

National Testing Agency

Question Paper Name :	B Tech 23rd Jan 2026 Shift 2
Subject Name :	B. Tech
Duration :	180
Total Marks :	300
Display Marks:	Yes

B. Tech

Group Number :	1
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 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
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 1 Question Id : 444792455 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The system of linear equations

$$x + y + z = 6$$

$$2x + 5y + az = 36$$

$$x + 2y + 3z = b$$

has

Options :

4447921547. unique solution for $a = 8$ and $b = 14$

4447921548. unique solution for $a = 8$ and $b = 16$

4447921549. infinitely many solutions for $a = 8$ and $b = 14$

4447921550. infinitely many solutions for $a = 8$ and $b = 16$

Question Number : 2 Question Id : 444792459 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the mean and the variance of the data

Class	4-8	8-12	12-16	16-20
Frequency	3	λ	4	7

are μ and 19 respectively, then the value of $\lambda + \mu$ is

Options :

4447921563. 18

4447921564. 19

4447921565. 20

4447921566. 21

Question Number : 3 Question Id : 444792469 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

$$\text{Let } I(x) = \int \frac{3dx}{(4x+6)(\sqrt{4x^2+8x+3})} \text{ and } I(0) = \frac{\sqrt{3}}{4} + 20. \text{ If}$$

$$I\left(\frac{1}{2}\right) = \frac{a\sqrt{2}}{b} + c, \text{ where } a, b, c \in \mathbb{N}, \gcd(a, b) = 1, \text{ then } a + b + c \text{ is equal to}$$

Options :

4447921603. 28

4447921604. 29

4447921605. 30

4447921606. 31

Question Number : 4 Question Id : 444792461 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An equilateral triangle OAB is inscribed in the parabola $y^2 = 4x$ with the vertex O at the vertex of the parabola. Then the minimum distance of the circle having AB as a diameter from the origin is

Options :

4447921571. $2(8 - 3\sqrt{3})$

4447921572. $4(6 + \sqrt{3})$

4447921573. $2(3 + \sqrt{3})$

4447921574. $4(3 - \sqrt{3})$

Question Number : 5 Question Id : 444792453 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 the real solutions of the equation

$$\log_{(x+3)}(6x^2 + 28x + 30) = 5 - 2\log_{(6x+10)}(x^2 + 6x + 9) \text{ is equal to}$$

Options :

4447921539. 0

4447921540. 1

4447921541. 2

4447921542. 4

Question Number : 6 Question Id : 444792468 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The least value of $(\cos^2 \theta - 6\sin \theta \cos \theta + 3\sin^2 \theta + 2)$ is

Options :

4447921599. $4 + \sqrt{10}$

4447921600. $4 - \sqrt{10}$

4447921601. -1

4447921602. 1

Question Number : 7 Question Id : 444792451 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $A = \{0, 1, 2, \dots, 9\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $|x - y|$ is a multiple of 3.

Given below are two statements:

Statement I: $n(R) = 36$.

Statement II: R is an equivalence relation.

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

Options :

4447921531. Both Statement I and Statement II are correct

4447921532. Both Statement I and Statement II are incorrect

4447921533. Statement I is correct but Statement II is incorrect

4447921534. Statement I is incorrect but Statement II is correct

Question Number : 8 Question Id : 444792470 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 enclosed between the circles $x^2 + y^2 = 4$ and $x^2 + (y - 2)^2 = 4$ is:

Options :

4447921607. $\frac{4}{3}(2\pi - 3\sqrt{3})$

4447921608. $\frac{2}{3}(4\pi - 3\sqrt{3})$

4447921609. $\frac{2}{3}(2\pi - 3\sqrt{3})$

4447921610. $\frac{4}{3}(2\pi - \sqrt{3})$

Question Number : 9 Question Id : 444792458 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Bag A contains 9 white and 8 black balls, while bag B contains 6 white and 4 black balls. One ball is randomly picked up from the bag B and mixed up with the balls in the bag A. Then a ball is randomly drawn from the bag A. If the probability, that the ball drawn is white, is $\frac{p}{q}$, $\gcd(p, q) = 1$, then $p + q$ is equal to

Options :

4447921559. 23

4447921560. 22

4447921561. 21

4447921562. 24

Question Number : 10 Question Id : 444792460 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the points of intersection of the ellipses $x^2 + 2y^2 - 6x - 12y + 23 = 0$ and $4x^2 + 2y^2 - 20x - 12y + 35 = 0$ lie on a circle of radius r and centre (a, b) , then the value of $ab + 18r^2$ is

Options :

4447921567. 51

4447921568. 55

4447921569. 53

4447921570. 52

Question Number : 11 Question Id : 444792467 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $f(x) = \begin{cases} \frac{a|x| + x^2 - 2(\sin|x|)(\cos|x|)}{x} & , x \neq 0 \\ b & , x = 0 \end{cases}$

is continuous at $x = 0$, then $a + b$ is equal to

Options :

4447921595. 0

4447921596. 1

4447921597. 2

4447921598. 4

Question Number : 12 Question Id : 444792466 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a} \times \vec{b} = 2(\vec{a} \times \vec{c})$. If $|\vec{a}| = 1, |\vec{b}| = 4, |\vec{c}| = 2$, and the angle between $\vec{b}$ and $\vec{c}$ is 60° , then $|\vec{a} \cdot \vec{c}|$ is equal to

Options :

4447921591. 0

4447921592. 1

4447921593. 2

4447921594. 4

Question Number : 13 Question Id : 444792465 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$, $\vec{c} = \lambda\hat{i} + \hat{j} + \hat{k}$ and $\vec{v} = \vec{a} \times \vec{b}$. If $\vec{v} \cdot \vec{c} = 11$ and the length of the projection of $\vec{b}$ on $\vec{c}$ is p , then $9p^2$ is equal to

Options :

4447921587. 4

4447921588. 6

4447921589. 9

4447921590. 12

Question Number : 14 Question Id : 444792462 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let PQ be a chord of the hyperbola $\frac{x^2}{4} - \frac{y^2}{b^2} = 1$, perpendicular to the x-axis

such that OPQ is an equilateral triangle, O being the centre of the hyperbola. If the eccentricity of the hyperbola is $\sqrt{3}$, then the area of the triangle OPQ is

Options :

4447921575. $\frac{8\sqrt{3}}{5}$

4447921576. $2\sqrt{3}$

4447921577. $\frac{9}{5}$

4447921578. $\frac{11}{5}$

Question Number : 15 Question Id : 444792464 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\frac{\pi}{2} < \theta < \pi$ and $\cot \theta = -\frac{1}{2\sqrt{2}}$. Then the value of

$$\sin\left(\frac{15\theta}{2}\right)(\cos 8\theta + \sin 8\theta) + \cos\left(\frac{15\theta}{2}\right)(\cos 8\theta - \sin 8\theta)$$

is equal to

Options :

4447921583. $\frac{\sqrt{2}-1}{\sqrt{3}}$

4447921584. $\frac{1-\sqrt{2}}{\sqrt{3}}$

4447921585. $\frac{\sqrt{2}}{\sqrt{3}}$

4447921586. $-\frac{\sqrt{2}}{\sqrt{3}}$

Question Number : 16 Question Id : 444792454 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}$, $i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to

Options :

4447921543. 0

4447921544. -1

4447921545. 1

4447921546. 256

Question Number : 17 Question Id : 444792452 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider two sets $A = \{x \in \mathbb{Z} : |(|x-3|-3)| \leq 1\}$ and

$$B = \left\{ x \in \mathbb{R} - \{1, 2\} : \frac{(x-2)(x-4)}{x-1} \log_e(|x-2|) = 0 \right\}.$$

Then the number of onto functions $f: A \rightarrow B$ is equal to

Options :

4447921535. 32

4447921536. 62

4447921537. 79

4447921538. 81

Question Number : 18 Question Id : 444792463 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, 2) and C(-3, -6) be two diagonally opposite vertices of a rhombus, whose sides AD and BC are parallel to the line $7x - y = 14$. If B (α , β) and D (γ , δ) are the other two vertices, then $|\alpha + \beta + \gamma + \delta|$ is equal to

Options :

4447921579. 1

4447921580. 3

4447921581. 6

4447921582. 9

Question Number : 19 Question Id : 444792456 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\sum_{k=1}^n a_k = \alpha n^2 + \beta n$. If $a_{10} = 59$ and $a_6 = 7a_1$, then $\alpha + \beta$ is equal to

Options :

4447921551. 3

4447921552. 5

4447921553. 7

4447921554. 12

Question Number : 20 Question Id : 444792457 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 ways, in which 16 oranges can be distributed to four children such that each child gets at least one orange, is

Options :

4447921555. 384

4447921556. 403

4447921557. 455

4447921558. 429

Mathematics Section B

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
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 21 Question Id : 444792472 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let S denote the set of 4-digit numbers $abcd$ such that $a > b > c > d$ and P denote the set of 5-digit numbers having product of its digits equal to 20. Then $n(S) + n(P)$ is equal to ____

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 22 Question Id : 444792473 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If the image of the point $P(a, 2, a)$ in the line $\frac{x}{2} = \frac{y+a}{1} = \frac{z}{1}$ is Q and the image of Q in the line $\frac{x-2b}{2} = \frac{y-a}{1} = \frac{z+2b}{-5}$ is P, then $a + b$ is equal to ____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 23 Question Id : 444792471 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and B be a matrix such that $B(I - A) = I + A$. Then the sum of the diagonal elements of $B^T B$ is equal to ____

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 24 Question Id : 444792474 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The number of elements in the

set $S = \left\{ x : x \in [0, 100] \text{ and } \int_0^x t^2 \sin(x-t) dt = x^2 \right\}$ is ____

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 25 Question Id : 444792475 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If the solution curve $y = f(x)$ of the differential equation

$(x^2 - 4)y' - 2xy + 2x(4 - x^2)^2 = 0$, $x > 2$,

passes through the point (3, 15), then the local maximum value of f is ____

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Physics Section A

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
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 26 Question Id : 444792481 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A small metallic sphere of diameter 2 mm and density 10.5 g/cm^3 is dropped in glycerine having viscosity 10 Poise and density 1.5 g/cm^3 respectively. The terminal velocity attained by the sphere is ____ cm/s.

$$(\pi = \frac{22}{7} \text{ and } g = 10 \text{ m/s}^2)$$

Options :

4447921636. 1.0

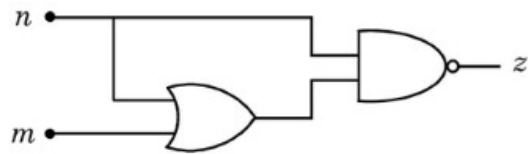
4447921637. 1.5

4447921638. 2.0

4447921639. 3.0

Question Number : 27 Question Id : 444792495 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For the given logic gate circuit, which of the following is the correct truth table ?



Options :

n	m	z
0	0	1
0	1	0
1	1	0
1	0	0

4447921692.

n	m	z
0	0	1
0	1	0
1	1	1
1	0	0

4447921693.

n	m	z
0	0	1
0	1	1
1	1	0
1	0	0

4447921694.

n	m	z
0	0	0
0	1	1
1	1	0
1	0	1

4447921695.

Question Number : 28 Question Id : 444792482 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An air bubble of volume 2.9 cm^3 rises from the bottom of a swimming pool of 5 m deep. At the bottom of the pool water temperature is 17°C . The volume of the bubble when it reaches the surface, where the water temperature is 27°C , is _____ cm^3 .

($g = 10 \text{ m/s}^2$, density of water = 10^3 kg/m^3 , and 1 atm pressure is 10^5 Pa)

Options :

4447921640. 4.2

4447921641. 2.0

4447921642. 3.0

4447921643. 4.5

Question Number : 29 Question Id : 444792490 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A circular loop of radius 7 cm is placed in uniform magnetic field of 0.2 T directed perpendicular to plane of loop. The loop is converted into a square loop in 0.5 s. The EMF induced in the loop is _____ mV.

Options :

4447921672. 1.32

4447921673. 13.2

4447921674. 6.6

4447921675. 8.25

Question Number : 30 Question Id : 444792480 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 14 kg initially at rest explodes and breaks into three fragments of masses in the ratio 2 : 2 : 3. The two pieces of equal masses fly off perpendicular to each other with a speed of 18 m/s each. The velocity of the heavier fragment is _____ m/s.

Options :

4447921632. $12\sqrt{2}$

4447921633. $10\sqrt{2}$

4447921634. 12

4447921635. $24\sqrt{2}$

Question Number : 31 Question Id : 444792494 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 pair of nuclei are isobars of the element?

Options :

4447921688. ${}^2_1\text{H}$ and ${}^3_1\text{H}$

4447921689. ${}^{236}_{92}\text{U}$ and ${}^{238}_{92}\text{U}$

4447921690. ${}^3_1\text{H}$ and ${}^3_2\text{He}$

4447921691. ${}^{198}_{80}\text{Hg}$ and ${}^{197}_{79}\text{Au}$

Question Number : 32 Question Id : 444792491 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 speeds of electromagnetic waves in vacuum and a medium, having dielectric constant $k = 3$ and permeability of $\mu = 2\mu_0$, is

(μ_0 = permeability of vacuum)

Options :

4447921676. 3 : 2

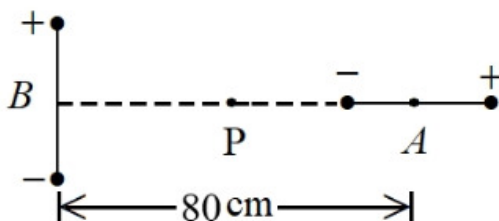
4447921677. 6 : 1

4447921678. 36 : 1

4447921679. $\sqrt{6} : 1$

Question Number : 33 Question Id : 444792488 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two short dipoles (A, B), A having charges $\pm 2 \mu\text{C}$ and length 1 cm and B having charges $\pm 4 \mu\text{C}$ and length 1 cm are placed with their centres 80 cm apart as shown in the figure. The electric field at a point P , equi-distant from the centres of both dipoles is _____ N/C.



Options :

4447921664. $9\sqrt{2} \times 10^4$

4447921665. $\frac{9}{16}\sqrt{2} \times 10^4$

4447921666. $\frac{9}{16}\sqrt{2} \times 10^5$

4447921667. $4.5\sqrt{2} \times 10^4$

Question Number : 34 Question Id : 444792484 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The internal energy of a monoatomic gas is $3nRT$. One mole of helium is kept in a cylinder having internal cross section area of 17 cm^2 and fitted with a light movable frictionless piston. The gas is heated slowly by supplying 126 J heat. If the temperature rises by 4°C , then the piston will move _____ cm.

(atmospheric pressure = 10^5 Pa)

Options :

4447921648. 15.5

4447921649. 14.5

4447921650. 1.55

4447921651. 1.45

Question Number : 35 Question Id : 444792476 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

To compare EMF of two cells using potentiometer the balancing lengths obtained are 200 cm and 150 cm . The least count of scale is 1 cm . The percentage error in the ratio of EMFs is _____

Options :

4447921616. 1.45

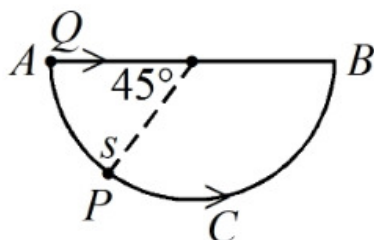
4447921617. 1.55

4447921618. 1.65

4447921619. 1.75

Question Number : 36 Question Id : 444792478 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A bead P sliding on a frictionless semi-circular string (ACB) and it is at point S at $t = 0$ and at this instant the horizontal component of its velocity is v . Another bead Q of the same mass as P is ejected from point A at $t = 0$ along the horizontal string AB , with the speed v , friction between the beads and the respective strings may be neglected in both cases. Let t_P and t_Q be the respective times taken by beads P and Q to reach the point B , then the relation between t_P and t_Q is



Options :

4447921624. $t_P < t_Q$

4447921625. $t_P > t_Q$

4447921626. $t_P = t_Q$

4447921627. $t_P > 1.25t_Q$

Question Number : 37 Question Id : 444792485 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A parallel plate capacitor with plate separation 5 mm is charged by a battery. On introducing a mica sheet of 2 mm and maintaining the connections of the plates with the terminals of the battery, it is found that it draws 25% more charge from the battery. The dielectric constant of mica is _____.

Options :

4447921652. 2.5

4447921653. 1.0

4447921654. 1.5

4447921655. 2.0

Question Number : 38 Question Id : 444792483 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

One mole of an ideal diatomic gas expands from volume V to $2V$ isothermally at a temperature 27°C and does W joule of work. If the gas undergoes same magnitude of expansion adiabatically from 27°C doing the same amount of work W , then its final temperature will be (close to) _____ $^\circ\text{C}$.

($\log_e 2 = 0.693$)

Options :

4447921644. -117

4447921645. -56

4447921646. -30

4447921647. -189

Question Number : 39 Question Id : 444792479 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A block is sliding down on an inclined plane of slope θ and at an instant $t = 0$ this block is given an upward momentum so that it starts moving up on the inclined surface with velocity u . The distance (S) travelled by the block before its velocity become zero, is _____.

(g = gravitational acceleration)

Options :

4447921628. $\frac{u^2}{4g \sin \theta}$

4447921629. $\frac{u^2}{2g \cos \theta}$

4447921630. $\frac{2u^2}{g \cos \theta}$

$$4447921631. \frac{u^2}{\sqrt{2}g \cos \theta}$$

Question Number : 40 Question Id : 444792477 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A paratrooper jumps from an aeroplane and opens a parachute after 2 s of free fall and starts deaccelerating with 3 m/s^2 . At 10 m height from ground, while descending with the help of parachute, the speed of paratrooper is 5 m/s. The initial height of the airplane is _____ m.

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

Options :

4447921620. 82.5

4447921621. 62.5

4447921622. 92.5

4447921623. 20

Question Number : 41 Question Id : 444792489 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two charges $7 \mu\text{C}$ and $-2 \mu\text{C}$ are placed at $(-9, 0, 0) \text{ cm}$ and $(9, 0, 0) \text{ cm}$ respectively in an external field $E = \frac{A}{r^2} \hat{r}$, where $A = 9 \times 10^5 \text{ N/C.m}^2$.

Considering the potential at infinity is 0, the electrostatic energy of the configuration is _____ J.

Options :

4447921668. -90.7

4447921669. 1.4

4447921670. 49.3

4447921671. 24.3

Question Number : 42 Question Id : 444792486 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Suppose a long solenoid of 100 cm length, radius 2 cm having 500 turns per unit length, carries a current $I = 10 \sin(\omega t) \text{ A}$, where $\omega = 1000 \text{ rad./s}$. A circular conducting loop (B) of radius 1 cm coaxially slid through the solenoid at a speed $v = 1 \text{ cm/s}$. The r.m.s. current through the loop when the coil B is inserted 10 cm inside the solenoid is $\alpha / \sqrt{2} \mu\text{A}$. The value of α is _____.

[Resistance of the loop = 10Ω]

Options :

4447921656. 100

4447921657. 280

4447921658. 197

4447921659. 80

Question Number : 43 Question Id : 444792487 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}$ cm is 2 A. The magnetic field at its centroid is $\alpha \times 10^{-5}$ T. The value of α is _____.

(Given : $\mu_0 = 4\pi \times 10^{-7}$ SI units)

Options :

4447921660. $\sqrt{3}$

4447921661. $2\sqrt{3}$

4447921662. $3\sqrt{3}$

4447921663. $\frac{\sqrt{3}}{2}$

Question Number : 44 Question Id : 444792492 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

When an unpolarized light falls at a particular angle on a glass plate (placed in air), it is observed that the reflected beam is linearly polarized. The angle of refracted beam with respect to the normal is _____.

($\tan^{-1}(1.52) = 57.7^\circ$, refractive indices of air and glass are 1.00 and 1.52, respectively.)

Options :

4447921680. 32.3°

4447921681. 36.3°

4447921682. 39.6°

4447921683. 42.6°

Question Number : 45 Question Id : 444792493 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A prism of angle 75° and refractive index $\sqrt{3}$ is coated with thin film of refractive index 1.5 only at the back exit surface. To have total internal reflection at the back exit surface the incident angle must be _____.

($\sin 15^\circ = 0.25$ and $\sin 25^\circ = 0.43$)

Options :

4447921684. 15°

4447921685. $> 25^\circ$

4447921686. between 15° and 20°

4447921687. $< 15^\circ$

Physics Section B

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
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 46 Question Id : 444792500 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The average energy released per fission for the nucleus of ${}_{92}^{235}\text{U}$ is 190 MeV.

When all the atoms of 47 g pure ${}_{92}^{235}\text{U}$ undergo fission process, the energy released is $\alpha \times 10^{23}$ MeV. The value of α is _____.

(Avogadro Number = 6×10^{23} per mole)

Response Type : Numeric

Evaluation Required For SA : Yes

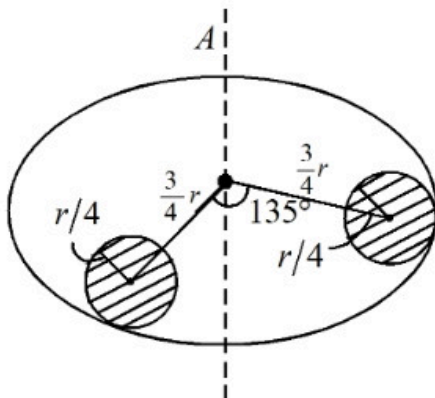
Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 47 Question Id : 444792496 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Suppose there is a uniform circular disc of mass M kg and radius r m shown in figure. The shaded regions are cut out from the disc. The moment of inertia of the remainder about the axis A of the disc is given by $\frac{x}{256} Mr^2$. The value of x is _____.



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 48 Question Id : 444792497 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A ball of radius r and density ρ dropped through a viscous liquid of density σ and viscosity η attains its terminal velocity at time t , given by $t = A \rho^a r^b \eta^c \sigma^d$, where A is a constant and a, b, c and d are integers. The value of $\frac{b+c}{a+d}$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 49 Question Id : 444792498 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The velocity of sound in air is doubled when the temperature is raised from 0°C to $\alpha^{\circ}\text{C}$. The value of α is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 50 Question Id : 444792499 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The size of the images of an object, formed by a thin lens are equal when the object is placed at two different positions 8 cm and 24 cm from the lens. The focal length of the lens is _____ cm.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

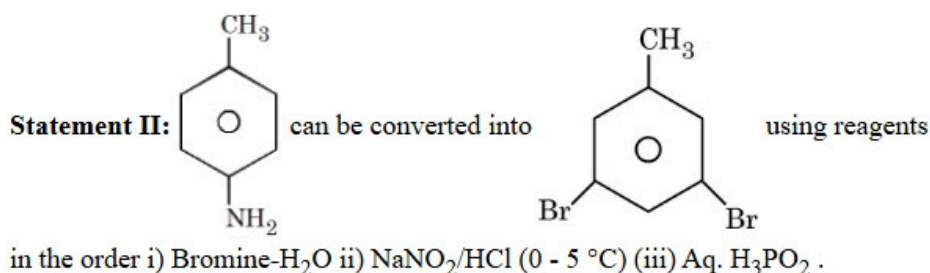
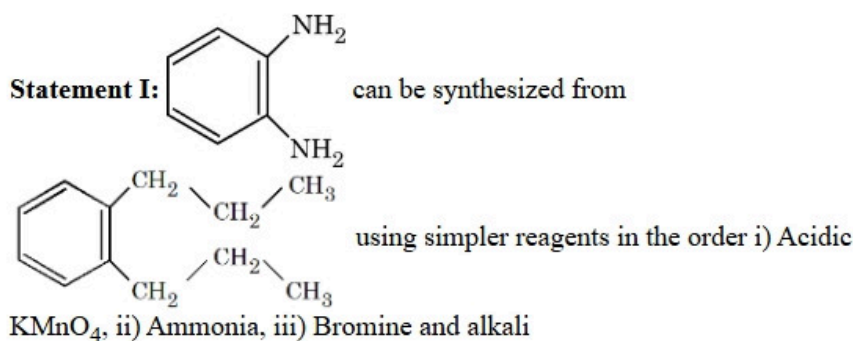
Text Areas : PlainText

Chemistry Section A

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
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 51 Question Id : 444792517 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:



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

Options :

4447921765. Both Statement I and Statement II are true

4447921766. Both Statement I and Statement II are false

4447921767. Statement I is true but Statement II is false

4447921768. Statement I is false but Statement II is true

Question Number : 52 Question Id : 444792512 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In Carius method 0.2425 g of an organic compound gave 0.5253 g silver chloride.
The percentage of chlorine in the organic compound is

Options :

4447921745. 37.57%

4447921746. 34.79%

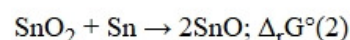
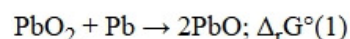
4447921747. 53.58%

4447921748. 87.65%

Question Number : 53 Question Id : 444792504 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

It is noticed that Pb^{2+} is more stable than Pb^{4+} but Sn^{2+} is less stable than Sn^{4+} .

Observe the following reactions.



Identify the correct set from the following

Options :

4447921713. $\Delta_r G^\circ(1) < 0$; $\Delta_r G^\circ(2) > 0$

4447921714. $\Delta_r G^\circ(1) < 0$; $\Delta_r G^\circ(2) < 0$

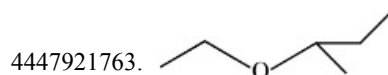
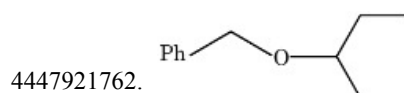
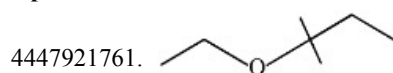
4447921715. $\Delta_r G^\circ(1) > 0$; $\Delta_r G^\circ(2) > 0$

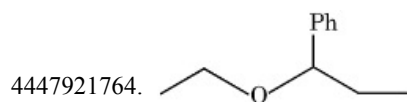
4447921716. $\Delta_r G^\circ(1) > 0$; $\Delta_r G^\circ(2) < 0$

Question Number : 54 Question Id : 444792516 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

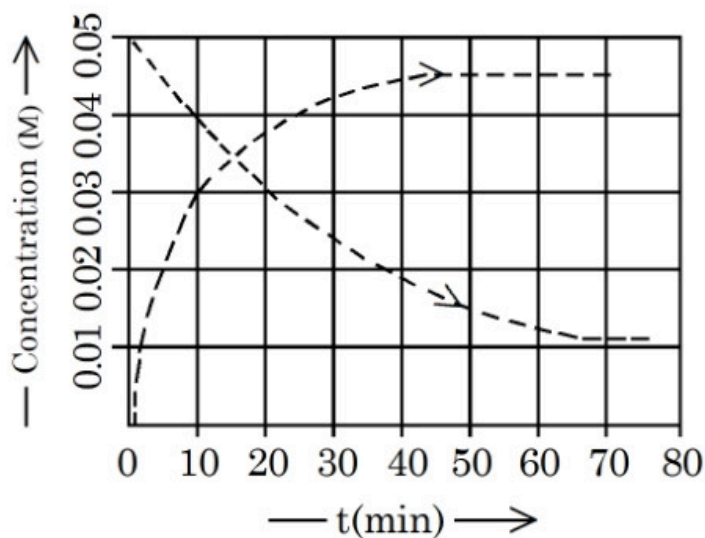
A mixed ether (P), when heated with excess of hot concentrated hydrogen iodide produces two different alkyl iodides which when treated with aq. NaOH give compounds (Q) and (R). Both (Q) and (R) give yellow precipitate with NaOI.
Identify the mixed ether (P):

Options :





Question Number : 55 Question Id : 444792506 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



Given above is the concentration vs time plot for a dissociation reaction : $A \rightarrow nB$.

Based on the data of the initial phase of the reaction (initial 10 min), the value of n is ____.

Options :

4447921721. 4

4447921722. 5

4447921723. 3

4447921724. 2

Question Number : 56 Question Id : 444792501 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The work functions of two metals (M_A and M_B) are in the 1 : 2 ratio. When these metals are exposed to photons of energy 6 eV, the kinetic energy of liberated electrons of $M_A : M_B$ is in the ratio of 2.642 : 1. The work functions (in eV) of M_A and M_B are respectively.

Options :

4447921701. 2.3, 4.6

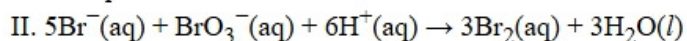
4447921702. 3.1, 6.2

4447921703. 1.5, 3.0

4447921704. 1.4, 2.8

Question Number : 57 Question Id : 444792507 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical
Observe the following reactions at T(K).

I. $A \rightarrow \text{products}$.



Both the reactions are started at 10.00 am. The rates of these reactions at 10.10 am are same. The value of $-\frac{\Delta[\text{Br}^-]}{\Delta t}$ at 10.10 am is $2 \times 10^{-4} \text{ mol L}^{-1} \text{ min}^{-1}$. The

concentration of A at 10.10 am is $10^{-2} \text{ mol L}^{-1}$. What is the first order rate constant (in min^{-1}) of reaction I?

Options :

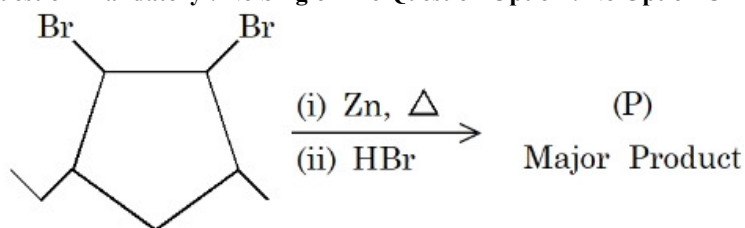
4447921725. 4×10^{-3}

4447921726. 2×10^{-3}

4447921727. 10^{-2}

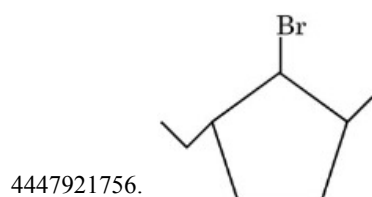
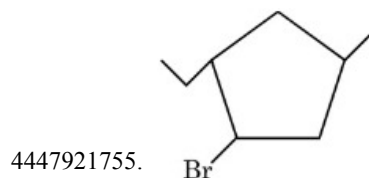
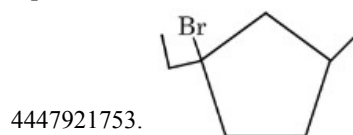
4447921728. 10^{-3}

Question Number : 58 Question Id : 444792514 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



Identify (P)

Options :



Question Number : 59 Question Id : 444792513 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: $(\text{CH}_3)_3\text{C}^\oplus$ is more stable than $\text{CH}_3^\oplus$ as nine hyperconjugation interactions are possible in $(\text{CH}_3)_3\text{C}^\oplus$.

Statement II: $\text{CH}_3^\oplus$ is less stable than $(\text{CH}_3)_3\text{C}^\oplus$ as only three hyperconjugation interactions are possible in $\text{CH}_3^\oplus$.

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

Options :

4447921749. Both Statement I and Statement II are true

4447921750. Both Statement I and Statement II are false

4447921751. Statement I is true but Statement II is false

4447921752. Statement I is false but Statement II is true

Question Number : 60 Question Id : 444792503 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Which statements are **NOT TRUE** about XeO_2F_2 ?

- A. It has a see-saw shape.
- B. Xe has 5 electron pairs in its valence shell in XeO_2F_2 .
- C. The O–Xe–O bond angle is close to 180° .
- D. The F–Xe–F bond angle is close to 180° .
- E. Xe has 16 valence electrons in XeO_2F_2 .

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

Options :

4447921709. B, C and E Only

4447921710. B and D Only

4447921711. A and D Only

4447921712. B, D and E Only

Question Number : 61 Question Id : 444792502 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Identify the INCORRECT statements from the following:

- A. Notation ${}^{24}_{12}\text{Mg}$ represents 24 protons and 12 neutrons.
- B. Wavelength of a radiation of frequency $4.5 \times 10^{15} \text{ s}^{-1}$ is $6.7 \times 10^{-8} \text{ m}$.
- C. One radiation has wavelength = λ_1 (900 nm) and energy = E_1 . Other radiation has wavelength = λ_2 (300 nm) and energy = E_2 . $E_1 : E_2 = 3 : 1$.
- D. Number of photons of light of wavelength 2000 pm that provides 1 J of energy is 1.006×10^{16} .

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

Options :

4447921705. A and B Only

4447921706. A and C Only

4447921707. A and D Only

4447921708. B and C Only

Question Number : 62 Question Id : 444792519 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Both human DNA and RNA are chiral molecules. The chirality in DNA and RNA arises due to the presence of

Options :

4447921773. D-sugar component

4447921774. L-sugar component

4447921775. Base unit

4447921776. Chiral phosphate unit

Question Number : 63 Question Id : 444792510 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The oxidation state of chromium in the final product formed in the reaction between KI and acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution is:

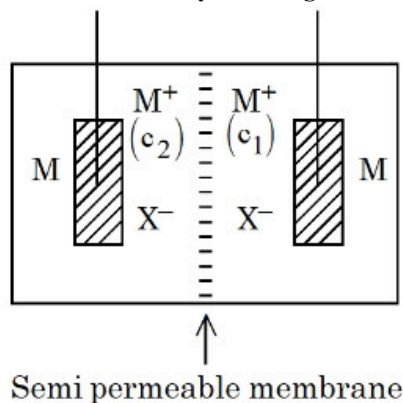
Options :

4447921737. +4

4447921738. +6

4447921739. +2

4447921740. +3



Consider the above electrochemical cell where a metal electrode (M) is undergoing redox reaction by forming M^+ ($M \rightarrow M^+ + e^-$). The cation M^+ is present in two different concentrations c_1 and c_2 as shown above. Which of the following statement is correct for generating a positive cell potential?

Options :

4447921717. If c_1 is present at cathode, then $c_1 < c_2$.

4447921718. If c_1 is present at anode, then $c_1 > c_2$.

4447921719. If c_1 is present at cathode, then $c_1 > c_2$.

4447921720. If c_1 is present at anode, then $c_1 = c_2$.

Question Number : 65 Question Id : 444792518 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A student has been given a compound "x" of molecular formula- C_6H_7N . 'x' is sparingly soluble in water. However, on addition of dilute mineral acid, 'x' becomes soluble in water. 'x' when treated with $CHCl_3$ and $KOH(alc)$, 'y' is produced. 'y' has a specific unpleasant smell. On treatment with benzenesulphonyl chloride, 'x' gives a compound 'z' which is soluble in alkali. The number of different "H" atoms present in 'z' is:-

Options :

4447921769. 5

4447921770. 4

4447921771. 7

4447921772. 8

Question Number : 66 Question Id : 444792515 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 statements are **TRUE** about Haloform reaction?:

- A. Sodium hypochlorite reacts with KI to give KOI.
- B. KOI is a reducing agent.

C. α , β -unsaturated methylketone $(\text{CH}_3 - \text{CH} = \text{CH} - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3)$ will give

iodoform reaction.

- D. Isopropyl alcohol will not give iodoform test.
- E. Methanoic acid will give positive iodoform test.

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

Options :

4447921757. A, B & C Only

4447921758. A, C & E Only

4447921759. B, D & E Only

4447921760. A & C Only

Question Number : 67 Question Id : 444792509 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Elements X and Y belong to Group 15. The difference between the electronegativity values of 'X' and phosphorus is higher than that of the difference between phosphorus and 'Y'. 'X' & 'Y' are respectively

Options :

4447921733. Bi & N

4447921734. As & Bi

4447921735. N & As

4447921736. As & Sb

Question Number : 68 Question Id : 444792520 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Iodoform test can differentiate between

- A. Methanol and Ethanol
- B. CH_3COOH and $\text{CH}_3\text{CH}_2\text{COOH}$
- C. Cyclohexene and cyclohexanone
- D. Diethyl ether and Pentan-3-one
- E. Anisole and acetone

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

Options :

4447921777. A, B & E Only

4447921778. B, C & E Only

4447921779. A & E Only

Question Number : 69 Question Id : 444792511 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** set of details from the following:

- A. $[\text{Co}(\text{NH}_3)_6]^{3+}$: Inner orbital complex; d^2sp^3 hybridized
- B. $[\text{MnCl}_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized
- C. $[\text{CoF}_6]^{3-}$: Outer orbital complex; d^2sp^3 hybridized
- D. $[\text{FeF}_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized
- E. $[\text{Ni}(\text{CN})_4]^{2-}$: Inner orbital complex; sp^3 hybridized

Choose the correct answer from the options given below:

Options :

4447921741. A, B, C, D & E

4447921742. A, B & D Only

4447921743. A, C & E Only

4447921744. C & D Only

Question Number : 70 Question Id : 444792508 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 ionisation enthalpy of Na is larger than the corresponding ionisation enthalpy of Mg.

Statement II: The ionic radius of O^{2-} is larger than that of F^- .

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

Options :

4447921729. Both Statement I and Statement II are true

4447921730. Both Statement I and Statement II are false

4447921731. Statement I is true but Statement II is false

4447921732. Statement I is false but Statement II is true

Chemistry Section B

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
Question Shuffling Allowed :	Yes

Is Section Default? :

No

Question Number : 71 Question Id : 444792521 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
Total number of unpaired electrons present in the central metal atoms/ions of $[\text{Ni}(\text{CO})_4]$, $[\text{NiCl}_4]^{2-}$, $[\text{PtCl}_2(\text{NH}_3)_2]$, $[\text{Ni}(\text{CN})_4]^{2-}$ and $[\text{Pt}(\text{CN})_4]^{2-}$ is _____.

Response Type : Numeric

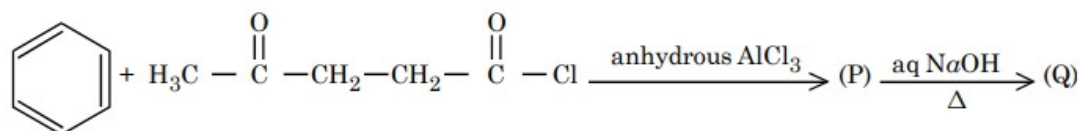
Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 72 Question Id : 444792522 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
Consider the following reaction of benzene.



In compound (Q), the percentage of oxygen is _____. (Nearest integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 73 Question Id : 444792523 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
200 cc of $x \times 10^{-3}$ M potassium dichromate is required to oxidise 750 cc of 0.6 M Mohr's salt solution in acidic medium.

Here $x =$ _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 74 Question Id : 444792525 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
Two liquids A and B form an ideal solution. At 320 K, the vapour pressure of the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is _____. (Nearest integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 75 Question Id : 444792524 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
 $\text{X}_2(\text{g}) + \text{Y}_2(\text{g}) \rightleftharpoons 2\text{Z}(\text{g})$

$\text{X}_2(\text{g})$ and $\text{Y}_2(\text{g})$ are added to a 1 L flask and it is found that the system attains the above equilibrium at T(K) with the number of moles of $\text{X}_2(\text{g})$, $\text{Y}_2(\text{g})$ and $\text{Z}(\text{g})$ being 3, 3 and 9 mol respectively (equilibrium moles). Under this condition of equilibrium, 10 mol of $\text{Z}(\text{g})$ is added to the flask and the temperature is maintained at T(K). Then the number of moles of $\text{Z}(\text{g})$ in the flask when the new equilibrium is established is _____. (Nearest integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText