National Testing Agency

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B. Tech

Group Number :	1
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Break time :	0
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Mathematics Section A

Section Id :	69112197
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	69112197
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 1 Question Id : 6911211201 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f: \mathbf{R} \to \mathbf{R}$ be defined as $f(x) = \dfrac{2x^2 - 3x + 2}{3x^2 + x + 3}$. Then f is :

Options :

6911214081. both one-one and onto

6911214082. one-one but not onto

6911214083. onto but not one-one

6911214084. neither one-one nor onto

Question Number : 2 Question Id : 6911211202 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the quadratic equation $(n^2-2n+2)x^2-3x+(n^2-2n+2)^2=0$, $n \in \mathbf{R}$. Let α be the minimum value of the product of its roots and β be the maximum value of the sum of its roots. Then the sum of the first six terms of the G.P., whose first term is α and the common ratio is $\frac{\alpha}{\beta}$, is :

Options :

6911214085. $\frac{61}{37}$

6911214086. $\frac{121}{81}$

6911214087. $\frac{364}{243}$

6911214088. $\frac{1093}{729}$

Question Number : 3 Question Id : 6911211203 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $S=\{z \in \mathbb{C} : z^2+\sqrt{6}\,iz-3=0\}$. Then $\sum_{z \in S} z^8$ is equal to :

Options :

6911214089. 162

6911214090. 184

6911214091. 262

6911214092. 324

Question Number : 4 Question Id : 6911211204 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The sum of all possible values of $\theta \in [0, 2\pi]$, for which the system of equations :

$$x\cos 3\theta - 8y - 12z = 0$$
$$x\cos 2\theta + 3y + 3z = 0$$
$$x + y + 3z = 0$$

has a non-trivial solution, is equal to :

Options :

6911214093. π

6911214094. 2π

6911214095. 3π

6911214096. 4π

Question Number : 5 Question Id : 6911211205 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $A=\begin{bmatrix}1 & 0 & 0\\ 3 & 1 & 0\\ 9 & 3 & 1\end{bmatrix}$ and $B=[b_{ij}]$, $1\le i, j\le 3$. If $B=A^{99}-I$, then the value of $\frac{b_{31}-b_{21}}{b_{32}}$ is :

Options :

6911214097. 99

6911214098. 199

6911214099. 149

6911214100. 159

Question Number : 6 Question Id : 6911211206 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The sum $1+\frac{1}{2}\left(1^2+2^2\right)+\frac{1}{3}\left(1^2+2^2+3^2\right)+\ldots.$ upto 10 terms is equal to :

Options :

6911214101. 130

6911214102. 155

6911214103. $\frac{315}{2}$

6911214104. $\frac{325}{2}$

Question Number : 7 Question Id : 6911211207 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A building has ground floor and 10 more floors. Nine persons enter in a lift at the ground floor. The lift goes up to the 10^{th} floor. The number of ways, in which any 4 persons exit at a floor and the remaining 5 persons exit at a different floor, if the lift does not stop at the first and the second floors, is equal to :

Options :

6911214105. 2184

6911214106. 3064

6911214107. 7056

6911214108. 11340

Question Number : 8 Question Id : 6911211208 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the mean and the variance of seven observations $2, 4, \alpha, 8, \beta, 12, 14, \alpha < \beta$, be 8 and 16 respectively. Then the quadratic equation whose roots are $3\alpha+2$ and $2\beta+1$ is :

Options :

6911214109. $x^2-35x+306=0$

6911214110. $x^2-41x+420=0$

6911214111. $x^2-45x+506=0$

6911214112. $x^2-37x+342=0$

Question Number : 9 Question Id : 6911211209 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A bag contains 6 blue and 6 green balls. Pairs of balls are drawn without replacement until the bag is empty. The probability that each drawn pair consists of one blue and one green ball is :

Options :

6911214113. $\frac{63}{925}$

6911214114. $\frac{17}{231}$

6911214115. $\frac{16}{231}$

6911214116. $\frac{64}{925}$

Question Number : 10 Question Id : 6911211210 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let C be a circle having centre in the first quadrant and touching the x-axis at a distance of 3 units from the origin. If the circle C has an intercept of length $6\sqrt{3}$ on y-axis, then the length of the chord of the circle C on the line $x-y=3$ is :

Options :

6911214117. 8

6911214118. 6

6911214119. $6\sqrt{2}$

6911214120. $8\sqrt{2}$

Question Number : 11 Question Id : 6911211211 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The eccentricity of an ellipse E with centre at the origin O is $\frac{\sqrt{3}}{2}$ and its directrices are $x = \pm\frac{4\sqrt{6}}{3}$.

Let $H:\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ be a hyperbola whose eccentricity is equal to the length of semi-major axis of E, and whose length of latus rectum is equal to the length of minor axis of E. Then the distance between the foci of H is :

Options :

6911214121. $\frac{4\sqrt{2}}{\sqrt{7}}$

6911214122. $\frac{4\sqrt{2}}{7}$

6911214123. $\frac{4}{\sqrt{7}}$

6911214124. $\frac{8}{7}$

Question Number : 12 Question Id : 6911211212 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $x=9$ be a directrix of an ellipse E, whose centre is at the origin and eccentricity is $\frac{1}{3}$. Let P $(\alpha, 0)$, $\alpha > 0$, be a focus of E and AB be a chord passing through P. Then the locus of the mid point of AB is :

Options :

6911214125. $9y^2 = 8x\,(1-x)$

6911214126. $3y^2 = 4x\,(1-x)$

6911214127. $9y^2 = 8x\,(x-1)$

6911214128. $3y^2 = 4x\,(x-1)$

Question Number : 13 Question Id : 6911211213 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $\sin\left(\tan^{-1}(x\sqrt{2})\right) = \cot\left(\sin^{-1}\sqrt{1-x^2}\right)$, $x \in (0, 1)$, then the value of x is :

Options :

6911214129. $\frac{1}{2}$

6911214130. $\frac{1}{3}$

6911214131. $\frac{2}{3}$

6911214132. $\frac{5}{8}$

Question Number : 14 Question Id : 6911211214 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The shortest distance between the lines $\frac{x-4}{1} = \frac{y-3}{2} = \frac{z-2}{-3}$ and $\frac{x+2}{2} = \frac{y-6}{4} = \frac{z-5}{-5}$ is :

Options :

6911214133. $\frac{5\sqrt{6}}{6}$

6911214134. $2\sqrt{5}$

6911214135. $3\sqrt{5}$

6911214136. $4\sqrt{5}$

Question Number : 15 Question Id : 6911211215 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\vec{a} = 2\hat{i} + 3\hat{j} + 3\hat{k}$ and $\vec{b} = 6\hat{i} + 3\hat{j} + 3\hat{k}$. Then the square of the area of the triangle with adjacent sides determined by the vectors $\left(2\vec{a} + 3\vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$ is :

Options :

6911214137. 450

6911214138. 900

6911214139. 1800

6911214140. 2400

Question Number : 16 Question Id : 6911211216 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\lim\limits_{x \to 2} \dfrac{(\tan(x-2))\left(rx^2+(p-2)x-2p\right)}{(x-2)^2} = 5$ for some r, p $\in$ **R**. If the set of all possible values of q, such that the roots of the equation $rx^2 - px + q = 0$ lie in (0, 2), be the interval $(\alpha, \beta]$, then $4(\alpha+\beta)$ equals :

Options :

6911214141. 11

6911214142. 13

6911214143. 17

6911214144. 21

Question Number : 17 Question Id : 6911211217 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $A = \begin{bmatrix} 1 & 3 & -1 \\ 2 & 1 & \alpha \\ 0 & 1 & -1 \end{bmatrix}$ be a singular matrix. Let $f(x) = \int\limits_0^x \left(t^2 + 2t + 3\right) dt$, $x \in [1, \alpha]$. If M and m are respectively the maximum and the minimum values of f in $[1, \alpha]$, then $3(M-m)$ is equal to :

Options :

6911214145. 64

6911214146. 68

6911214147. 72

6911214148. 76

Question Number : 18 Question Id : 6911211218 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f: \mathbf{R} \to \mathbf{R}$ be such that $f(xy) = f(x)f(y)$, for all $x, y \in \mathbf{R}$ and $f(0) \neq 0$. Let $g : [1, \infty) \to \mathbf{R}$ be a differentiable function such that

$$x^2 g(x) = \int_1^x \left(t^2 f(t) - tg(t)\right) dt.$$

Then g(2) is equal to :

Options :

6911214149. $\frac{13}{8}$

6911214150. $\frac{11}{16}$

6911214151. $\frac{15}{32}$

6911214152. $\frac{17}{64}$

Question Number : 19 Question Id : 6911211219 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The area of the region $\{(x, y) : x^2 - 8x \leq y \leq -x\}$ is :

Options :

6911214153. $\frac{343}{6}$

6911214154. $\frac{637}{6}$

6911214155. $\frac{437}{6}$

6911214156. $\frac{523}{6}$

Question Number : 20 Question Id : 6911211220 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The value of the integral $\int_{-1}^{1} \left(\frac{x^3 + |x| + 1}{x^2 + 2|x| + 1}\right) dx$ is equal to :

Options :

6911214157. $3 \log_e 2$

6911214158. $2\log_e 2$

6911214159. $5\log_e 3$

6911214160. $3\log_e 3$

Mathematics Section B

Section Id :	69112198
Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	5
Number of Questions to be attempted :	5
Section Marks :	20
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	69112198
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 21 Question Id : 6911211221 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $R = \{(x, y) \in \mathbf{N} \times \mathbf{N} : \log_e (x + y) \leq 2\}$. Then the minimum number of elements, required to be added in R to make it a transitive relation, is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 22 Question Id : 6911211222 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If $(1-x^3)^{10} = \sum_{r=0}^{10} a_r x^r (1-x)^{30-2r}$, then $\frac{9a_9}{a_{10}}$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 23 Question Id : 6911211223 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let the line $x - y = 4$ intersect the circle $C : (x-4)^2 + (y+3)^2 = 9$ at the points Q and R. If $P(\alpha, \beta)$ is a point on C such that $PQ = PR$, then $(6\alpha + 8\beta)^2$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 24 Question Id : 6911211224 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let the image of the point $P(0,-5,0)$ in the line $\frac{x-1}{2}=\frac{y}{1}=\frac{z+1}{-2}$ be the point R and the image of the point $Q\left(0,\frac{-1}{2},0\right)$ in the line $\frac{x-1}{-1}=\frac{y+9}{4}=\frac{z+1}{1}$ be the point S. Then the square of the area of the parallelogram PQRS is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 25 Question Id : 6911211225 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $f(x)=\begin{cases}x^3+8\ ; & x<0\ ,\\ x^2-4\ ; & x\geq 0\ ,\end{cases}$ and $g(x)=\begin{cases}(x-8)^{1/3}\ ; & x<0,\\ (x+4)^{1/2}\ ; & x\geq 0\ .\end{cases}$

Then the number of points, where the function gof is discontinuous, is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Physics Section A

Section Id :	69112199
Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	69112199
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 26 Question Id : 6911211226 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The percentage error in the calculated volume of a sphere, if there is 2% error in its diameter measurement, is _____.

Options :

6911214166. 1

6911214167. 2

6911214168. 6

6911214169. 8

Question Number : 27 Question Id : 6911211227 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match **List - I** with **List - II**.

	List - I		**List - II**
A.	Boltzmann constant	I.	$[M^{-1}L^{3}T^{-2}]$
B.	Stefan's constant	II.	$[ML^{2}T^{-1}]$
C.	Planck's constant	III.	$[ML^{2}T^{-2}K^{-1}]$
D.	Gravitational constant	IV.	$[ML^{0}T^{-3}K^{-4}]$

Choose the **correct** answer from the options given below :

Options :

6911214170. A-I, B-II, C-III, D-IV

6911214171. A-IV, B-III, C-II, D-I

6911214172. A-III, B-IV, C-II, D-I

6911214173. A-II, B-I, C-IV, D-III

Question Number : 28 Question Id : 6911211228 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A solid sphere (A) of mass $5m$ and a spherical shell (B) of mass m, both having same radius, are placed on a rough surface. When a force of same magnitude is applied tangentially at the highest points of A and B, they start rolling without slipping with an acceleration of a_A and a_B, respectively. The ratio of a_A and a_B is _____.

Options :

6911214174. 5 : 21

6911214175. 6 : 10

6911214176. 21 : 25

6911214177. $1:5$

Question Number : 29 Question Id : 6911211229 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A body of mass 1 kg moves along a straight line with a velocity $v = 2x^2$. The work done by the body during displacement from $x = 0$ to 5 m is _____ J.

Options :

6911214178. 0

6911214179. 250

6911214180. 1250

6911214181. 1000

Question Number : 30 Question Id : 6911211230 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A cylinder with adiabatic walls is closed at both ends and is divided into two compartments by a frictionless adiabatic piston. Ideal gas is filled in both (left and right) the compartments at same P, V, T. Heating is started from left side until pressure changes to $^{27}P/_{8}$. If initial volume of each compartment was 9 litres then the final volume in right-hand side compartment is _____ litres. (for this ideal gas $C_P/C_V = 1.5$)

Options :

6911214182. 3

6911214183. 4

6911214184. 14

6911214185. 9

Question Number : 31 Question Id : 6911211231 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For an electromagnetic wave propagating through vacuum, $\vec{k}$, $\vec{E}$ and ω represent propagation vector, electric field and angular frequency, respectively. The magnetic field associated with this wave is represented by :

Options :

6911214186. $\frac{\vec{E} \times \vec{k}}{\omega}$

6911214187. $\frac{\vec{k} \times \vec{E}}{\omega}$

6911214188. $\omega\left(\vec{E} \times \vec{k}\right)$

6911214189. $\omega\left(\vec{k} \times \vec{E}\right)$

Question Number : 32 Question Id : 6911211232 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two identical bodies A and B of equal masses have initial velocities $\vec{v}_1 = 4\hat{i}$ m/s and $\vec{v}_2 = 4\hat{j}$ m/s respectively. The body A has acceleration $\vec{a}_1 = 6\hat{i} + 6\hat{j}$ m/s^2 while the acceleration of the other body B is zero. The centre of mass of the two bodies moves in _____ path.

Options :

6911214190. circular

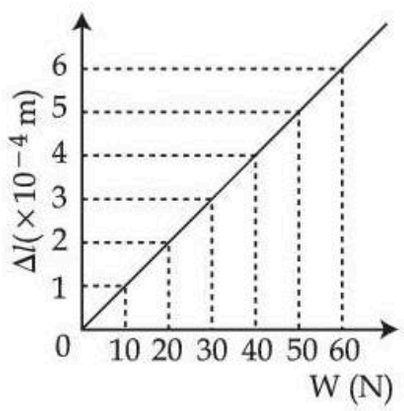
6911214191. parabolic

6911214192. straight line

6911214193. elliptical

Question Number : 33 Question Id : 6911211233 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Figure represents the extension (Δl) of a wire of length 1 meter, suspended from the ceiling of the room at one end with a load W connected to the other end. If the cross-sectional area of the wire is 10^{-5} m^2 then the Young's modulus of the wire is _____ N/m^2.



Options :

6911214194. 1.0×10^{11}

6911214195. 2.0×10^{10}

6911214196. 1.0×10^{10}

6911214197. 2.0×10^{11}

Question Number : 34 Question Id : 6911211234 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A cylindrical vessel of 40 cm radius is completely filled with water and its capacity is 528 dm^3 (dm : decimeter) The vessel is placed on a solid block of exactly same height as vessel. If a small hole is made at 70 cm below the top of water level, then horizontal range of water falling on the ground in the beginning is _____ cm.

Options :

6911214198. $120\sqrt{2}$

6911214199. $140\sqrt{2}$

6911214200. $140\sqrt{3}$

6911214201. $120\sqrt{3}$

Question Number : 35 Question Id : 6911211235 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If 2 mole of an ideal monoatomic gas at temperature T, is mixed with 6 mole of another ideal monoatomic gas at temperature $2T$ then the temperature of mixture is :

Options :

6911214202. $\frac{5}{2}T$

6911214203. $\frac{5}{4}T$

6911214204. $\frac{7}{2}T$

6911214205. $\frac{7}{4}T$

Question Number : 36 Question Id : 6911211236 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A spring stretches by 2 mm when it is loaded with a mass of 200 g. From equilibrium position the mass is further pulled down by 2 mm and released. The frequency associated with the system and maxmimum energy in the spring are _____ Hz and _____ J, respectively.
(Take $g = 10\ m/s^2$)

Options :

6911214206. $\frac{5\sqrt{50}}{\pi}$ and 8×10^{-3}

6911214207. $\frac{5\sqrt{50}}{\pi}$ and 8

6911214208. $10\sqrt{50}$ and 2×10^{-3}

6911214209. $\frac{5\sqrt{50}}{\pi}$ and 16×10^{-3}

Question Number : 37 Question Id : 6911211237 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The electric potential as a function of x, y is given by $V = 5(x^2 - y^2)$ V. The electric field at a point (2, 3) m is _____ V/m.

Options :

6911214210. $\left(-20\hat{i} + 30\hat{j}\right)$

6911214211. $\left(20\hat{i} - 30\hat{j}\right)$

6911214212. $\left(20\hat{i} + 45\hat{j}\right)$

6911214213. $\left(-4\hat{i} + 6\hat{j}\right)$

Question Number : 38 Question Id : 6911211238 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A current of 30 A each flows in opposite directions in two conducting wires, placed parallel to each other at a distance of 8 cm. The magnetic field at the mid point between the two wires is _____ μT.

$(\frac{\mu_o}{4\pi} = 10^{-7}\ N/A^2)$

Options :

6911214214. 30

6911214215. 300

6911214216. 150

6911214217. 0.0

Question Number : 39 Question Id : 6911211239 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A square loop of side 2 cm is placed in a time varying magnetic field with magnitude as $B = 0.4 \sin(300t)$ Tesla. The normal to the plane of loop makes an angle of 60° with the field. The maximum induced emf produced in the loop is _____ mV.

Options :

6911214218. 12

6911214219. 18

6911214220. 21

6911214221. 24

Question Number : 40 Question Id : 6911211240 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A sphere of capacitance 100 pF is charged to a potential of 100 V. Another identical uncharged metal sphere is brought in contact with the charged sphere, then the change in the total energy stored on these spheres, when they touch is $\alpha \times 10^{-7}$ J. The value of α is _____.

(combined capacitance of spheres is 200 pF)

Options :

6911214222. 5

6911214223. $\frac{5}{2}$

6911214224. $\frac{7}{2}$

6911214225. $\frac{9}{2}$

Question Number : 41 Question Id : 6911211241 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The energy released if hydrogen atoms are combined to form $^{4}_{2}He$ is _____ MeV.

(Take binding energies per nucleon of $^{2}_{1}H$ and $^{4}_{2}He$ as 1.1 MeV and 7.2 MeV, respectively)

Options :

6911214226. 6.1

6911214227. 24.4

6911214228. 26.6

6911214229. 5

Question Number : 42 Question Id : 6911211242 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Angle of minimum deviation is equal to the half of the angle of prism in an equilateral prism. The refractive index of the prism is _____.

Options :

6911214230. 1.5

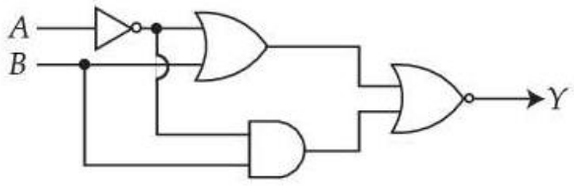
6911214231. $\sqrt{3}$

6911214232. $\sqrt{2}$

6911214233. 1.65

Question Number : 43 Question Id : 6911211243 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Refer to the logic circuit given below. For two inputs $(A=1, B=1)$ and $(A=0, B=1)$, output (Y) will be _____.



Options :

6911214234. 1, 0 respectively

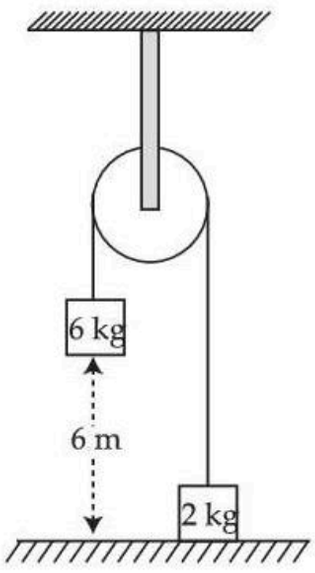
6911214235. 0, 1 respectively

6911214236. 0, 0 respectively

6911214237. 1, 1 respectively

Question Number : 44 Question Id : 6911211244 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The velocity at which 6 kg mass (shown in figure) strikes the ground when it is released from a height of 6 m above the ground is _____ m/s. Assume pulley is massless and string is light and inextensible. (Take $g = 10\ m/s^2$)



Options :

6911214238. 7.74

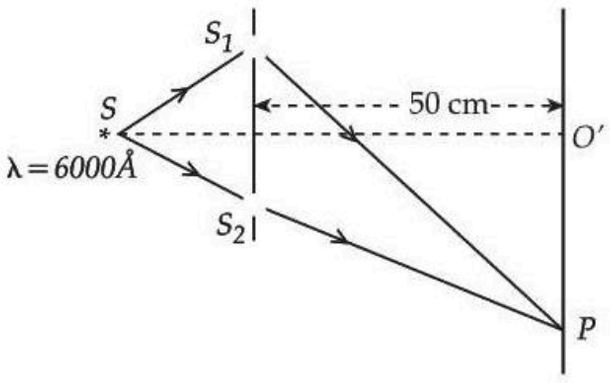
6911214239. 7.20

6911214240. 6.55

6911214241. 4.50

Question Number : 45 Question Id : 6911211245 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In a Young double slit experiment, the wavelength of incident light is 6000 Å, the separation between slits S_1 and S_2 is 5 cm and the distance between slits plane and screen is 50 cm, as shown in the figure below. If the resultant intensity at P is equal to the intensity due to individual slits, the path difference between interfering waves is _____ Å.



Options :

6911214242. 4000

6911214243. 3000

6911214244. 2000

6911214245. 1000

Physics Section B

Section Id :	691121100
Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	5
Number of Questions to be attempted :	5
Section Marks :	20
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	691121100
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 46 Question Id : 6911211246 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A block takes t time to slide down a plane inclined at 45° to the horizontal. If the surface is made smooth (frictionless), the block takes time $\frac{t}{2}$ to slide down the plane. The coefficient of friction between the block and the inclined plane is $\left(\frac{\alpha}{100}\right)$. The value of α is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Possible Answers :

1

Question Number : 47 Question Id : 6911211247 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The de Broglie wavelength for an electron accelerated through the potential difference of V_1 volt is λ_1. When the potential difference is changed to V_2 volt, the associated de Broglie wavelength is increased by 50%. If $(V_1/V_2) = (9/\alpha)$, then the value of α is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

1

Question Number : 48 Question Id : 6911211248 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A moving coil of galvanometer when shunted with 2 Ω resistance gives a full scale deflection for a current of 500 mA. When a resistance of 470 Ω is connected in series it gives a full scale deflection for 10 V potential applied on it. The value of resistance of galvanometer coil is _____ Ω.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

1

Question Number : 49 Question Id : 6911211249 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Two cells of emfs 1 V and 2 V and internal resistance 2 Ω and 1 Ω, respectively connected in parallel, gave a current of 1 A through an external resistance. If the polarity of one cell is reversed, then value of current through the external resistance will be $\frac{\alpha}{5}$ A. The value of α is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

1

Question Number : 50 Question Id : 6911211250 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A concave mirror of focal length 10 cm forms an image which is double the size of object when the object is placed at two different positions. The distance between the two positions of the object is _____ cm.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

Chemistry Section A

Section Id :	691121101
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	691121101
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 51 Question Id : 6911211251 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Which of the following contain the same number of atoms ?

(Given : Molar mass in g mol^{-1} of H, He, O and S are 1, 4, 16 and 32 respectively)

A. 2 g of O_2 gas

B. 4 g of SO_2 gas

C. 1400 mL of O_2 at STP

D. 0.05 L of He at STP

E. 0.0625 mol of H_2 gas

Choose the **correct** answer from the options given below :

Options :

6911214251. A and B only

6911214252. B and C only

6911214253. C and D only

6911214254. A, C and E only

Question Number : 52 Question Id : 6911211252 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The Bohr radius of a hydrogen like species is 70.53 pm. The species and the stationary state (n) are respectively

(Given : Hydrogen atom Bohr radius is 52.9 pm)

Options :

6911214255. Li^{2+}, 3

6911214256. He^{+}, 3

6911214257. $He^+, 2$

6911214258. $Li^{2+}, 2$

Question Number : 53 Question Id : 6911211253 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

Statement I : The number of compounds among SO_2, SO_3, SF_4, SF_6 and H_2S in which sulphur does not obey the Octet rule is 3.

Statement II : Among $[H_2O, ClF_3, SF_4]$, $[NH_3, BrF_5, SF_4]$, $[BrF_5, ClF_3, XeF_4]$ and $[XeF_4, ClF_3, H_2O]$, the number of sets in which all the molecules have one lone pair of electrons on the central atom is 1.

In the light of the above statements, choose the **correct** answer from the options given below :

Options :

6911214259. Both **Statement I** and **Statement II** are true

6911214260. Both **Statement I** and **Statement II** are false

6911214261. **Statement I** is true but **Statement II** is false

6911214262. **Statement I** is false but **Statement II** is true

Question Number : 54 Question Id : 6911211254 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match **List - I** with **List - II**.

Given V_1 and V_2 are initial and final volumes respectively.

	List - I (Isothermal process)		**List - II (Expression)**
A.	Reversible expansion	I.	$q = 0$
B.	Free expansion	II.	$q = nRT \ln \frac{V_2}{V_1}$
C.	Irreversible Compression	III.	$w = -p_{ext}(V_1 - V_2)$
D.	Cyclic reversible	IV.	$\frac{q_{rev}}{T} = 0$

Choose the **correct** answer from the options given below :

Options :

6911214263. A-II, B-III, C-I, D-IV

6911214264. A-II, B-I, C-IV, D-III

6911214265. A-II, B-I, C-III, D-IV

6911214266. A-I, B-II, C-III, D-IV

Question Number : 55 Question Id : 6911211255 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

Chamber 1	Semi-permeable membrane	Chamber 2
18 g glucose in 100 mL aqueous solution		30 g glucose in 250 mL aqueous solution

Statement I : H_2O molecules move from the chamber 1 to chamber 2.

Statement II : The osmotic pressure of a solution prepared by dissolving 50 mg of potassium sulphate (molar mass = 174 g/mol) in 2 L of water (at 27 °C) is 0.0107 bar. (Given: $R = 0.083\ dm^3\ bar\ K^{-1}\ mol^{-1}$ and assume complete dissociation of electrolyte)

In the light of the above statements, choose the **correct** answer from the options given below :

Options :

6911214267. Both **Statement I** and **Statement II** are true

6911214268. Both **Statement I** and **Statement II** are false

6911214269. **Statement I** is true but **Statement II** is false

6911214270. **Statement I** is false but **Statement II** is true

Question Number : 56 Question Id : 6911211256 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given is a concentrated solution of a weak electrolyte A_xB_y of concentration 'c' and dissociation constant 'K'. The degree of dissociation is given by :

Options :

6911214271. $\left[K \times c^{x+y-1} x^x y^y\right]^{x+y}$

6911214272. $\left(\frac{K}{c^{x+y-1}\, x^x y^y}\right)^{\frac{1}{x+y}}$

6911214273. $\left(\frac{c^{x+y-1}\, x^x y^y}{K}\right)^{x+y}$

6911214274. $\left(\frac{c^{x+y-1}\,x^x y^y}{K}\right)^{\frac{1}{x+y}}$

Question Number : 57 Question Id : 6911211257 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For a general redox reaction

Anode $\quad Red_1 \rightarrow Ox_1^{n_1^+} + n_1 e^-$

Cathode $\quad Ox_2 + n_2 e^- \rightarrow Red_2^{n_2^-}$

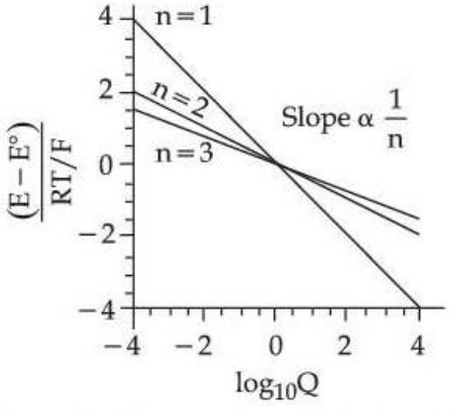
Which of the following statement is **incorrect** ?

Options :

6911214275. The overall reaction can be written as $n_2 Red_1 + n_1\, Ox_2 \rightleftharpoons n_2 Ox_1^{n_1^+} + n_1 Red_2^{n_2^-}$

6911214276.

The electrons do not appear in the overall reaction because electrons produced at the anode are consumed at the cathode.



6911214277. Here n is the number of electrons transferred in redox reaction.

6911214278.

If the reaction is carried out reversibly, the electrical work done is equal to the ratio of charge and potential difference through which charge is moved.

Question Number : 58 Question Id : 6911211258 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In a period, the first ionisation enthalpy of the element at extreme left and the negative electron gain enthalpy of the extreme right element, except noble gases, are respectively.

Options :

6911214279. lowest and lowest

6911214280. highest and lowest

6911214281. lowest and highest

6911214282. highest and highest

Question Number : 59 Question Id : 6911211259 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

Statement I : $F_2O < H_2O < Cl_2O$ is the correct trend in terms of bond angle.

Statement II : SiF_4, SnF_4 and PbF_4 are ionic in nature.

In the light of the above statements, choose the **correct** answer from the options given below :

Options :

6911214283. Both **Statement I** and **Statement II** are true

6911214284. Both **Statement I** and **Statement II** are false

6911214285. **Statement I** is true but **Statement II** is false

6911214286. **Statement I** is false but **Statement II** is true

Question Number : 60 Question Id : 6911211260 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The correct order of first (Δ_iH_1) and second (Δ_iH_2) ionisation enthalpy values of Cr and Mn are :

A. Δ_iH_1 : Cr > Mn

B. Δ_iH_2 : Cr > Mn

C. Δ_iH_1 : Mn > Cr

D. Δ_iH_2 : Mn > Cr

Choose the **correct** answer from the options given below :

Options :

6911214287. A and B only

6911214288. B and C only

6911214289. A and D only

6911214290. C and D only

Question Number : 61 Question Id : 6911211261 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Which of the following sequences of hybridisation, geometry and magnetic nature are **correct** for the given coordination compounds ?

A. $[NiCl_4]^{2-}$ – sp^3, tetrahedral, paramagnetic

B. $[Ni(NH_3)_6]^{2+}$ – sp^3d^2, octahedral, paramagnetic

C. $[Ni(CO)_4]$ – sp^3, tetrahedral, paramagnetic

D. $[Ni(CN)_4]^{2-}$ – dsp^2, square planar, diamagnetic

Choose the **correct** answer from the options given below :

Options :

6911214291. A, B, C and D

6911214292. B, C and D only

6911214293. A, C and D only

6911214294. A, B and D only

Question Number : 62 Question Id : 6911211262 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

Statement I : A mixture of $C_{12}H_{22}O_{11}$ (sugar) and NaCl can be separated by dissolving sugar in alcohol, due to differential solubility.

Statement II : Rose essence from rose petals is seperated by steam distillation due to its high volatility and insolubility in H_2O.

In the light of the above statements, choose the **correct** answer from the options given below :

Options :

6911214295. Both **Statement I** and **Statement II** are true

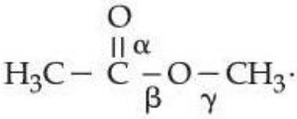
6911214296. Both **Statement I** and **Statement II** are false

6911214297. **Statement I** is true but **Statement II** is false

6911214298. **Statement I** is false but **Statement II** is true

Question Number : 63 Question Id : 6911211263 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Shown below is the structure of methyl acetate with three different α, β and γ carbon - oxygen bonds.



The correct order of bond lengths of these bonds is :

Options :

6911214299. $\alpha > \beta > \gamma$

6911214300. $\alpha < \beta < \gamma$

6911214301. $\alpha = \beta = \gamma$

6911214302. $\alpha < \beta = \gamma$

Question Number : 64 Question Id : 6911211264 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

'*x*' is the product which is obtained by the hydrolysis of prop-1-yne in the presence of mercuric sulphate under dilute acidic medium at 333 K. '*y*' is the product which is obtained by the reaction of ethane nitrile with methyl magnesium bromide in dry ether followed by hydrolysis. IUPAC name of product obtained from '*x*' and '*y*' in the presence of barium hydroxide followed by heating is :

Options :

6911214303. 2 - Methylpent-4-en-3-one

6911214304. 4 - Methylpent-3-en-2-one

6911214305. 4 - Methylpent-1-ene

6911214306. 2 - Methylpent-3-one

Question Number : 65 Question Id : 6911211265 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An optically active alkyl bromide C_4H_9Br, reacts with ethanolic KOH to form major compound [A] which reacts with bromine to give compound [B]. Compound [B] reacts with ethanolic KOH and sodamide to give compound [C]. One molecule of water adds to compound [C] on warming with mercuric sulphate and dilute sulphuric acid at 333 K to form compound [D]. The functional group in compound D will be confirmed by :

Options :

6911214307. Haloform test

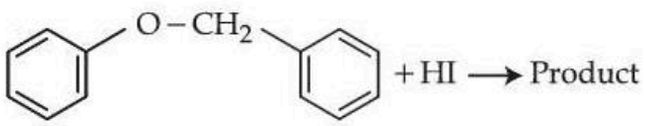
6911214308. Lucas test

6911214309. Silver mirror test

6911214310. Benedict test

Question Number : 66 Question Id : 6911211266 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the following reaction.



Statement I : In the above reaction, product formed will be a mixture of benzyl alcohol and iodobenzene.

Statement II : In the above reaction, the $-O-CH_2-$ bond is cleaved to give the product.

In the light of the above statements, choose the **correct** answer from the options given below :

Options :

6911214311. Both **Statement I** and **Statement II** are true

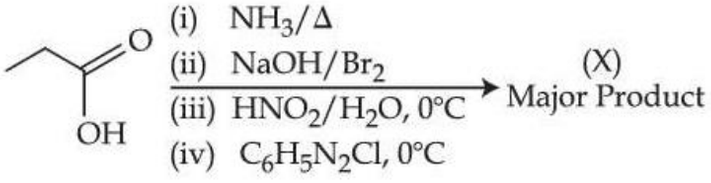
6911214312. Both **Statement I** and **Statement II** are false

6911214313. **Statement I** is true but **Statement II** is false

6911214314. **Statement I** is false but **Statement II** is true

Question Number : 67 Question Id : 6911211267 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the following organic reaction sequence. Choose the final product (X) from the following (consider the major product in all intermediate reactions)



Options :

6911214315. Benzene

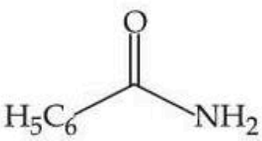
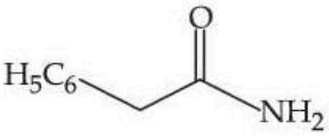
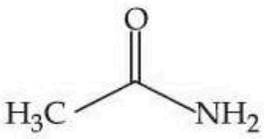
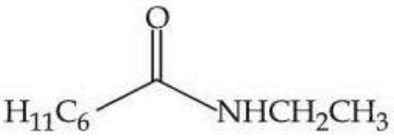
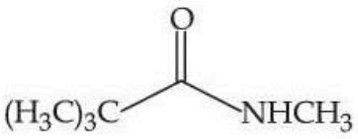
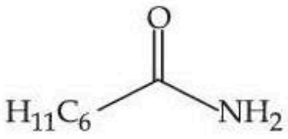
6911214316. Phenol

6911214317. Propanol

6911214318. Chlorobenzene

Question Number : 68 Question Id : 6911211268 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The number of compounds from the following which can undergo reaction with Br_2/KOH (alcoholic) to give respective products and these respective products can also be obtained separately by Gabriel phthalimide reaction is :

Options :

6911214319. 5

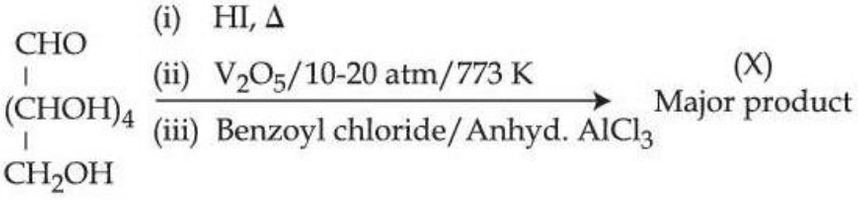
6911214320. 4

6911214321. 3

6911214322. 6

Question Number : 69 Question Id : 6911211269 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the following reactions. Total number of electrons in the π bonds and lone pair of electrons in the product (X) is :



Options :

6911214323. 12

6911214324. 16

6911214325. 14

6911214326. 18

Question Number : 70 Question Id : 6911211270 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Treatment of a gas 'X' with a freshly prepared ferrous sulphate solution gives a compound 'Y' as a brown ring. The compounds X and Y are.

Options :

6911214327. NO and $[Fe(NO)]SO_4$

6911214328. NO_2 and $[Fe(NO_2)]SO_4$

6911214329. N_2O and $[Fe(N_2O)]SO_4$

6911214330. N_2O_4 and $[Fe(N_2O_4)]SO_4$

Chemistry Section B

Section Id :	691121102
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	5
Number of Questions to be attempted :	5
Section Marks :	20
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	691121102
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 71 Question Id : 6911211271 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

An excess of $AgNO_3$ is added to 100 mL of a 0.05 M solution of tetraaquadichloridochromium (III) chloride. The number of moles of AgCl precipitated will be _____ $\times 10^{-3}$.

(Nearest integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 72 Question Id : 6911211272 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

An alkane (Y) requires 8 moles of oxygen for complete combustion and on chlorination with $Cl_2/h\nu$, (Y) gives only one monochlorinated product (Z). The total number of primary carbon atoms in (Y) is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 73 Question Id : 6911211273 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

500 mL of 0.2 M MnO_4^- solution in basic medium when mixed with 500 mL of 1.5 M KI solution, oxidises iodide ions to liberate molecular iodine. This liberated iodine is then titrated with a standard x M thiosulphate solution in presence of starch till the end point. If 300 mL of thiosulphate was consumed, then the value of x is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 74 Question Id : 6911211274 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In a closed flask at 600 K, one mole of $X_2Y_4(g)$ attains equilibrium as given below :

$$X_2Y_4(g) \rightleftharpoons 2XY_2(g)$$

At equilibrium, 75% $X_2Y_4(g)$ was dissociated and the total pressure is 1 atm. The magnitude of $\Delta_r G^{\ominus}$ (in kJ mol^{-1}) at this temperature is _____. (Nearest Integer)
(Given : $R = 8.3$ J mol^{-1} K^{-1}; $\ln 10 = 2.3$, $\log 2 = 0.3$, $\log 3 = 0.48$, $\log 5 = 0.69$, $\log 7 = 0.84$)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 75 Question Id : 6911211275 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Decomposition of a hydrocarbon follows the equation $k = (5.5 \times 10^{11} s^{-1})\ e^{\frac{-28000K}{T}}$. The activation energy of reaction is _____ kJ mol^{-1}. (Nearest Integer)
Given : $R = 8.3$ J K^{-1} mol^{-1}

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1