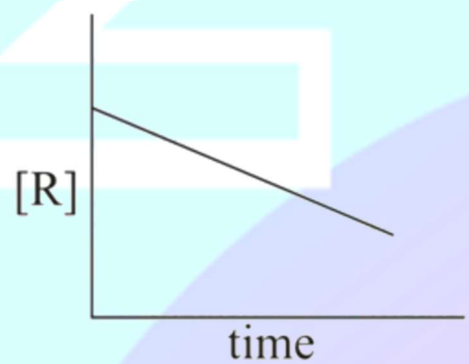
Q45. Liquid M and liquid N form an ideal solution. The vapour pressures of pure liquids M and N are 450 and 700 mmHg , respectively, at the same temperature. Then correct statements is:
(x_M = Mole fraction of ' M ' in solution;
x_N = Mole fraction of ' N 'in solution;
y_M = Mole fraction of ' M ' in vapour phase;
y_N = Mole fraction of ' N ' in vapour phase;)
(1) $\frac{x_M}{x_N} > \frac{y_M}{y_N}$
(2) $\frac{x_M}{x_N} = \frac{y_M}{y_N}$
(3) $\frac{x_M}{x_N} < \frac{y_M}{y_N}$
(4) $(x_M - ym_M) < (x_N - yN_N)$

Q46. The standard Gibbs energy for the given cell reaction in $kJ mol^{-1}$ at 298 K is:
$Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$,
$E^0 = 2$ V at 298 K
(Faraday's constant , $F = 96000 C mol^{-1}$)
(1) -192
(2) 192
(3) 384
(4) -384

Q47. The given plots represent the variation of the concentration of a reactant R with time for two different reactions (i) and (ii). The respective orders of the reaction are



(i)



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

Q48. The aerosol is a kind of colloid in which
(1) solid is dispersed in gas.
(2) liquid is dispersed in water.
(3) gas is dispersed in solid.
(4) gas is dispersed in liquid.

Q49. The ore that contains the metal in the form of fluoride is known as which of the following?
(1) cryolite
(2) magnetite
(3) malachite
(4) sphalerite

Q50. Match the catalysts (Column I) with products (Column II)

	Column I		Column II
	Catalyst		Product
A.	V_2O_5	P.	Polyethylene
B.	$TiCl_4/Al(Me)_3$	Q.	Ethanal
C.	$PdCl_2$	R.	H_2SO_4
D.	Iron Oxide	S.	NH_3

(1) (A) − (S); (B) − (R); (C) − (Q); (D) − (P)
(2) (A) − (R);
(B) −(S); (C) − (P);
(D) −(Q)
(3) (A) − (Q);
(B) −(R); (C) − (P);
(D) - (S)
(4) (A) − (R); (B) − (P); (C) − (Q);
(D) −(S)

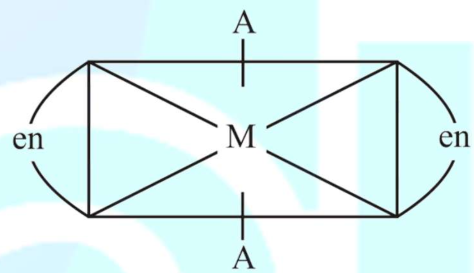
Q51. The correct order of the oxidation states of nitrogen in NO, N_2O, NO_2 and N_2O_3 is
(1) $N_2O < NO < N_2O_3 < NO_2$
(2) $NO_2 < N_2O_3 < NO < N_2O$
(3) $NO_2 < NO < N_2O_3 < N_2O$
(4) $N_2O < N_2O_3 < NO < NO_2$

Q52. The number of water molecules not coordinated to copper ion directly in $CuSO_4 \cdot 5H_2O$, is
(1) 4
(2) 2
(3) 1
(4) 3

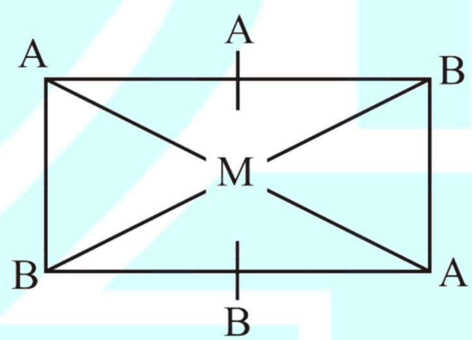
Q53. The degenerate orbitals of $[Cr(H_2O)_6]^{3+}$ are
(1) $d_{x^2-y^2}$ and d_{xy}.
(2) d_{z^2} and d_{xz}.
(3) d_{yz} and d_{z^2}.
(4) d_{xz} and d_{yz}.

Q54. The one that will show optical activity is (en =ethane-1,2-diamine)

(1)

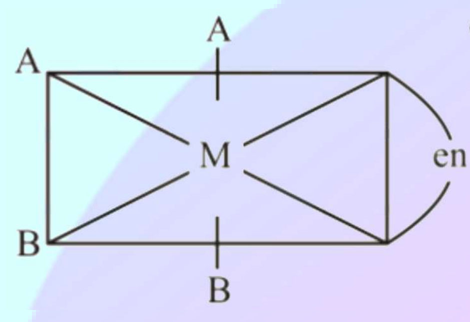


(2)



(3)

(4



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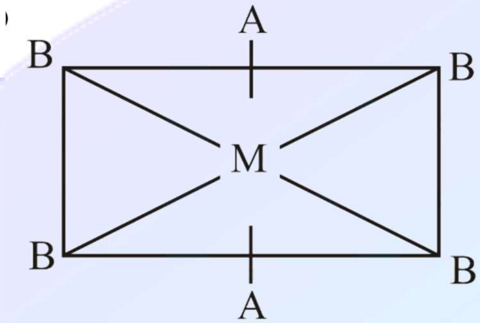
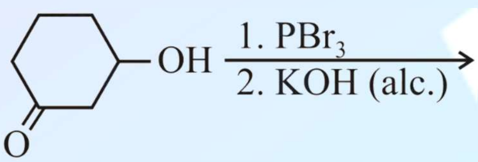
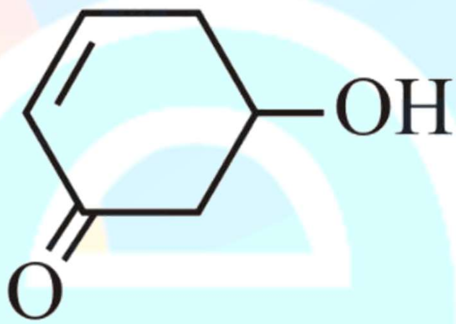


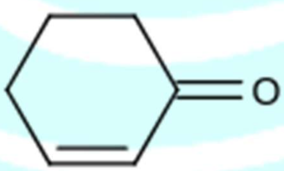
Q55. The major product of the following reaction is



(1)

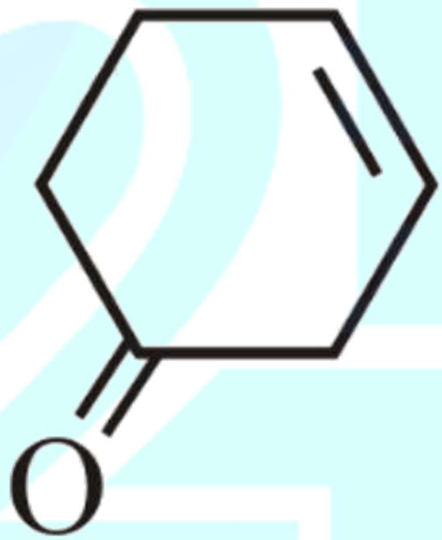


(2)



(3)

(4)



HO

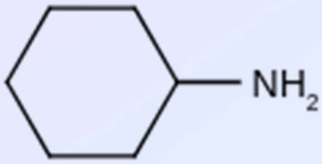
Q56. The organic compound that gives following qualitative analysis is:

(a) Dil. HCl

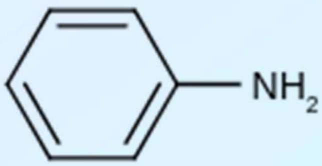
(b) NaOH solution

(c) Br_2/ water

(1)



Insoluble
Soluble
Decolourization
(2)



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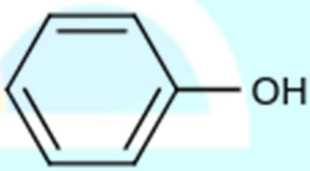

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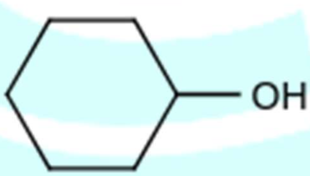
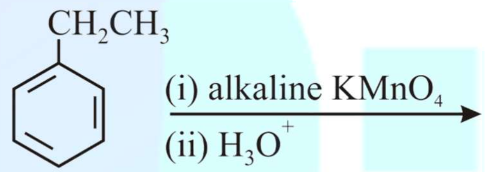
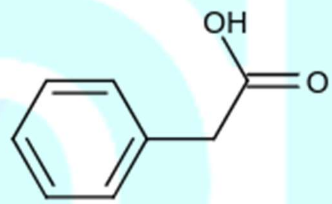


Q57. The major product of the following reaction is:

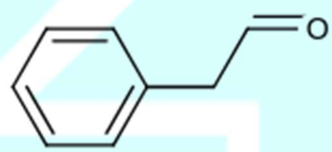


(1)

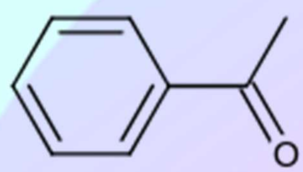


(2)

(3)



(4)

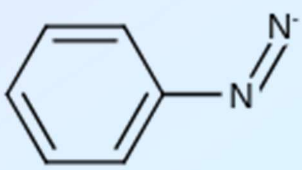


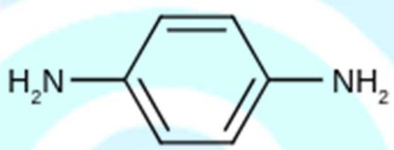
Q58. The major product of the following reaction is:

$CH_3CH = CHCO_2CH_3 \xrightarrow{LiAlH_4}$

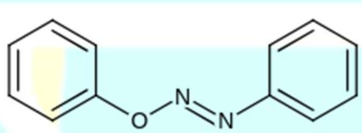
(1) $CH_3CH_2CH_2CO_2CH_3$
(2) $CH_3CH = CHCH_2OH$
(3) $CH_3CH_2CH_2CH_2OH$
(4) $CH_3CH_2CH_2CHO$

Q59. Aniline dissolved in dilute HCl is reacted with sodium nitrite at 0°C. This solution was added dropwise to a solution containing an equimolar mixture of aniline and phenol in dilute HCl . The structure of the major product is
(1)

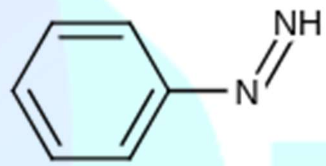




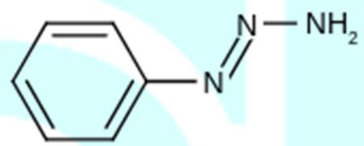
(2)



(3)



(4)



Q60. Which of the following statements is not true about sucrose?
(1) It is also named as invert sugar.
(2) It is a non-reducing sugar.
(3) The glycosidic linkage is present Between C_1 of
(4) On hydrolysis, it produces glucose and fructose. α-glucose and C_1 of β-fructose.

Q61. Let $p, q \in Q$. If $2 - \sqrt{3}$ is a root of the quadratic equation $x^2 + px + q = 0$, then
(1) $p^2 - 4q + 12 = 0$
(2) $q^2 + 4p + 14 = 0$
(3) $p^2 - 4q - 12 = 0$
(4) $q^2 - 4p - 16 = 0$

Q62. All the points in the set $S = \left\{\frac{\alpha+i}{\alpha-i}, \alpha \in R\right\}, i = \sqrt{-1}$ lie on a
(1) straight line whose slope is -1
(2) circle whose radius is $\sqrt{2}$
(3) circle whose radius is 1
(4) straight line whose slope is 1

Q63. A committee of 11 member is to be formed from 8 males and 5 females. If m is the number of ways the committee is formed with at least 6 males and n is the number of ways the committee is formed with at least 3 females, then:
(1) $m = n = 68$
(2) $n = m - 8$

(3) $m = n = 78$
(4) $m + n = 68$

Q64. Let the sum of the first n terms of a non-constant $A.P., a_1, a_2, a_3, \ldots, a_n$ be $50n + \frac{n(n-7)}{2}A$, where A is a constant. If d is the common difference of this $A.P.$, then the ordered pair (d, a_{50}) is equal to
(1) $(50, 50 + 46A)$
(2) $(A, 50 + 45A)$
(3) $(50, 50 + 45A)$
(4) $(A, 50 + 46A)$

Q65. If the fourth term in the Binomial expansion of $\left(\frac{2}{x} + x^{\log_8 x}\right)^6, (x > 0)$ is 20×8^7, then a value of x is
(1) 8^{-2}
(2) 8
(3) 8^3
(4) 8^2

Q66. The value of $\cos^2 10° - \cos 10° \cos 50° + \cos^2 50°$ is
(1) $\frac{3}{4}$
(2) $\frac{3}{4} + \cos 20°$
(3) $\frac{3}{2}$
(4) $\frac{3}{2}(1 + \cos 20°)$

Q67. Let $S = \{\theta \in [-2\pi, 2\pi]: 2\cos^2\theta + 3\sin\theta = 0\}$. Then the sum of the elements of S is:
(1) π
(2) $\frac{13}{6}$
(3) $\frac{5\pi}{3}$
(4) 2π

Q68. Slope of a line passing through $P(2,3)$ and intersecting the line $x + y = 7$ at a distance of 4 units from P, is
(1) $\frac{\sqrt{7}-1}{\sqrt{7}+1}$
(2) $\frac{1-\sqrt{7}}{1+\sqrt{7}}$
(3) $\frac{\sqrt{5}-1}{\sqrt{5}+1}$
(4) $\frac{1-\sqrt{5}}{1+\sqrt{5}}$

Q69. If a tangent to the circle $x^2 + y^2 = 1$ intersects the coordinate axes at distinct points P and Q, then the locus of the mid-point of PQ is:
(1) $x^2 + y^2 - 16x^2y^2 = 0$
(2) $x^2 + y^2 - 4x^2y^2 = 0$
(3) $x^2 + y^2 - 2xy = 0$
(4) $x^2 + y^2 - 2x^2y^2 = 0$

Q70. If one end of a focal chord of the parabola, $y^2 = 16x$ is at $(1,4)$, then the length of this focal chord is
(1) 24
(2) 25
(3) 22
(4) 20

Q71. If the line $y = mx + 7\sqrt{3}$ is normal to the hyperbola $\frac{x^2}{24} - \frac{y^2}{18} = 1$, then a value of m is:
(1) $\frac{\sqrt{5}}{2}$
(2) $\frac{3}{\sqrt{5}}$
(3) $\frac{\sqrt{15}}{2}$
(4) $\frac{2}{\sqrt{5}}$

Q72. For any two statement p and q, the negative of the expression $p \vee (\sim p \wedge q)$ is
(1) $\sim p \vee \sim q$
(2) $p \wedge q$
(3) $\sim p \wedge \sim q$
(4) $p \leftrightarrow q$

Q73. If the standard deviation of the numbers $-1, 0, 1, k$ is $\sqrt{5}$ where $k > 0$, then k is equal to
(1) $\sqrt{6}$
(2) $4\sqrt{\frac{5}{3}}$
(3) $2\sqrt{\frac{10}{3}}$
(4) $2\sqrt{6}$

Q74. If $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} \ldots \begin{bmatrix} 1 & n-1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 78 \\ 0 & 1 \end{bmatrix}$, then the inverse of $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$ is:
(1) $\begin{bmatrix} 1 & -12 \\ 0 & 1 \end{bmatrix}$
(2) $\begin{bmatrix} 1 & 0 \\ 12 & 1 \end{bmatrix}$

(3) $\begin{bmatrix} 1 & 0 \\ 13 & 1 \end{bmatrix}$
(4) $\begin{bmatrix} 1 & -13 \\ 0 & 1 \end{bmatrix}$

Q75. Let α and β be the roots of the equation $x^2 + x + 1 = 0$. Then for $y \neq 0$ in R, $\begin{vmatrix} y+1 & \alpha & \beta \\ \alpha & y+\beta & 1 \\ \beta & 1 & y+\alpha \end{vmatrix}$ is equal to
(1) y^3
(2) $y(y^2 - 1)$
(3) $y^3 - 1$
(4) $y(y^2 - 3)$

Q76. If the function $f: R - \{1, -1\} \to A$ defined by $f(x) = \frac{x^2}{1-x^2}$, is surjective, then A is equal to
(1) $[0, \infty)$
(2) $R - \{-1\}$
(3) $R - [-1,0)$
(4) $R - (-1,0)$

Q77. Let $f(x) = 15 - |x - 10|; x \in R$. Then the set of all values of x, at which the function $g(x) = f(f(x))$ is not differentiable, is:
(1) $\{5,10,15\}$
(2) $\{10\}$
(3) $\{10,15\}$
(4) $\{5,10,15,20\}$

Q78. If the function f defined on $\left(\frac{\pi}{6}, \frac{\pi}{3}\right)$ by $f(x) = \begin{cases} \frac{\sqrt{2}\cos x - 1}{\cot x - 1}, & x \neq \frac{\pi}{4} \\ k, & x = \frac{\pi}{4} \end{cases}$ is continuous, then k is equal to
(1) $\frac{1}{2}$
(2) 1
(3) 2
(4) $\frac{1}{\sqrt{2}}$

Q79. Let $\sum_{k=1}^{10} f(a+k) = 16(2^{10} - 1)$, where the function f satisfies $f(x+y) = f(x)f(y)$ for all natural numbers x, y and $f(1) = 2$. Then the natural number ' a ' is:
(1) 3
(2) 16
(3) 4
(4) 2

Q80. If $f(x)$ is a non-zero polynomial of degree four, having local extreme points at $x = -1,0,1$; then the set $S = \{x \in R: f(x) = f(0)\}$ contains exactly
(1) Two irrational and two rational numbers
(2) Four rational numbers
(3) Two irrational and one rational number
(4) Four irrational numbers

Q81. If the tangent to the curve, $y = x^3 + ax - b$ at the point $(1, -5)$ is perpendicular to the line, $-x + y + 4 = 0$, then which one of the following points lies on the curve?
(1) $(2, -2)$
(2) $(2, -1)$
(3) $(-2, 1)$
(4) $(-2, 2)$

Q82. Let S be the set of all values of x for which the tangent to the curve $y = f(x) = x^3 - x^2 - 2x$ at (x, y) is parallel to the line segment joining the points $(1, f(1))$ and $(-1, f(-1))$, then S is equal to
(1) $\left\{-\frac{1}{3}, -1\right\}$
(2) $\left\{-\frac{1}{3}, 1\right\}$
(3) $\left\{\frac{1}{3}, 1\right\}$
(4) $\left\{\frac{1}{3}, -1\right\}$

Q83. $\int \sec^2 x \cdot \cot^{\frac{4}{3}} x dx$ is equal to
(1) $3\tan^{-\frac{1}{3}} x + C$
(2) $-\frac{3}{4}\tan^{-\frac{4}{3}} x + C$
(3) $-3\tan^{-\frac{1}{3}} x + C$
(4) $-3\cot^{-\frac{1}{3}} x + C$

Q84. The value of $\int_0^{\pi/2} \frac{\sin^3 x}{\sin x + \cos x} dx$ is:
(1) $\frac{\pi-1}{2}$
(2) $\frac{\pi-2}{8}$
(3) $\frac{\pi-1}{4}$
(4) $\frac{\pi-2}{4}$

Q85. The area (in sq. units) of the region $A = \{(x, y): x^2 \le y \le x + 2\}$ is
(1) $\frac{13}{6}$
(2) $\frac{31}{6}$

(3) $\frac{9}{2}$
(4) $\frac{10}{3}$

Q86. The solution of the differential equation $x\frac{dy}{dx}+2y=x^2,(x\neq 0)$ with $y(1)=1$, is
(1) $y=\frac{x^3}{5}+\frac{1}{5x^2}$
(2) $y=\frac{3}{4}x^2+\frac{1}{4x^2}$
(3) $y=\frac{x^2}{4}+\frac{3}{4x^2}$
(4) $y=\frac{4}{5}x^3+\frac{1}{5x^2}$

Q87. Let $\vec{\alpha}=3\hat{\imath}+\hat{\jmath}$ and $\vec{\beta}=2\hat{\imath}-\hat{\jmath}+3\hat{k}$. If $\vec{\beta}=\overrightarrow{\beta_1}-\overrightarrow{\beta_2}$, where $\overrightarrow{\beta_1}$ is parallel to $\vec{\alpha}$ and $\overrightarrow{\beta_2}$ is perpendicular to $\vec{\alpha}$, then $\overrightarrow{\beta_1}\times\overrightarrow{\beta_2}$ is equal to:
(1) $\frac{1}{2}(-3\hat{\imath}+9\hat{\jmath}+5\hat{k})$
(2) $3\hat{\imath}-9\hat{\jmath}-5\hat{k}$
(3) $-3\hat{\imath}+9\hat{\jmath}+5\hat{k}$
(4) $\frac{1}{2}(3\hat{\imath}-9\hat{\jmath}+5\hat{k})$

Q88. A plane passing though the points $(0,-1,0)$ and $(0,0,1)$ and making an angle $\frac{\pi}{4}$ with the plane $y-z+5=0$, also passes through the point
(1) $(\sqrt{2},-1,4)$
(2) $(\sqrt{2},1,4)$
(3) $(-\sqrt{2},-1,-4)$
(4) $(-\sqrt{2},1,-4)$

Q89. If the line, $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-2}{4}$ meets the plane, $x+2y+3z=15$ at a point P, then the distance of P from the origin is,
(1) $2\sqrt{5}$
(2) $\frac{9}{2}$
(3) $\frac{\sqrt{5}}{2}$
(4) $\frac{7}{2}$

Q90. Four persons can hit a target correctly with probabilities $\frac{1}{2},\frac{1}{3},\frac{1}{4}$ and $\frac{1}{8}$ respectively. If all hit at the target independently, then the probability that the target would be hit, is
(1) $\frac{25}{192}$
(2) $\frac{7}{32}$
(3) $\frac{1}{192}$
(4) $\frac{25}{32}$

ANSWER KEYS

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