Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

Date: 30/12/2024

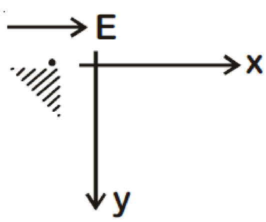
Time: 3 hours **Max. Marks:** 300

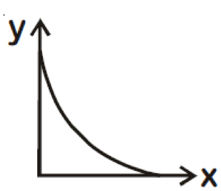
UTS-1_MT-14_(24-25)

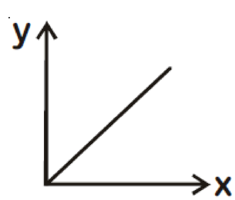
Physics

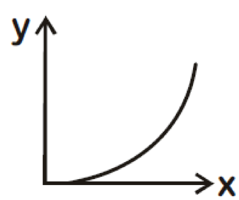
Single Choice Question

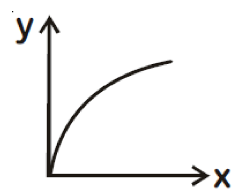
Q1 A small point mass carrying some positive charge on it, is released from the edge of a table. There is a uniform electric field in this region in the horizontal direction. Which of the following options then correctly describe the trajectory of the mass? (Curves are drawn schematically and are not to scale).



a) 

b) 

c) 

d) 

Q2 A particle executes S.H.M. of amplitude A along x-axis. At t = 0, the position of the particle is $x = \frac{A}{2}$ and it moves along positive x-axis the displacement of particle in time t as the function of x = A sin (ωt + δ), then the value δ will be :

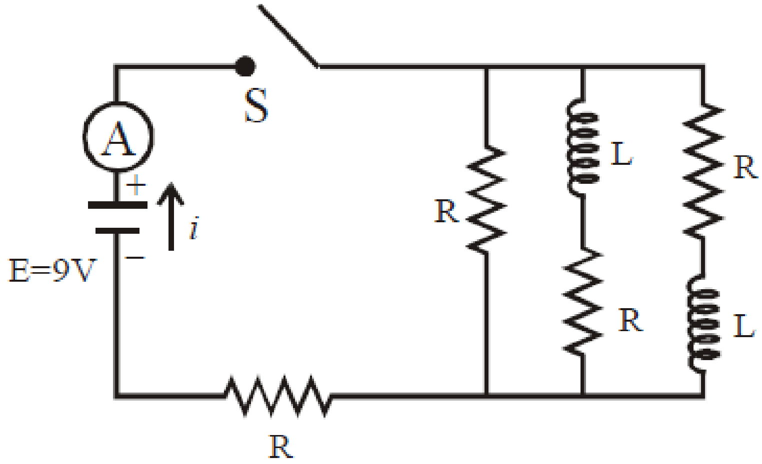
a) $\frac{\pi}{6}$

b) $\frac{\pi}{3}$

c) $\frac{\pi}{4}$

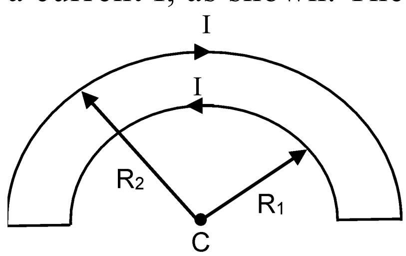
d) $\frac{\pi}{2}$

Q3 Figure shows a circuit that contains four identical resistors with resistance R = 2.0 Ω, two identical inductors with inductance L = 2.0 mH and an ideal battery with emf E = 9 V. The current 'i' just after the switch 'S' is closed will be:



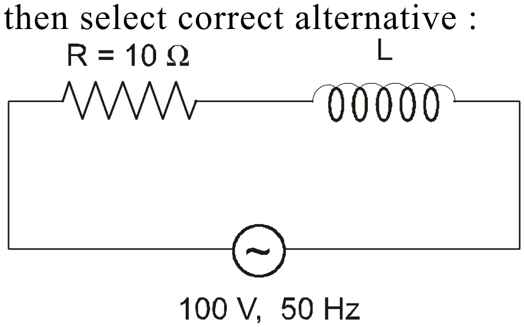
a) 2.25 A **b)** 3.0 A **c)** 3.37 A **d)** 9 A

Q4 The wire loop formed by joining two semi-circular sections of radii R_1 and R_2, carries a current I, as shown. The magnitude of magnetic field at the centre C is



a) $\frac{\mu_0 I}{2}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$ **b)** $\frac{\mu_0 I}{4}\left(\frac{1}{R_1}+\frac{1}{R_2}\right)$ **c)** $\frac{\mu_0 I}{2}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ **d)** $\frac{\mu_0 I}{4}\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

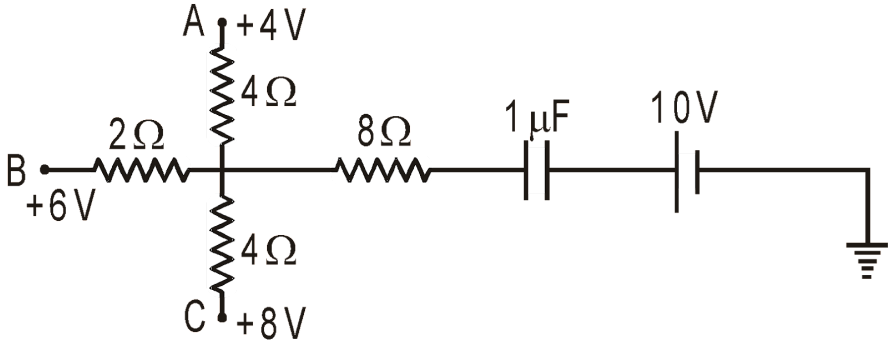
Q5 In LR circuit (shown in figure), current is lagging by $\frac{\pi}{3}$ in phase with applied voltage, then select correct alternative :



a) $L = \frac{10}{\sqrt{3}\pi}$ H, i = 10 A **b)** $L = \frac{10}{\pi}$ H, i = 5A **c)** $L = \frac{\sqrt{3}}{10\pi}$ H, i = 5A

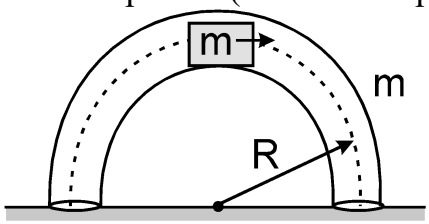
d) $L = \frac{10}{\sqrt{3}\pi}$, $i = 5\sqrt{2}$ A

Q6 Figure shows a part of network of a capacitor and resistors. The potential indicated at A, B and C are with respect to the ground. The charge on the capacitor in steady state is



a) 4 μC **b)** 6 μC **c)** 10 μC **d)** 16 μC

Q7 In a vertical plane inside a smooth hollow thin tube a block of same mass as that of tube is released as shown in figure. When it is slightly disturbed it moves towards right. By the time the block reaches the right end of the tube then the displacement of the tube will be (where 'R' is mean radius of tube). Assume that the tube remains in vertical plane. (Horizontal plane is smooth)



a) $\frac{2R}{\pi}$ **b)** $\frac{4R}{\pi}$ **c)** $\frac{R}{2}$ **d)** R

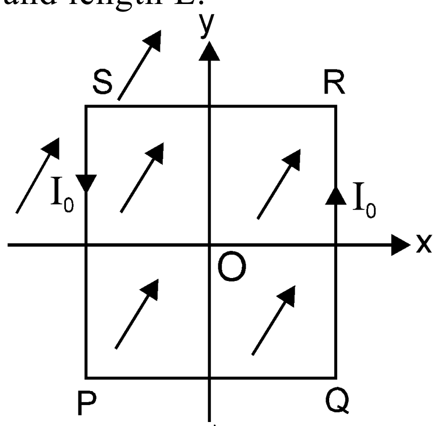
Q8 Two polaroids are kept crossed to each other. Now one of them is rotated through an angle of 45°. The percentage of unpolarized incident light now transmitted through the system is

a) 15% **b)** 25% **c)** 50% **d)** 60%

Q9 Consider a uniformly charged spherical shell of radius 'a'. Net charge on shell is Q. The shell is surrounded by another uncharged concentric shell of radius 'b'. The work done by external agent in charging outer shell with uniform charge –Q is.

a) $-\frac{KQ^2}{b}$ **b)** $\frac{KQ^2}{a}-\frac{KQ^2}{b}$ **c)** $\frac{KQ^2}{2a}-\frac{KQ^2}{2b}$ **d)** $-\frac{KQ^2}{2b}$

Q10 A uniform, constant magnetic field $\vec{B}$ is directed at an angle of 45° to the x-axis in the xy-plane, PQRS is a rigid square wire frame carrying a steady current I_0, with its centre at the origin O. At time t = 0, the frame is at rest in the position shown in the figure, with its sides parallel to the x and y axes. Each side of the frame is of mass M and length L.



The torque $\vec{\tau}$ about O acting on the frame due to the magnetic field will be

a) $\vec{\tau} = \frac{BI_0L^2}{\sqrt{2}}(-\hat{i} + \hat{j})$

b) $\vec{\tau} = \frac{BI_0L^2}{\sqrt{2}}(\hat{i} - \hat{j})$

c) $\vec{\tau} = \frac{BI_0L^2}{\sqrt{2}}(\hat{i} + \hat{j})$

d) $\vec{\tau} = \frac{BI_0L^2}{\sqrt{2}}(-\hat{i} - \hat{j})$

Q11 A wire is of mass (0.3 ± 0.003)gm. The radius is (0.5 ± 0.005)mm and length is (6.0 ± 0.06)cm then % error in density is

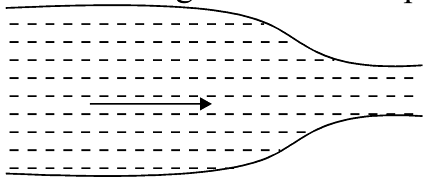
a) 3

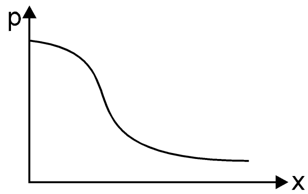
b) 4

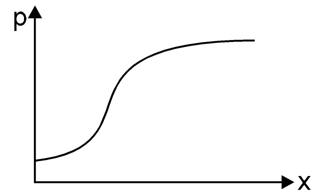
c) 6

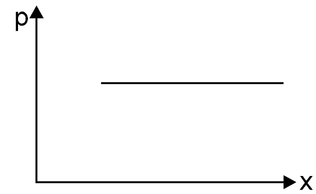
d) –2

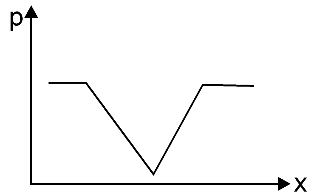
Q12 Water flows through a frictionless horizontal duct with a cross-section varying as shown in figure. Pressure p at points along the axis is represented by:



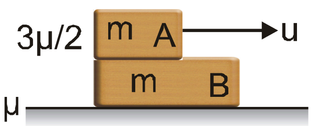
a) 

b) 

c) 

d) 

Q13 In the figure shown a block A of mass m is kept on block B of mass m. A is given a velocity towards right as shown. The coefficient of friction between A and B is $\frac{3\mu}{2}$ and that between B and ground is μ.



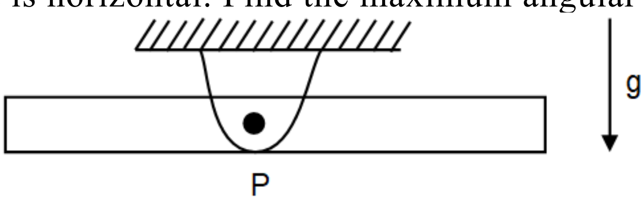
a) B will accelerate towards right with acceleration $\frac{\mu g}{2}$.

b) B will accelerate towards left with acceleration $\frac{\mu g}{2}$.

c) B will not accelerate at all.

d) B will move towards right with acceleration μg.

Q14 A uniform rod of length L is hinged from a point P and released in the position when it is horizontal. Find the maximum angular acceleration of the rod at this instant.

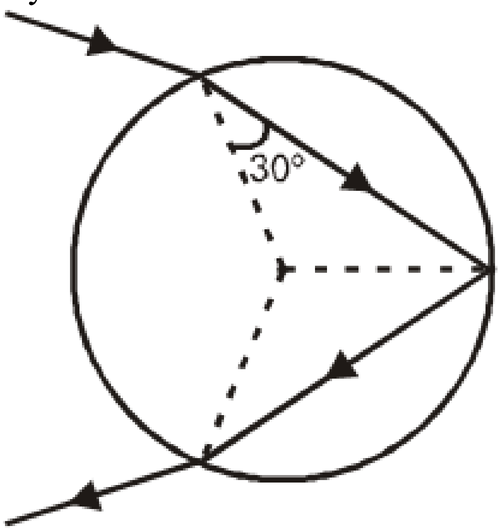


a) $\frac{3g}{L}$ **b)** $\frac{3g}{2L}$ **c)** $\frac{\sqrt{3}g}{L}$ **d)** $\frac{\sqrt{3}g}{2L}$

Q15 The amplitude of magnetic field in an electromagnetic wave propagating along y-axis is 6.0×10^{-7} T. The maximum value of electric field in the electromagnetic wave is:

a) 5×10^{14} Vm^{-1} **b)** 180 Vm^{-1} **c)** 2×10^{15} Vm^{-1} **d)** 6.0×10^{-7} Vm^{-1}

Q16 A ray is incident from air on a sphere of refractive index $\sqrt{2}$ as shown in figure. Angle of refraction of the ray inside sphere is 30º. The total deviation suffered by the ray is



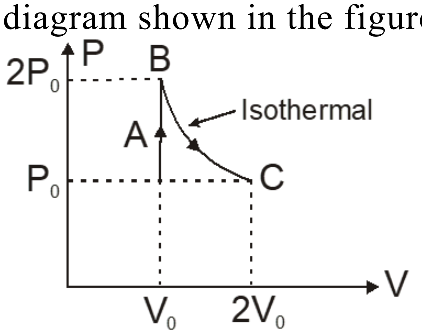
a) 150° **b)** 120° **c)** 90° **d)** 45°

Q17 Two particles of combined mass M, placed in space with certain separation, are released. Interaction between the particles is only of gravitational nature and there is no external force present. Acceleration of one particle with respect to the other when separation between them is R, has a magnitude :

a) $\frac{GM}{2R^2}$ **b)** $\frac{GM}{R^2}$ **c)** $\frac{2GM}{R^2}$

d) not possible to calculate due to lack of information

Q18 A diatomic ideal gas undergoes a thermodynamic change according to the P–V diagram shown in the figure. The total heat given to the gas is nearly (use $\ell n2 = 0.7$) :



a) 2.5 P_0V_0 **b)** 1.4 P_0V_0 **c)** 3.9 P_0V_0 **d)** 1.1 P_0V_0

Q19 A small spherical ball of radius r, falling through a viscous medium of negligible density has terminal velocity 'v'. Another ball of the same mass but of radius 2r, falling through the same viscous medium will have terminal velocity:

a) $\frac{v}{2}$ **b)** $\frac{v}{4}$ **c)** 4v **d)** 2v

Q20 Two light beams of intensities in the ratio of 9 : 4 are allowed to interfere. The ratio of the intensity of maxima and minima will be :

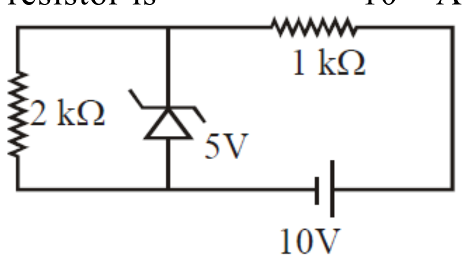
a) 2 : 3 **b)** 16 : 81 **c)** 25 : 169 **d)** 25 : 1

Numerical

Q21 A circular coil of radius 10 cm is placed in a uniform magnetic field of 3.0×10^{-5} T with its plane perpendicular to the field initially. It is rotated at constant angular speed about an axis along the diameter of coil and perpendicular to magnetic field so that it undergoes half of rotation in 0.2 s. The maximum value of EMF induced (in μV) in the coil will be close to the integer ________.
(Take $\pi^2 \approx 10$)

Q22 With what acceleration a (in m/s^2) should the box descend vertically so that the block of mass M lying on the floor of box exerts a force $\frac{Mg}{4}$ on the floor of the box? (g = 10 m/s^2) (Round off to the Nearest Integer)

Q23 In connection with the circuit drawn below, the value of current flowing through 2 kΩ resistor is ______ $\times 10^{-4}$ A.



Q24 The difference between $(n + 2)^{th}$ Bohr radius and n^{th} Bohr radius is equal to the $(n - 2)^{th}$ Bohr radius. The value of n is ?

Q25 A train stopping at two stations 2 km apart on a straight line takes 4 minutes for the journey. Assuming that its motion is first uniformly accelerated and then uniformly retarded. Find value of $\frac{1}{x} + \frac{1}{y}$
[where ' x ' and ' y ' are the magnitude of the acceleration and retardation respectively in (km/min^2)].

Chemistry

Single Choice Question

Q26 Consider following solutions in given solvents :
I : 0.3M aqueous glucose solution
II : 0.2 M aqueous sodium chloride solution
III : 0.3 M aqueous ammonium phosphate solution
IV : 0.4 M benzoic acid in benzene (dimerises upto 50%)
Select incorrect statement from given options for the above given solutions:

a) I and IV are isotonic solutions.

b) III is hypertonic as compared with each of I, II and IV.

c) IV is hypotonic as compared with each of I, II and III.

d) II is hypotonic as compared with III but hypertonic as compared with I and IV.

Q27 E° (SRP) of different half cells are given

$E^\circ_{Cu^{2+}/Cu} = 0.34$ volt ; $E^\circ_{Zn^{2+}/Zn} = -0.76$ volt

$E^\circ_{Ag^{+}/Ag} = 0.8$ volt ; $E^\circ_{Mg^{2+}/Mg} = -2.37$ volt

In which cell among the following ΔG° per mole of electron is most negative :

a) $Zn(s)|Zn^{2+}(1M) \| Mg^{2+}(1M)|Mg\ (s)$

b) $Zn(s)|Zn^{2+}(1M) \| Ag^{+}(1M)|Ag(s)$

c) $Cu(s)|Cu^{2+}(1M) \| Ag^{+}(1M)|Ag\ (s)$

d) $Ag\ (s)\ |Ag^{+}(1M) \| Mg^{2+}(1M)|Mg\ (s)$

Q28 The following five solutions of KOH were prepared as first, 0.1 mole in 1 L; second, 0.2 mole in 2 L; third, 0.3 mole in 3 L; fourth, 0.4 mole in 4 L; fifth, 0.5 mole in 5 L. The pH of resultant solution, when all these solutions are mixed is

a) 2 **b)** 1 **c)** 13 **d)** 7

Q29 For the reaction $I_2(g) \rightleftharpoons 2I(g)$, $K_C = 1.0 \times 10^{-2}$ mol lit^{-1}. What volume of the vessel should be taken so that at equilibrium 1 mole of I_2 and 0.5 mole of 'I' are present at equilibrium?

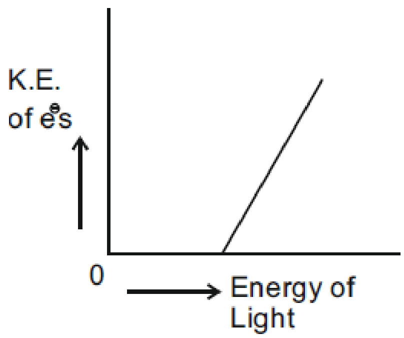
a) 25 L **b)** 0.04 L **c)** 0.25 L **d)** 5 L

Q30 For the following spontaneous process $H_2O_{(\ell)} \rightarrow H_2O_{(s)}$ at 1 atm and 268 K , which of the following option is true?
[Given : ΔS_{sys} = Entropy change of system and ΔS_{surr} = Entropy change of surrounding during the process]

a) $\Delta S_{surr} > 0$ **b)** $\Delta S_{sys} > 0$ **c)** $\Delta S_{surr} < 0$ **d)** $\Delta S_{sys} = -\Delta S_{surr}$

Q31 The metal complex that is diamagnetic is (Atomic number : Fe, 26; Cu, 29)
a) $K_3[Cu(CN)_4]$ **b)** $K_2[Cu(CN)_4]$ **c)** $K_3[Fe(CN)_4]$ **d)** $K_4[FeCl_6]$

Q32 Which of the graphs shown below does not represent the relationship between incident light and the electron ejected from metal surface?

a)


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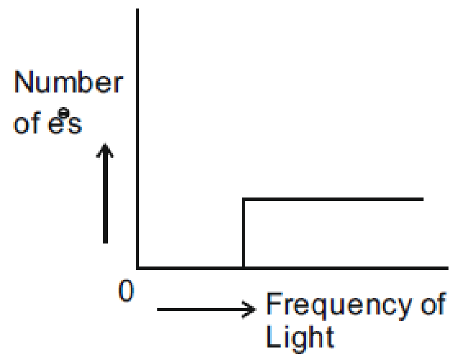
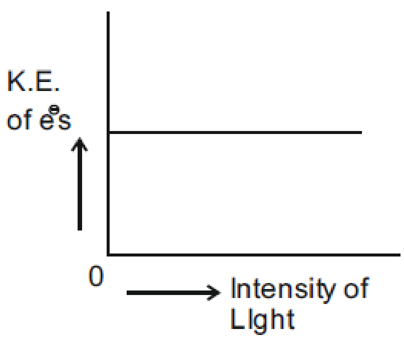
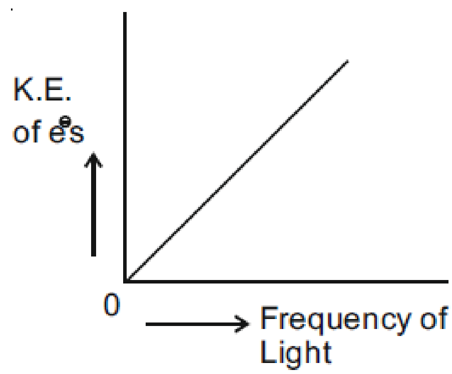
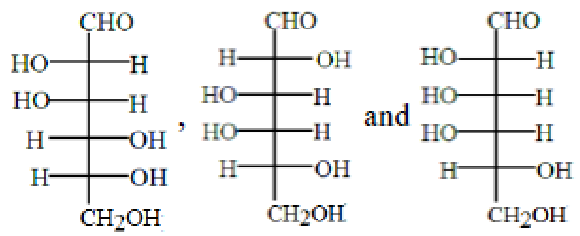


c)


d)


Q33 Treatment of D-glucose with aqueous NaOH results in a mixture of monosaccharides, which are

a)


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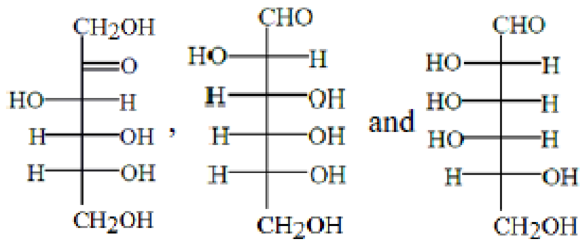
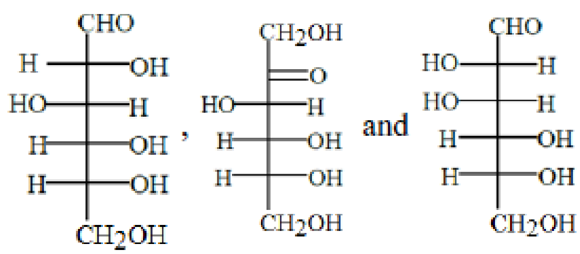
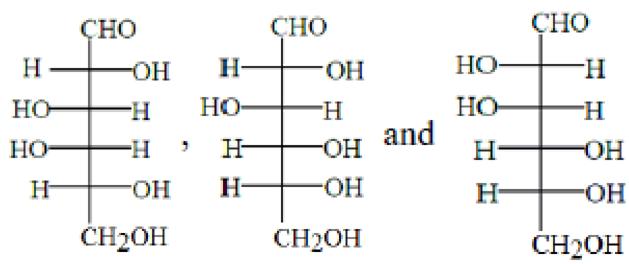
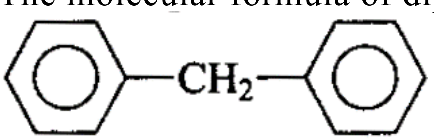


c)


d)


Q34 The molecular formula of diphenylmethane,


is $C_{13}H_{12}$;

How many structural isomers are possible when one of the hydrogen in replaced by a chlorine atom ?

a) 6 **b)** 4 **c)** 8 **d)** 7

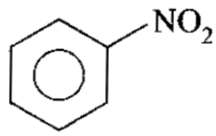
Q35 Considering $2s-2p$ mixing to be non-operative, which of the following specie(s) can undergo a transition from HOMO (gerade) to LUMO (ungerade).
Which of the following can undergo transition form fully filed homo (gerade) to lumo (ungerade).

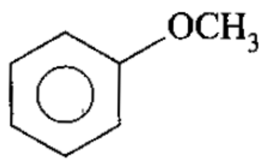
a) N_2 **b)** C_2 **c)** $Li_2^{\oplus}$ **d)** B_2

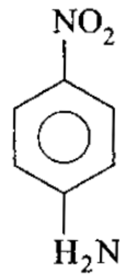
Q36 A compound X with molecular formula C_3H_8O can be oxidized to a compound Y with the molecular formula $C_3H_6O_2$. X is most likely to be a :

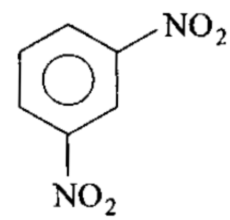
a) Primary alcohol **b)** Secondary alcohol **c)** Aldehyde **d)** Ketone

Q37 In which of the following molecules, π-electron density in ring is minimum ?

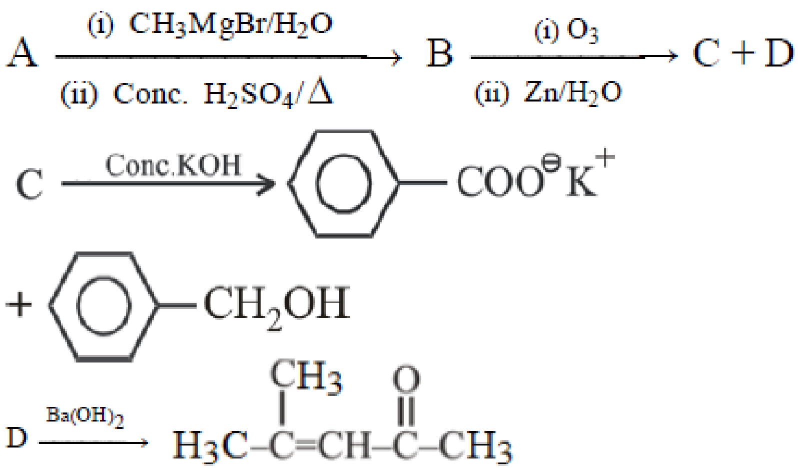
a) 

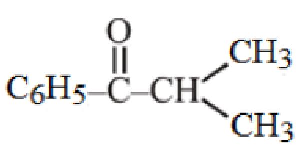
b) 

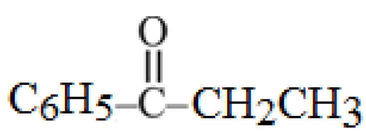
c) 

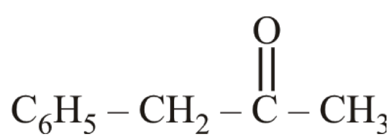
d) 

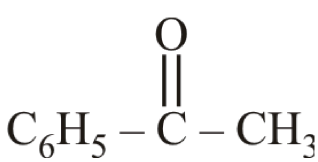
Q38 The compound A in the following reaction is :



a) 

b) 

c) 

d) 

Q39 A sample of an ethanol–water solution has a volume of 55.0 cm^3 and a mass of 50.0 g. What is the percentage of ethanol (by mass) in the solution? Assume that there is no change in volume when the pure compounds are mixed. The density of ethanol is 0.80 g/cm^3 and that of water is 1.00 g/cm^3.

a) 20% **b)** 40% **c)** 60% **d)** 45.45%

Q40 Decomposition of X exhibits a rate constant of 0.05 μg/year. How many years are required for the decomposition of 5 μg of X into 2.5 μg?

a) 40 **b)** 20 **c)** 50 **d)** 25

Q41 The ionic radii of K^+, Na^+, Al^{3+} and Mg^{2+} are in the order :

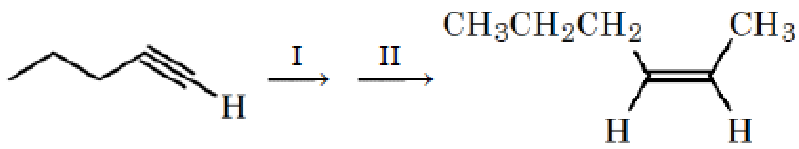
a) $Na^+ < K^+ < Mg^{2+} < Al^{3+}$

b) $Al^{3+} < Mg^{2+} < K^+ < Na^+$

c) $Al^{3+} < Mg^{2+} < Na^+ < K^+$

d) $K^+ < Al^{3+} < Mg^{2+} < Na^+$

Q42 Which set of reagent (in the correct order) would accomplish the following transformation?



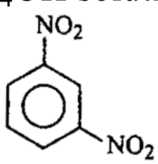
a) $BH_3 -$ THF; H_2O_2 / NaOH H_2SO_4

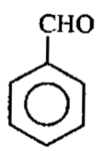
b) KOH / THF; CH_3I/H_2 / Pd / C

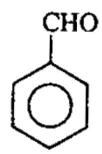
c) H_2 /Lindlar catalyst $NaNH_2$ / THF; CH_3I

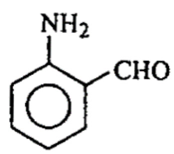
d) $NaNH_2$ / $NH_3(\ell)$; CH_3I H_2 /Lindlar catalyst

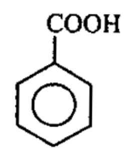
Q43 A mixture of two organic compound gives red coloured precipitate with cuprous chloride and silver mirror on heating with Zn and NH_4Cl followed by $AgNO_3$ + NH_4OH solution. The mixture contains :

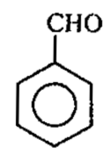
a) 

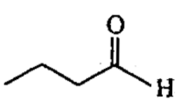
and 

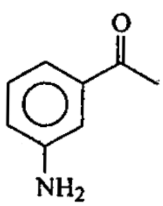
b) 

and 

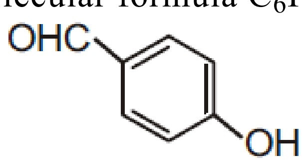
c) 

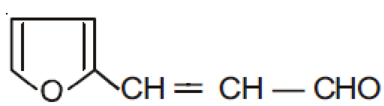
and 

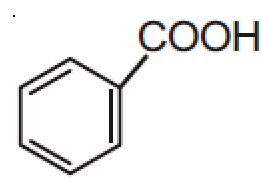
d) 

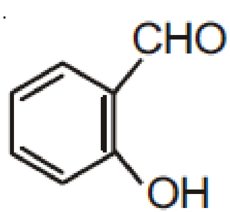
and 

Q44 An aromatic compound 'A' having molecular formula $C_7H_6O_2$ on treating with aqueous ammonia and heating forms compound 'B'. The compound 'B' on reaction with molecular bromine and potassium hydroxide provides compound 'C' having molecular formula C_6H_7N. The structure 'A' is :

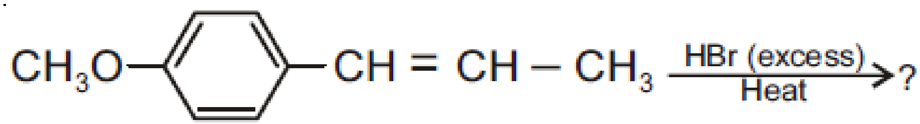
a) 

b) 

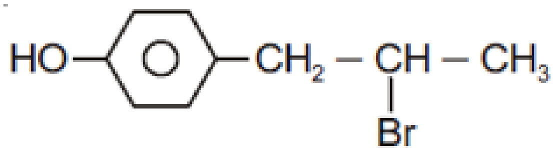
c) 

d) 

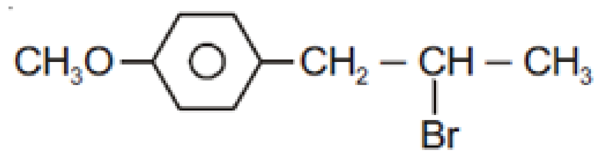
Q45 The major product in the following conversion is



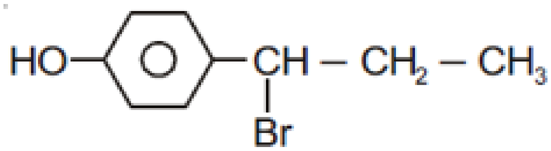
a)



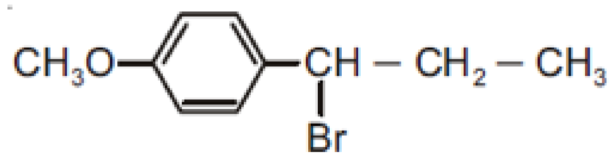
b)



c)



d)



Numerical

Q46 Consider the reaction given below which is use for the detection of phosphates in inorganic salt by using a Molybdenum compound "A".

$Na_2HPO_4 + "A" + HNO_3 \rightarrow \underset{\text{(Canary yellow ppt.)}}{B} +$

$"C" \quad "D" + "E"$

Find the number of oxygen atoms in (B) Canary yellow ppt.

Q47 $B_2H_{6(g)} + 6Cl_{2(g)} \rightarrow 2BCl_3 + 6HCl_{(g)}$

$\Delta_r H = -1326\,kJ \ldots$ (i)

$BCl_{3(g)} + 3H_2O_{(f)} \rightarrow H_3BO_{3(g)} + 3HCl_{(g)}$

$\Delta_r H = -112.5\,kJ \quad \ldots$(ii)

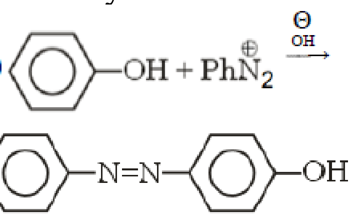
$B_2H_{6(g)} + 6H_2O_{(l)} \rightarrow 2H_3BO_{3(s)} + 6H_{2(g)}$

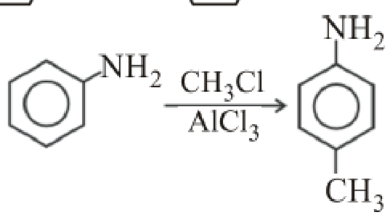
$\Delta H = -493.4kj \ldots$(iii)

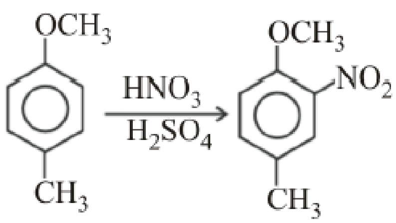
$\frac{1}{2}H_{2(g)} + \frac{1}{2}Cl_{2(g)} \rightarrow HCl_{(g)}; \Delta H = -92.3\,kJ$

Using the above given thermochemical data at 300 K, calculate molar enthalpy of sublimation of H_3BO_3 at 300 K (in kJ/mole).

Q48 How many reaction correctly matched with their major product :

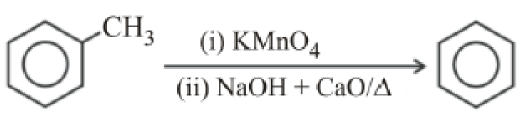
(i) 

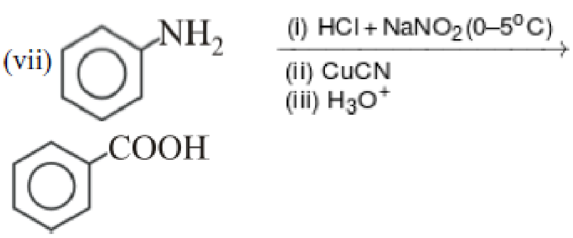
(ii) 

(iii) 

(iv) $CH_3-CHO \xrightarrow[\Delta]{\overset{\ominus}{O}H} CH_3-CH=CH-CHO$

(v) 

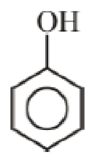
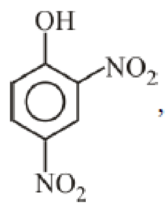
(vi) 

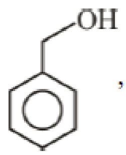
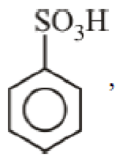
(vii) 

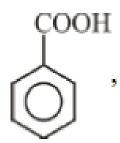
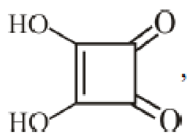
(viii) $Cl_3C-CHO \xrightarrow{NaOH} Cl_3C-CH_2OH$ +

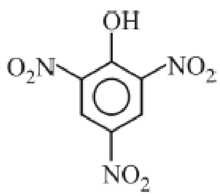
$Cl_3C-COONa$

Q49 Identify total number of compounds which are soluble in aq-NaOH and aq-$NaHCO_3$ both :

 ,
 ,

 ,
 ,

 , HCl,  ,

 ,


Q50 Complexes (ML_5) of metals Ni and Fe have ideal square pyramidal and trigonal bipyramidal geometries, respectively. The sum of the 90°, 120° and 180° L-M-L angles in the two complexes is __________.

Mathematics

Single Choice Question

Q51 If both roots of the equation $ax^2 + x + c - a = 0$ are imaginary and $c > -1$, then

a) $3a > 2 + 4c$ **b)** $3a < 2 + 4c$ **c)** $c < a$ **d)** none of these

Q52 The possible value of 'm' for which lines $x + 2y - 3 = 0$, $2x - y - 1 = 0$ and $y = mx$ form a triangle, can be

a) 1 **b)** $-\frac{1}{2}$ **c)** -2 **d)** 2

Q53 The number of nine – non – zero digits such that all the digits in the first four places are less than the digit in the middle and all the digits in the last four places are greater than that in the middle is

a) 2(4!) **b)** 3(7!)/2 **c)** 2(7!) **d)** ${}^4P_4 \times {}^4P_4$

Q54 The area enclosed between the curves $y = \log_e(x + e)$, $x = \log_e\left(\frac{1}{y}\right)$, and the x-axis is

a) 2 sq. units **b)** 1 sq. units **c)** 4 sq. units **d)** None of these

Q55 Let $y = y(x)$ be a function of x satisfying $y\sqrt{1-x^2} = k - x\sqrt{1-y^2}$ where k is a constant and $y\left(\frac{1}{2}\right) = -\frac{1}{4}$. Then $\frac{dy}{dx}$ at $x = \frac{1}{2}$, is equal to

a) $-\frac{\sqrt{5}}{2}$ **b)** $\frac{2}{\sqrt{5}}$ **c)** $\frac{\sqrt{5}}{2}$ **d)** $-\frac{\sqrt{5}}{4}$

Q56 If $f(x) = \begin{cases} \frac{1-\sin x}{(\pi - 2x)^2} \cdot \frac{\log \sin x}{\log(1 + \pi^2 - 4\pi x + 4x^2)}, & x \neq \frac{\pi}{2} \\ k, & x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \pi/2$, then k is-

a) $-\frac{1}{16}$ **b)** $-\frac{1}{32}$ **c)** $-\frac{1}{64}$ **d)** $-\frac{1}{128}$

Q57 Let $a_1, a_2, a_3 \ldots$ be a G.P. such that $a_1 < 0$, $a_1 + a_2 = 4$ and $a_3 + a_4 = 16$. If $\sum_{i=1}^{9} a_i = 4\lambda$, then λ is equal to

a) -513 **b)** -171 **c)** $\frac{511}{3}$ **d)** 171

Q58 The solution of $\frac{dy}{dx} = \frac{x^2 + y^2 + 1}{2xy}$ satisfying $y(1) = 1$ is given by

a) a system of parabola **b)** a system of circles **c)** $y^2 = x(1 + x) - 1$

d) $(x - 2)^2 + (y - 3)^2 = 5$

Q59 $\int \frac{(1-\tan^2 x)\cdot \operatorname{cosec} 2x dx}{\sec^2 x}$ is equal to [**Note:** 'C' is constant of integration]

a) $\frac{\ell n|\sin 2x|}{2}+C$ b) $\frac{\ell n|\cos 2x|}{2}+C$ c) $\frac{\ell n|\tan 2x|}{2}+C$ d) $\frac{\ell n|\cos x+\sin x|}{2}+C$

Q60 The coefficient of x^7 in the expression $(1 + x)^{10} + x(1 + x)^9 + x^2 (1 + x)^8 + \ldots + x^{10}$ is

a) 120 b) 330 c) 420 d) 210

Q61 If $f(x) = x^3 + x$ then least integral value of x for which $f(f(x)) - f(4 - 2x) > 0$ is

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

Q62 The maximum value of y satisfying the equation $yx^2 + 9y = 3|x| (6 + y)$, $x \in R$ is

a) 2 b) 5 c) 6 d) 7

Q63 Let $\vec{a}$ and $\vec{b}$ be two vectors such that $|\vec{a}| = 1, |\vec{b}| = 4$ and $\vec{a}.\vec{b} = 2$. If $\vec{c} = (2\vec{a}\times\vec{b}) - 3\vec{b}$, then find the angle between $\vec{b}$ and $\vec{c}$.

a) $\frac{\pi}{3}$ b) $\frac{\pi}{6}$ c) $\frac{3\pi}{4}$ d) $\frac{5\pi}{6}$

Q64 The odds against a certain event are 5 : 2 and the odds in favor of other event, independent of the former are 6 : 5. If the probability that at least one of the events must happen, is $\frac{p}{q}$ (p and q are relatively prime numbers) then $\left(\frac{q-p}{5}\right)$ is

a) 2 b) 5 c) 6 d) 7

Q65 Let a circle C of radius 5 lie below the x-axis. The line $L_1 = 4x + 3y + 2 = 0$ passes through the centre P of the circle C and intersects the line $L_2 : 3x-4y-11 = 0$ at Q. The line L_2 touches C at the point Q. Then the distance of P from the line $5x - 12y + 51 = 0$ is

a) 6 b) 4 c) 12 d) 11

Q66 The mean and variance of 7 observations are 8 and 16, respectively. If five observations are 2, 4, 10, 12, 14, then the absolute difference of the remaining two observations is :

a) 2 b) 5 c) 6 d) 7

Q67 Let R be the focus of the parabola $y^2 = 20x$ and the line $y = mx + c$ intersect the parabola at two points P and Q. Let the point G(10, 10) be the centroid of the triangle PQR. If $c-m = 6$, then $(PQ)^2$ is –

a) 325 b) 317 c) 296 d) 346

Q68 $\lim_{x\to 0} \dfrac{\int_0^{\sin^2 x} \ln(1+t^3)\,dt}{\int_0^x (e^t-1-t)(\tan t-t)(1-\cos t)\,dt}$, is equal to

a) 8 b) 16 c) 24 d) 48

Q69 Let $A=\begin{bmatrix}3 & 2\\ -1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}\sec\theta & 0\\ 0 & \sin\theta+\cos\theta\end{bmatrix}$ be two matrices. If A(adj A) = $5B^2$ then number of values of θ in $[0,2\pi]$ is
[**Note:** adj P denotes adjoint matrix of square matrix P.]

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

Q70 Let S and S′ be the foci of an ellipse and B be any one of the extremities of its minor axis. If ΔS′BS is a right angled triangle with right angle at B and area (ΔS′BS) = 8 sq. units, then the length of a latus rectum of the ellipse is

a) $4\sqrt{2}$ b) 4 c) $2\sqrt{2}$ d) 2

Numerical

Q71 Let Z be a complex number satisfying $|Z-1+2i| \le 3$ and $Z(2-i)+\bar{Z}(2+i) \ge 3\sqrt{5}$. Area bounded by Z is $\alpha\left(\frac{\pi}{3}-\frac{\sqrt{3}}{\beta}\right)$ then $(\alpha+\beta)$ is

Q72 If $\int_0^{\frac{\pi}{4}} \left(2e^x+\left(e^x+e^{-x}\right)\sec^2 x\right)e^{\tan x+x}dx = e^a(a^{\pi/2}+b)-c$; a, b, c $\in$ N then (a + b + c) is equal to

Q73 The number of elements in set $\{(a,b) : 2a^2+3b^2=35,\ a,b \in z\}$ where z is set of all integers, is

Q74 If $S=\begin{bmatrix}0 & a\alpha^2 & a\beta^2\\ b\alpha+c & 0 & a\gamma^2\\ b\beta+c & (b\gamma+c) & 0\end{bmatrix}$ is a skew symmetric matrix (where α, β, γ are distinct) & the value of $\begin{vmatrix}(a+1)^2 & (1-a) & (2-c)\\ (3+c) & (b+c)^2 & (b+1)^2\\ (3-b)^2 & b^2 & (c+3)\end{vmatrix}$ is λ then $\left|\frac{\lambda}{100}\right|$ is equal to

Q75 The number of three digit numbers having only two consecutive digits identical is N, then the value of $(N/2)^{1/2}$ is.

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**B**	**A**	**A**	**D**	**C**	**A**	**C**	**B**	**D**	**A**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**B**	**A**	**C**	**C**	**B**	**A**	**B**	**C**	**A**	**D**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**15**	**8**	**25**	**8**	**4**	**C**	**B**	**C**	**A**	**A**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**A**	**D**	**C**	**B**	**D**	**A**	**D**	**C**	**B**	**C**
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	**C**	**D**	**A**	**C**	**C**	**40**	**25**	**5**	**5**	**20**
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	**B**	**C**	**D**	**A**	**A**	**C**	**B**	**C**	**A**	**B**
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	**B**	**C**	**D**	**B**	**D**	**A**	**A**	**C**	**C**	**B**
Que.	71	72	73	74	75					
Ans.	**13**	**4**	**8**	**0**	**9**					