

National Testing Agency

Question Paper Name :	B Tech 2nd Apr 2026 Shift 2
Subject Name :	B. Tech
Creation Date :	2026-04-03 12:09:09
Duration :	180
Total Marks :	300
Display Marks:	Yes

B. Tech

Group Number :	1
Group Id :	6911213
Group Maximum Duration :	0
Group Minimum Duration :	180
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300

Mathematics Section A

Section Id :	69112113
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 :	69112113
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 1 Question Id : 691121151 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let α, β be the roots of the equation $x^2 - 3x + r = 0$, and $\frac{\alpha}{2}, 2\beta$ be the roots of the equation $x^2 + 3x + r = 0$.

If the roots of the equation $x^2 + 6x = m$ are $2\alpha + \beta + 2r$ and $\alpha - 2\beta - \frac{r}{2}$, then m is equal to :

Options :

691121511. -135

691121512. -567

691121513. 135

691121514. 567

Question Number : 2 Question Id : 691121152 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is
Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the circles $C_1: |z| = r$ and $C_2: |z - 3 - 4i| = 5$, $z \in \mathbb{C}$, be such that C_2 lies within C_1 . If z_1 moves on C_1 , z_2 moves on C_2 and $\min |z_1 - z_2| = 2$, then $\max |z_1 - z_2|$ is equal to :

Options :

691121515. 12

691121516. 17

691121517. 22

691121518. 24

Question Number : 3 Question Id : 691121153 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is
Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the system of equations

$$x + 5y + 6z = 4,$$

$$2x + 3y + 4z = 7,$$

$$x + 6y + az = b$$

has infinitely many solutions, then the point (a, b) lies on the line

Options :

691121519. $y - x = 3$

691121520. $x - y = 3$

691121521. $x + y = 11$

691121522. $x + y = 12$

Question Number : 4 Question Id : 691121154 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is
Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $a_1, a_2, a_3, \dots$ be an A.P. and $g_1 = a_1, g_2, g_3, \dots$ be an increasing G.P. If $a_1 = a_2 + g_2 = 1$ and $a_3 + g_3 = 4$, then $a_{10} + g_5$ is equal to :

Options :

691121523. 81

691121524. 76

691121525. 62

691121526. 55

Question Number : 5 Question Id : 691121155 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The sum $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \dots$ up to 8 terms, is :

Options :

691121527. 70

691121528. 71

691121529. 72

691121530. 73

Question Number : 6 Question Id : 691121156 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If for $3 \leq r \leq 30$, $\left({}^{30}C_{30-r}\right) + 3\left({}^{30}C_{31-r}\right) + 3\left({}^{30}C_{32-r}\right) + \left({}^{30}C_{33-r}\right) = {}^m C_r$, then m equals :

Options :

691121531. 31

691121532. 32

691121533. 33

691121534. 34

Question Number : 7 Question Id : 691121157 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let p_n denote the total number of triangles formed by joining the vertices of an n-side regular polygon. If $p_{n+1} - p_n = 66$, then the sum of all distinct prime divisors of n is :

Options :

691121535. 7

691121536. 8

691121537. 5

691121538. 6

Question Number : 8 Question Id : 691121158 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A man throws a fair coin repeatedly. He gets 10 points for each head he throws and 5 points for each tail he throws. If the probability that he gets exactly 30 points is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $m + n$ is equal to :

Options :

691121539. 53

691121540. 55

691121541. 107

691121542. 105

Question Number : 9 Question Id : 691121159 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The mean and variance of n observations are 8 and 16, respectively. If the sum of the first $(n - 1)$ observations is 48 and the sum of squares of the first $(n - 1)$ observations is 496, then the value of n is :

Options :

691121543. 21

691121544. 16

691121545. 13

691121546. 7

Question Number : 10 Question Id : 691121160 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let a circle pass through the origin and its centre be the point of intersection of two mutually perpendicular lines $x + (k - 1)y + 3 = 0$ and $2x + k^2y - 4 = 0$. If the line $x - y + 2 = 0$ intersects the circle at the points A and B, then $(AB)^2$ is equal to :

Options :

691121547. 10

691121548. 27

691121549. 18

691121550. 34

Question Number : 11 Question Id : 691121161 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let O be the origin, and P and Q be two points on the rectangular hyperbola $xy = 12$ such that the mid point of the line segment PQ is $\left(\frac{1}{2}, -\frac{1}{2}\right)$. Then the area of the triangle OPQ equals :

Options :

691121551. $\frac{3}{2}$

691121552. $\frac{5}{2}$

691121553. $\frac{7}{2}$

691121554. $\frac{9}{2}$

Question Number : 12 Question Id : 691121162 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the parabola $y = x^2 + px + q$ passing through the point $(1, -1)$ be such that the distance between its vertex and the x -axis is minimum. Then the value of $p^2 + q^2$ is :

Options :

691121555. 2

691121556. 4

691121557. 5

691121558. 8

Question Number : 13 Question Id : 691121163 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $P = \{\theta \in [0, 4\pi] : \tan^2\theta \neq 1\}$ and $S = \{a \in \mathbb{Z} : 2(\cos^8\theta - \sin^8\theta) \sec 2\theta = a^2, \theta \in P\}$. Then $n(S)$ is :

Options :

691121559. 0

691121560. 1

691121561. 2

691121562. 3

Question Number : 14 Question Id : 691121164 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the vectors $\vec{a} = -\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} + \hat{k}$. For some $\lambda, \mu \in \mathbb{R}$, let $\vec{c} = \lambda\vec{a} + \mu\vec{b}$.

If $\vec{c} \cdot (3\hat{i} - 6\hat{j} + 2\hat{k}) = 10$ and $\vec{c} \cdot (\hat{i} + \hat{j} + \hat{k}) = -2$, then $|\vec{c}|^2$ is equal to :

Options :

691121563. 8

691121564. 12

691121565. 14

691121566. 15

Question Number : 15 Question Id : 691121165 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the point A be the foot of perpendicular drawn from the point P(a, b, 0) on the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-\alpha}{3}$. If the midpoint of the line segment PA is $\left(0, \frac{3}{4}, \frac{-1}{4}\right)$, then the value of $a^2 + b^2 + \alpha^2$ is equal to :

Options :

691121567. 1

691121568. 2

691121569. 6

691121570. 9

Question Number : 16 Question Id : 691121166 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two adjacent sides of a parallelogram PQRS are given by $\vec{PQ} = \hat{j} + \hat{k}$ and $\vec{PS} = \hat{i} - \hat{j}$. If the side PS is rotated about the point P by an acute angle α in the plane of the parallelogram so that it becomes perpendicular to the side PQ, then $\sin^2\left(\frac{5\alpha}{2}\right) - \sin^2\left(\frac{\alpha}{2}\right)$ is equal to :

Options :

691121571. $\frac{1}{2}$

691121572. $\frac{\sqrt{3}}{2}$

691121573. $\frac{\sqrt{3}}{4}$

691121574. $\frac{2\sqrt{3}}{5}$

Question Number : 17 Question Id : 691121167 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 $\int_0^{20\pi} (\sin^4 x + \cos^4 x) dx$ is equal to :

Options :

691121575. $\frac{15\pi}{2}$

691121576. 25π

691121577. 15π

691121578. $\frac{25\pi}{2}$

Question Number : 18 Question Id : 691121168 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f(x)$ be a polynomial of degree 5, and have extrema at $x = 1$ and $x = -1$. If $\lim_{x \rightarrow 0} \left(\frac{f(x)}{x^3} \right) = -5$, then $f(2) - f(-2)$ is equal to :

Options :

691121579. 0

691121580. 50

691121581. 92

691121582. 112

Question Number : 19 Question Id : 691121169 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f(x) = \int \left(\frac{16x + 24}{x^2 + 2x - 15} \right) dx$. If $f(4) = 14 \log_e(3)$ and $f(7) = \log_e(2^\alpha \cdot 3^\beta)$, $\alpha, \beta \in \mathbb{N}$, then $\alpha + \beta$ is equal to :

Options :

691121583. 31

691121584. 37

691121585. 39

691121586. 41

Question Number : 20 Question Id : 691121170 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $x=x(y)$ be the solution of the differential equation $2y^2 \frac{dx}{dy} - 2xy + x^2 = 0, y > 1, x(e) = e$.

Then $x(e^2)$ is equal to :

Options :

691121587. $\frac{3}{2}e^2$ 691121588. $\frac{2}{3}e^2$ 691121589. e^2 691121590. $2e^2$

Mathematics Section B

Section Id :	69112114
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 :	69112114
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 21 Question Id : 691121171 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $A = \{2, 3, 4, 5, 6\}$. Let R be a relation on the set $A \times A$ given by $(x, y)R(z, w)$ if and only if x divides z and $y \leq w$. Then the number of elements in R is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

Question Number : 22 Question Id : 691121172 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the matrices $A = \begin{bmatrix} 2 & -2 \\ 4 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 9 \\ 1 & 3 \end{bmatrix}$. If matrices P and Q are such that $PA = B$ and

$AQ = B$, then the absolute value of the sum of the diagonal elements of $2(P + Q)$ is _____.

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 : 691121173 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let A be the point (3, 0) and circles with variable diameter AB touch the circle $x^2 + y^2 = 36$ internally. Let the curve C be the locus of the point B. If the eccentricity of C is e, then $72e^2$ 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 : 691121174 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If the area of the region bounded by $16x^2 - 9y^2 = 144$ and $8x - 3y = 24$ is A, then $3(A + 6 \log_e(3))$ 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 : 25 Question Id : 691121175 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The number of points in the interval $[2, 4]$, at which the function $f(x) = \left[x^2 - x - \frac{1}{2} \right]$, where $[\cdot]$ denotes the greatest integer function, 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 :

69112115

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 :	69112115
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 26 Question Id : 691121176 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Dimensions of universal gravitational constant (G) in terms of Planck's constant (h), distance (L), mass (M) and time (T) are _____.

Options :

691121596. $[hTLM^{-2}]$

691121597. $[hT^{-1}LM^{-2}]$

691121598. $[hTL^2M^{-2}]$

691121599. $[h^{-1}T^{-1}LM^{-2}]$

Question Number : 27 Question Id : 691121177 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A 0.5 kg mass is in contact against the inner wall of a cylindrical drum of radius 4 m rotating about its vertical axis. The minimum rotational speed of the drum to enable the mass to remain stuck to the wall (without falling) is 5 rad/s. The coefficient of friction between the drum's inner wall surface and mass is _____. (Take $g = 10 \text{ m/s}^2$)

Options :

691121600. 0.1

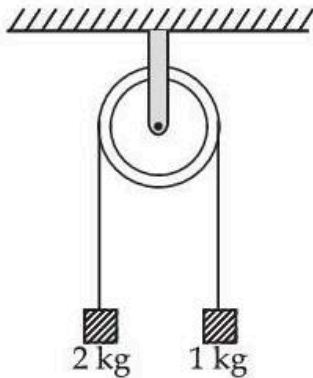
691121601. 0.5

691121602. 0.7

691121603. 0.3

Question Number : 28 Question Id : 691121178 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two blocks of masses 2 kg and 1 kg respectively, are tied to the ends of a string which passes over a light frictionless pulley as shown in the figure below. The masses are held at rest at the same horizontal level and then released. The distance traversed by the centre of mass in 2 s is _____m. (Take $g = 10 \text{ m/s}^2$)



Options :

691121604. 3.33

691121605. 3.12

691121606. 2.22

691121607. 1.42

Question Number : 29 Question Id : 691121179 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A particle having charge 10^{-9} C moving in x - y plane in fields of $0.4 \hat{j} \text{ N/C}$ and $4 \times 10^{-3} \hat{k} \text{ T}$ experiences a force of $(4\hat{i} + 2\hat{j}) \times 10^{-10} \text{ N}$. The velocity of the particle at that instant is _____ m/s.

Options :

691121608. $50\hat{i} + 100\hat{j}$

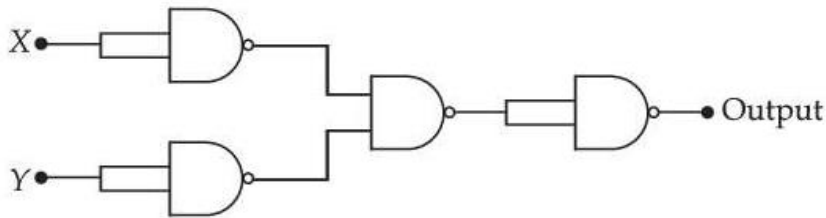
691121609. $100\hat{i} + 50\hat{j}$

691121610. $-50\hat{i} + 100\hat{j}$

691121611. $50\hat{i} - 100\hat{j}$

Question Number : 30 Question Id : 691121180 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If X and Y are the inputs, the given circuit works as _____.



Options :

691121612. OR gate

691121613. AND gate

691121614. NAND gate

691121615. NOR gate

Question Number : 31 Question Id : 691121181 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If a body of mass 1 kg falls on the earth from infinity, it attains velocity (v) and kinetic energy (k) on reaching the surface of earth. The values of v and k respectively are _____.

(Take radius of earth to be 6400 km and $g = 9.8 \text{ m/s}^2$)

Options :

691121616. 11.2 km/s; $6.27 \times 10^7 \text{ J}$

691121617. 11.2 km/s; $12.54 \times 10^7 \text{ J}$

691121618. 8.8 km/s; $6.27 \times 10^7 \text{ J}$

691121619. 8.8 km/s; $12.54 \times 10^7 \text{ J}$

Question Number : 32 Question Id : 691121182 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In a screw gauge the zero of main scale reference line coincides with the fifth division of the circular scale when two studs are in contact. There are 100 divisions in circular scale and pitch of screw gauge is 0.1 mm. When diameter of a sphere is measured, the reading of main scale is 5 mm and 50th division of circular scale coincides with the reference line of main scale. The diameter of sphere is _____ mm.

Options :

691121620. 5.045

691121621. 5.055

691121622. 5.450

691121623. 5.550

Question Number : 33 Question Id : 691121183 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The surface tension of a soap bubble is 0.03 N/m. The work done in increasing the diameter of bubble from 2 cm to 6 cm is $\alpha\pi \times 10^{-4}$ J. The value of α is _____. (Take $\pi = 3.14$)

Options :

691121624. 0.86

691121625. 0.64

691121626. 1.92

691121627. 7.68

Question Number : 34 Question Id : 691121184 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A mixture of carbon dioxide and oxygen has volume 8310 cm³, temperature 300 K, pressure 100 kPa and mass 13.2 g. The number of moles of carbon dioxide and oxygen gases in the mixture respectively are _____.

(Assume both carbon dioxide and oxygen gases behave like ideal gases) [$R = 8.31$ J/mol.K]

Options :

691121628. 0.15 and 0.18

691121629. 0.25 and 0.08

691121630. 0.21 and 0.12

691121631. 0.13 and 0.20

Question Number : 35 Question Id : 691121185 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If an air bubble of diameter 2 mm rises steadily through a liquid of density 2000 kg/m³ at a rate of 0.5 cm/s, then the coefficient of viscosity of liquid is _____ Poise. (Take $g = 10$ m/s²)

Options :

691121632. 0.88

691121633. 8.8

691121634. 88.8

691121635. 0.088

Question Number : 36 Question Id : 691121186 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A spherical ball of mass 2 kg falls from a height of 10 m and is brought to rest after penetrating 10 cm into sand. The average force exerted by sand on the ball is _____ N.

(Take $g = 10 \text{ m/s}^2$)

Options :

691121636. 1980

691121637. 2020

691121638. 2000

691121639. 1000

Question Number : 37 Question Id : 691121187 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An electromagnetic wave travels in free space along the x -direction. At a particular point in space and time, $\vec{B} = 2 \times 10^{-7} \hat{j} \text{ T}$ is associated with this wave. The value of corresponding electric field $\vec{E}$ at this point is _____ V/m.

Options :

691121640. $60 \hat{k}$ 691121641. $-60 \hat{k}$ 691121642. $30 \hat{k}$ 691121643. $-600 \hat{k}$

Question Number : 38 Question Id : 691121188 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two resistors of 200Ω and 400Ω are connected in series with a battery of 100 V. A bulb rated at 200 V, 100 W is connected across the 400Ω resistance. The potential drop across the bulb is _____ V.

Options :

691121644. 25

691121645. 50

691121646. 66.6

691121647. 100

Question Number : 39 Question Id : 691121189 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two metal plates (A, B) are kept horizontally with separation of $\left(\frac{12}{\pi}\right)$ cm, with plate A on the top.

An atomizer jet sprays oil (density 1.5 g/cm^3) droplets of radius 1 mm horizontally. All oil droplets carry a charge 5 nC. The potentials V_A and V_B are required on plates A and B respectively in order to ensure the droplets do not descend. The values of V_A and V_B are _____.

(Neglect the air resistance to the droplets and take $g = 10 \text{ m/s}^2$)

Options :

691121648. 100 V and 580 V

691121649. 580 V and 100 V

691121650. 60 V and 400 V

691121651. 0 V and -200 V

Question Number : 40 Question Id : 691121190 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two point charges $8 \mu\text{C}$ and $-2 \mu\text{C}$ are located at $x = 2 \text{ cm}$ and $x = 4 \text{ cm}$, respectively on the x -axis. The ratio of electric flux due to these charges through two spheres of radii 3 cm and 5 cm with their centers at the origin is _____.

Options :

691121652. 4 : 1

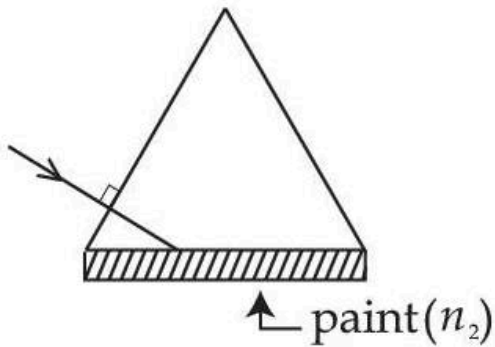
691121653. 3 : 4

691121654. 4 : 3

691121655. 4 : 5

Question Number : 41 Question Id : 691121191 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

One side of an equilateral prism is painted by a transparent material of refractive index n_2 . The refractive index of prism is 1.6. The minimum value of n_2 required for total internal reflection from painted face is _____.



Options :

691121656. $3\sqrt{3}/1.6$

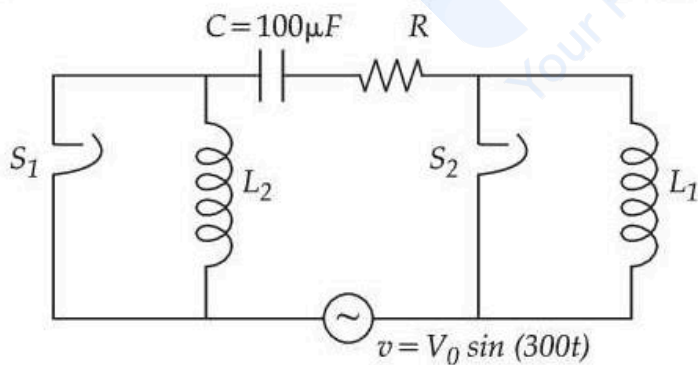
691121657. $\sqrt{3}$

691121658. $3.2/\sqrt{3}$

691121659. $4\sqrt{3}/5$

Question Number : 42 Question Id : 691121192 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The figure given below shows an LCR series circuit with two switches S_1 and S_2 . When switch S_1 is closed keeping S_2 open, the phase difference (ϕ) between the current and source voltage is 30° and phase difference is 60° when S_2 is closed keeping S_1 open. The value of $(3L_1 - L_2)$ is _____ H.



Options :

691121660. $\frac{9}{2}$

691121661. $\frac{2}{9}$

691121662. $\frac{1}{3}$

691121663. 3

Question Number : 43 Question Id : 691121193 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A circular current loop of radius R is placed inside square loop of side length L ($L \gg R$) such that they are co-planar and their centers coincide. The permeability of free space is μ_0 . The mutual inductance between circular loop and square loop is _____.

Options :

691121664. $2\sqrt{2} \frac{\mu_0 L^2}{R}$

691121665. $\sqrt{2} \frac{\mu_0 L^2}{R}$

691121666. $\sqrt{2} \frac{\mu_0 R^2}{L}$

691121667. $2\sqrt{2} \frac{\mu_0 R^2}{L}$

Question Number : 44 Question Id : 691121194 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The binding energy per nucleon of ${}^{209}_{83}\text{Bi}$ is _____ MeV.

[Take $m({}^{209}_{83}\text{Bi}) = 208.980388 \text{ u}$, $m_p = 1.007825 \text{ u}$, $m_n = 1.008665 \text{ u}$, $1 \text{ u} = 931 \text{ MeV}/c^2$]

Options :

691121668. 7.48

691121669. 7.84

691121670. 8.79

691121671. 6.94

Question Number : 45 Question Id : 691121195 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The equation of motion of a particle is given by $x = a \sin\left(50t + \frac{\pi}{3}\right) \text{ cm}$. The particle will come to rest at time t_1 and it will have zero acceleration at time t_2 . The t_1 and t_2 respectively are _____.

Options :

691121672. $\frac{\pi}{300} \text{ s}, \frac{\pi}{75} \text{ s}$

691121673. $\frac{\pi}{75} \text{ s}, \frac{\pi}{300} \text{ s}$

691121674. $\frac{\pi}{300} \text{ s}, \frac{\pi}{25} \text{ s}$

691121675. $\frac{\pi}{50} \text{ s}, \frac{\pi}{100} \text{ s}$

Physics Section B

Section Id :	69112116
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 :	69112116
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 46 Question Id : 691121196 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In a Young's double slit experiment, the intensity at some point on the screen is found to be $\frac{3}{4}$ times of the maximum of the interference pattern. The path difference between the interfering waves at this point is $\frac{\lambda}{x}$ where λ is wavelength of the incident light. 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 : 47 Question Id : 691121197 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Using Bohr's model, calculate the ratio of the magnetic fields generated due to the motion of the electrons in the 2nd and 4th orbits of hydrogen atom _____.

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 : 691121198 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

5 moles of unknown gas is heated at constant volume from 10°C to 20°C . The molar specific heat of this gas at constant pressure $c_p = 8 \text{ cal/mol.}^{\circ}\text{C}$ and $R = 8.36 \text{ J/mol.}^{\circ}\text{C}$. The change in the internal energy of the gas is _____ calorie.

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 : 691121199 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If sunlight is focused on a paper using convex lens, it starts burning the paper in shortest time when the lens is kept at 30 cm above the paper. If the radius of curvature of the lens is 60 cm then the

refractive index of the lens material is $\frac{\alpha}{10}$. The value of α is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

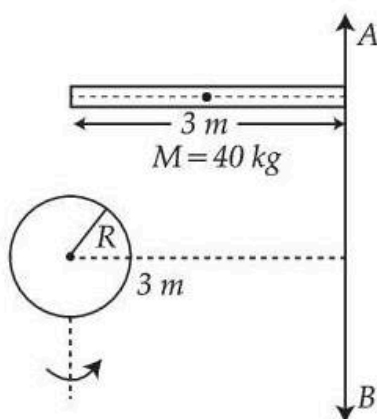
Possible Answers :

1

Question Number : 50 Question Id : 691121200 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Moment of inertia about an axis AB for a rod of mass 40 kg and length 3 m is same as that of a solid sphere of mass of 10 kg and radius R about an axis parallel to AB axis with separation of

3 m as shown in figure below. The value of R is given as $\sqrt{\frac{\alpha}{2}}$. 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

Chemistry Section A

Section Id :

69112117

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 :	69112117
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 51 Question Id : 691121201 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The ratio of mass percentage (w/w) of C : H in a hydrocarbon is 12 : 1. It has two carbon atoms. The weight (in g) of $\text{CO}_2(\text{g})$ formed when 3.38 g of this hydrocarbon is completely burnt in oxygen is : (Given : Molar mass in g mol^{-1} C : 12, H : 1, , O : 16)

Options :

691121681. 5.68
691121682. 11.44
691121683. 22.74
691121684. 17.05

Question Number : 52 Question Id : 691121202 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The first and second ionization constants of a weak dibasic acid H_2A are 8.1×10^{-8} and 1.0×10^{-13} respectively. 0.1 mol of H_2A was dissolved in 1L of 0.1 M HCl solution. The concentration of HA^- in the resultant solution is :

Options :

691121685. 0.1 M
691121686. 9.53×10^{-6} M
691121687. 8.1×10^{-8} M
691121688. 1.0×10^{-13} M

Question Number : 53 Question Id : 691121203 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

SF_4 is isostructural with :

- A. $\text{BrF}_4^\ominus$
- B. CH_4
- C. $\text{IF}_4^\oplus$
- D. XeF_4
- E. XeO_2F_2

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

Options :

691121689. C Only

691121690. C and E Only

691121691. A and D Only

691121692. B and E Only

Question Number : 54 Question Id : 691121204 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Gas 'A' undergoes change from state 'X' to state 'Y'. In this process, the heat absorbed and work done by the gas is 10 J and 18 J respectively. Now gas is brought back to state 'X' by another process during which 6 J of heat is evolved. In the reverse process of 'Y' to 'X',

Options :

691121693. 18 J of the work is done by the gas 'A'.

691121694. 2 J of the work is done by the gas 'A'.

691121695. 12 J of the work is done on the gas 'A' by the surrounding.

691121696. 14 J of the work is done on the gas 'A' by the surrounding.

Question Number : 55 Question Id : 691121205 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Solution A is prepared by dissolving 1 g of a protein (molar mass = 50000 g mol^{-1}) in 0.5 L of water at 300 K. Its osmotic pressure is x bar. Solution B is made by dissolving 2 g of same protein in 1 L of water at 300 K. Osmotic pressure of solution B is y bar. Entire solution of A is mixed with entire solution of B at same temperature. The osmotic pressure of resultant solution is z bar. x , y and z respectively are :

($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

Options :

691121697. 9.96×10^{-4} ; 9.96×10^{-4} ; 9.96×10^{-4}

691121698. 9.96×10^{-4} ; 9.96×10^{-4} ; 19.92×10^{-4}

691121699. 4.98×10^{-4} ; 4.98×10^{-4} ; 9.96×10^{-4}

691121700. 4.98×10^{-4} ; 4.98×10^{-4} ; 4.98×10^{-4}

Question Number : 56 Question Id : 691121206 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

At 25°C, 20.0 mL of 0.2 M weak monoprotic acid HX is titrated against 0.2 M NaOH. The pH of the solution (a) at the start of the titration (when NaOH has not been added) and (b) when 10 mL of NaOH is added respectively, are :

Given : $K_a = 5 \times 10^{-4}$

$pK_a = 3.3$

$\alpha \ll 1$

(a) (b)

Options :

691121701. 0.7 2.0

691121702. 2.0 3.3

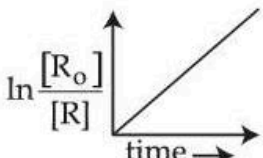
691121703. 1.1 2.2

691121704. 3.0 2.2

Question Number : 57 Question Id : 691121207 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the reaction $aX \rightarrow bY$, for which the rate constant at 30°C is $1 \times 10^{-3} \text{ mol}^{-1} \text{ L s}^{-1}$. Which of the following statements are true ?

- A. When concentration of 'X' is increased to four times, the rate of reaction becomes 16 times.
- B. The reaction is a second order reaction.
- C. The half-life period is independent of the concentration of X.
- D. Decomposition of N_2O_5 is an example of the above reaction.

E.  is valid for the above reaction.

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

Options :

691121705. A and B Only

691121706. A, B and C Only

A, B, D and E Only

691121707.

C and D Only

691121708.

Question Number : 58 Question Id : 691121208 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The correct set that contains all kinds (basic, acidic, amphoteric and neutral) of oxides is :

Options :

 Na_2O , K_2O , Al_2O_3 and As_2O_3

691121709.

 Al_2O_3 , As_2O_3 , CO and NO

691121710.

 K_2O , Cl_2O_7 , As_2O_3 and NO

691121711.

 Na_2O , N_2O , Al_2O_3 and CO

691121712.

Question Number : 59 Question Id : 691121209 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 second ionization enthalpy of B, Al and Ga is in the order of $B > Al > Ga$.

Statement II : The correct order in terms of first ionization enthalpy is $Si < Ge < Pb < Sn$.

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

Options :

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

691121713.

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

691121714.

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

691121715.

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

691121716.

Question Number : 60 Question Id : 691121210 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 : Among Zn, Mn, Sc and Cu, the energy required to remove the third valence electron is highest for Zn and lowest for Sc.

Statement II : The correct order of the following complexes in terms of CFSE is $[\text{Co}(\text{H}_2\text{O})_6]^{2+} < [\text{Co}(\text{H}_2\text{O})_6]^{3+} < [\text{Co}(\text{en})_3]^{3+}$.

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

Options :

691121717. Both **Statement I** and **Statement II** are true
691121718. Both **Statement I** and **Statement II** are false
691121719. **Statement I** is true but **Statement II** is false
691121720. **Statement I** is false but **Statement II** is true

Question Number : 61 Question Id : 691121211 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 complexes will show coordination isomerism ?

- A. $[\text{Ag}(\text{NH}_3)_2][\text{Ag}(\text{CN})_2]$
- B. $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$
- C. $[\text{Co}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
- D. $[\text{Fe}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$
- E. $[\text{Co}(\text{NH}_3)_6][\text{Fe}(\text{CN})_6]$

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

Options :

691121721. B, C and D Only
691121722. B, D and E Only
691121723. A, C and D Only
691121724. C, D and E Only

Question Number : 62 Question Id : 691121212 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Complete combustion of X g of an organic compound gave 0.25 g of CO_2 and 0.12 g of H_2O . If the % of carbon is 25% and of hydrogen is 4.89%, then $X = \text{_____} \times 10^{-3}$ g. (Nearest integer) (Molar mass of C, H and O are 12, 1 and 16 g mol^{-1} respectively.)

Options :

691121725. 273
691121726. 27
691121727. 2730
691121728. 227

Question Number : 63 Question Id : 691121213 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 : In $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{CH}^+-\text{C}_6\text{H}_4-\text{OCH}_3$, the carbocation is stabilised by + R effect of $-\text{OCH}_3$ group.

Statement II : In $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{CH}^--\text{C}_6\text{H}_4-\text{OCH}_3$, the carbanion is stabilised by $-R$ effect of $-\text{NO}_2$ group.

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

Options :

691121729. Both **Statement I** and **Statement II** are true

691121730. Both **Statement I** and **Statement II** are false

691121731. **Statement I** is true but **Statement II** is false

691121732. **Statement I** is false but **Statement II** is true

Question Number : 64 Question Id : 691121214 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The compound (X) on

- (i) on heating in the presence of anhydrous AlCl_3 and HCl gas gives 2,4-dimethyl pentane
- (ii) aromatization gives toluene and
- (iii) cyclisation gives methyl cyclohexane

The correct name of compound (X) is :

Options :

691121733. Hept-2-ene

691121734. Hept-1,3,5-triene

691121735. Heptane

691121736. Hept-2,4,6-triene

Question Number : 65 Question Id : 691121215 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Correct statements regarding alkyl halides ($R-X$) among the following are :

- A. Alcohol being less polar solvent as compared to water, alcoholic KOH favours elimination reaction with $R-X$.
- B. Order of reactivity towards S_N1 mechanism is $C_6H_5-CH_2-Cl > C_6H_5-CHCl-C_6H_5$.
- C. Non substituted aryl halides exhibit properties similar to alkyl halides.
- D. Vinyl chloride is an example of haloalkene and allyl chloride is an example of haloalkyne.
- E. $R-Cl$ can be prepared by reacting $R-OH$ with $SOCl_2$ but $Ar-Cl$ cannot be prepared by reacting $Ar-OH$ with $SOCl_2$.

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

Options :

A, B and C Only

691121737.

B and D Only

691121738.

A and E Only

691121739.

D and E Only

691121740.

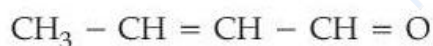
Question Number : 66 Question Id : 691121216 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An organic compound " x " where molar ratio of C, O and H are equal, on treatment with 50% KOH under reflux followed by acidification produced " y ". The most likely structure of " y " is :
[Molar mass of ' x ' is 58 g mol^{-1}]

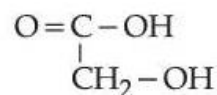
Options :



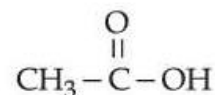
691121741.



691121742.



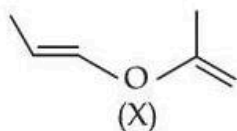
691121743.



691121744.

Question Number : 67 Question Id : 691121217 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A molecule (X) with following structure under mild acidic condition is hydrolysed to produce (Y) and (Z). Identify the correct statements about (Y) and (Z).



- A. Both (Y) and (Z) have same molar mass.
- B. (Y) and (Z) can be distinguished from each other by NaHCO_3 .
- C. (Y) and (Z) react with HCN with same rates.
- D. (Y) and (Z) undergo addition reaction with 2,4-DNP.

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

Options :

A, B and C Only

691121745.

B and C Only

691121746.

C and D Only

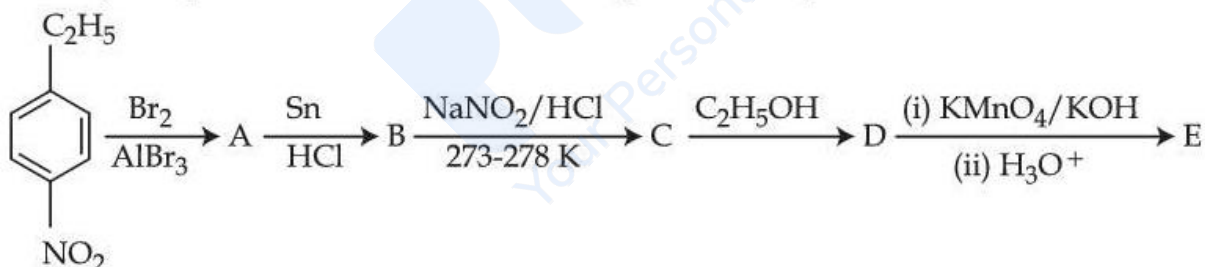
691121747.

A and D Only

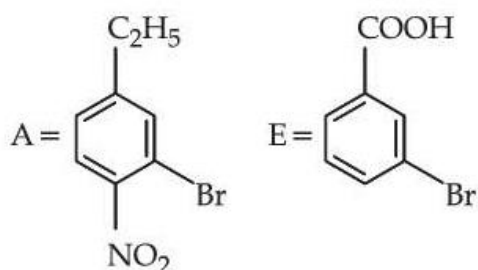
691121748.

Question Number : 68 Question Id : 691121218 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

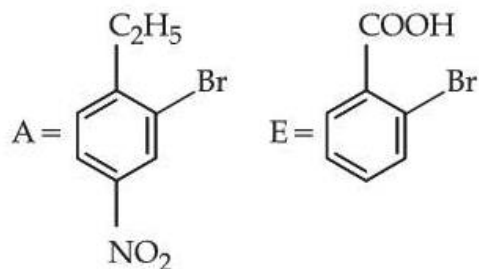
Identify compounds A and E in the following reaction sequence.



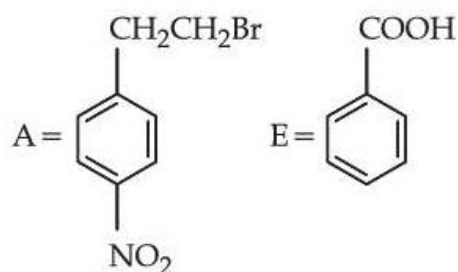
Options :



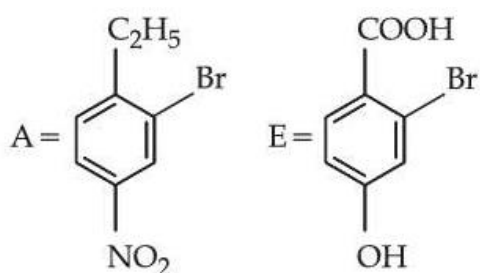
691121749.



691121750.



691121751.



691121752.

Question Number : 69 Question Id : 691121219 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is
 Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Identify the correct pair having amino acid (A) and the hormone (B) that is iodinated derivative of the amino acid (A).

(T and Y represent one letter code for amino acids)

Amino acid (A)

Hormone (B)

Options :

691121753. T Insulin

691121754. T Thyroxine

691121755. Y Thyroxine

691121756. Y Insulin

Question Number : 70 Question Id : 691121220 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is
 Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Among Fe^{2+} , Fe^{3+} , Cr^{2+} and Zn^{2+} , the ion that shows positive borax bead test and with highest ionisation enthalpy is :

Options :

691121757. Fe^{2+} 691121758. Zn^{2+} 691121759. Cr^{2+} 691121760. Fe^{3+}

Chemistry Section B

Section Id :	69112118
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 :	69112118
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 71 Question Id : 691121221 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The surface of sodium metal is irradiated with radiation of wavelength x nm. The kinetic energy of ejected electrons is 2.8×10^{-20} J. The work function of sodium is 2.3 eV. The value of x is _____ $\times 10^2$ nm. (Nearest integer)

(Given : $h = 6.6 \times 10^{-34}$ J s ; $1 \text{ eV} = 1.6 \times 10^{-19}$ J; $c = 3.0 \times 10^8 \text{ m s}^{-1}$)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

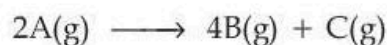
Text Areas : PlainText

Possible Answers :

1

Question Number : 72 Question Id : 691121222 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the following gas phase reaction being carried out in a closed vessel at 25°C .



<u>time</u> (min)	<u>total pressure of the</u> <u>system</u> (mm Hg)
30	300
∞	600

The pressure of C(g) at 30 minutes time interval would be _____ mm Hg. (nearest integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

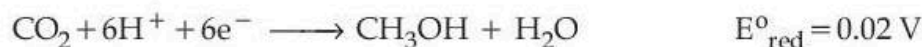
Text Areas : PlainText

Possible Answers :

1

Question Number : 73 Question Id : 691121223 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the following two half-cell reactions along with the standard reduction potential given :



A fuel cell was set up using the above two reactions such that the cell operates under the standard condition of 1 bar pressure and 298 K temperature. The fuel cell works with 80% efficiency. If the work derived from the cell using 1 mol of CH_3OH is used to compress an ideal gas isothermally against a constant pressure of 1 kPa, then the change in the volume of the gas,

$$\Delta V = \text{_____ m}^3. \text{ (nearest integer)}$$

$$\text{Given : } F = 96500 \text{ C mol}^{-1}$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

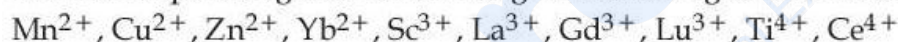
Text Areas : PlainText

Possible Answers :

1

Question Number : 74 Question Id : 691121224 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Number of paramagnetic ions among the following d- and f-block metal ions is _____.



(Atomic number of Mn = 25, Cu = 29, Zn = 30, Yb = 70, Sc = 21, La = 57, Gd = 64, Lu = 71, Ti = 22, Ce = 58)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

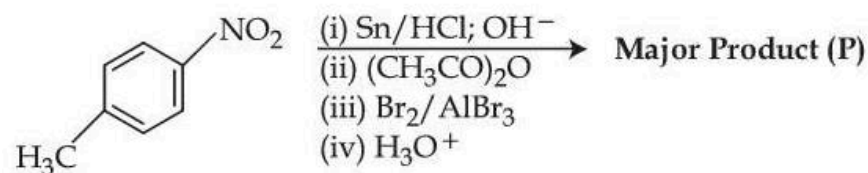
Text Areas : PlainText

Possible Answers :

1

Question Number : 75 Question Id : 691121225 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the following reactions sequence



When the product (P) is subjected to Carius analysis using AgNO_3 , 1.0 g of the product (P) will produce _____ g of the precipitate of AgBr. (Nearest Integer)

(Given : molar mass in g mol^{-1} C : 12, H : 1, O : 16, N : 14, Br : 80, Ag : 108)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

