

National Testing Agency

Question Paper Name :	B Tech 22nd 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 : 860654988 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Among the statements

(S1) : If $A(5, -1)$ and $B(-2, 3)$ are two vertices of a triangle, whose orthocentre is $(0, 0)$, then its third vertex is $(-4, -7)$

and

(S2) : If positive numbers $2a, b, c$ are three consecutive terms of an A.P., then the lines $ax + by + c = 0$ are concurrent at $(2, -2)$,

Options :

8606543364. both are correct

8606543365. both are incorrect

8606543366. only (S1) is correct

8606543367. only (S2) is correct

Question Number : 2 Question Id : 860654982 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let n be the number obtained on rolling a fair die. If the probability that the system

$$x - ny + z = 6$$

$$x + (n - 2)y + (n + 1)z = 8$$

$$(n - 1)y + z = 1$$

has a unique solution is $\frac{k}{6}$, then the sum of k and all possible values of n is :

Options :

8606543340. 20

8606543341. 21

8606543342. 22

8606543343. 24

Question Number : 3 Question Id : 860654979 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the domain of the function $f(x) = \log_3 \log_5 (7 - \log_2 (x^2 - 10x + 85)) + \sin^{-1} \left(\left| \frac{3x - 7}{17 - x} \right| \right)$

be $(\alpha, \beta]$. Then $\alpha + \beta$ is equal to :

Options :

8606543328. 8

8606543329. 9

8606543330. 10

8606543331. 12

Question Number : 4 Question Id : 860654991 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $[\cdot]$ denote the greatest integer function, and let $f(x) = \min \{ \sqrt{2}x, x^2 \}$.

Let $S = \{x \in (-2, 2) : \text{the function } g(x) = |x|[\cdot x^2] \text{ is discontinuous at } x\}$.

Then $\sum_{x \in S} f(x)$ equals

Options :

8606543376. $2 - \sqrt{2}$

8606543377. $1 - \sqrt{2}$

8606543378. $\sqrt{6} - 2\sqrt{2}$

8606543379. $2\sqrt{6} - 3\sqrt{2}$

Question Number : 5 Question Id : 860654983 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 deviation about the median of the numbers $k, 2k, 3k, \dots, 1000k$ is 500, then k^2 is equal to :

Options :

8606543344. 9

8606543345. 16

8606543346. 4

8606543347. 1

Question Number : 6 Question Id : 860654986 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $P(10, 2\sqrt{15})$ be a point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, whose foci are S and S' . If the length of its latus rectum is 8, then the square of the area of $\Delta PSS'$ is equal to :

Options :

8606543356. 900

8606543357. 2700

8606543358. 1462

8606543359. 4200

Question Number : 7 Question Id : 860654994 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 $A = \{(x, y) : 4x^2 + y^2 \leq 8 \text{ and } y^2 \leq 4x\}$ is :

Options :

8606543388. $\frac{\pi}{2} + \frac{1}{3}$

8606543389. $\pi + \frac{2}{3}$

8606543390. $\frac{\pi}{2} + 2$

8606543391. $\pi + 4$

Question Number : 8 Question Id : 860654987 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the locus of the mid-point of the chord through the origin O of the parabola $y^2 = 4x$ be the curve S. Let P be any point on S. Then the locus of the point, which internally divides OP in the ratio 3:1, is :

Options :

8606543360. $2y^2 = 3x$

8606543361. $3y^2 = 2x$

8606543362. $2x^2 = 3y$

8606543363. $3x^2 = 2y$

Question Number : 9 Question Id : 860654981 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is a solution of the system of equations $AX = B$, where $\text{adj } A = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}$ and

$B = \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix}$, then $|x + y + z|$ is equal to :

Options :

8606543336. 1

8606543337. $\frac{3}{2}$

8606543338. 2

8606543339. 3

Question Number : 10 Question Id : 860654978 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 quadratic equation $12x^2 - 20x + 3\lambda = 0, \lambda \in \mathbb{Z}$. If $\frac{1}{2} \leq |\beta - \alpha| \leq \frac{3}{2}$, then the sum of all possible values of λ is :

Options :

8606543324. 1

8606543325. 3

8606543326. 4

8606543327. 6

Question Number : 11 Question Id : 860654984 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let C_r denote the coefficient of x^r in the binomial expansion of $(1+x)^n, n \in \mathbb{N}, 0 \leq r \leq n$. If

$P_n = C_0 - C_1 + \frac{2^2}{3}C_2 - \frac{2^3}{4}C_3 + \dots + \frac{(-2)^n}{n+1}C_n$, then the value of $\sum_{n=1}^{25} \frac{1}{P_{2n}}$ equals.

Options :

8606543348. 675

8606543349. 525

8606543350. 650

8606543351. 580

Question Number : 12 Question Id : 860654976 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 elements in the relation $R = \{(x, y) : 4x^2 + y^2 < 52, x, y \in \mathbb{Z}\}$ is

Options :

8606543316. 67

8606543317. 77

8606543318. 86

8606543319. 89

Question Number : 13 Question Id : 860654993 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f(x) = [x]^2 - [x+3] - 3$, $x \in \mathbb{R}$, where $[\cdot]$ is the greatest integer function. Then

Options :

8606543384. $f(x) = 0$ for finitely many values of x

8606543385. $f(x) < 0$ only for $x \in [-1, 3)$

8606543386. $f(x) > 0$ only for $x \in [4, \infty)$

8606543387. $\int_0^2 f(x) dx = -6$

Question Number : 14 Question Id : 860654980 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $S = \{z \in \mathbb{C} : 4z^2 + \bar{z} = 0\}$. Then $\sum_{z \in S} |z|^2$ is equal to :

Options :

8606543332. $\frac{5}{64}$

8606543333. $\frac{3}{16}$

8606543334. $\frac{1}{16}$

8606543335. $\frac{7}{64}$

Question Number : 15 Question Id : 860654989 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \lambda\hat{j} + 2\hat{k}$, $\lambda \in \mathbb{Z}$ be two vectors. Let $\vec{c} = \vec{a} \times \vec{b}$ and $\vec{d}$ be a vector of magnitude 2 in yz -plane. If $|\vec{c}| = \sqrt{53}$, then the maximum possible value of $(\vec{c} \cdot \vec{d})^2$ is equal to :

Options :

8606543368. 26

8606543369. 52

8606543370. 104

Question Number : 16 Question Id : 860654995 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $y = y(x)$ satisfies the differential equation

$$16(\sqrt{x+9\sqrt{x}})(4+\sqrt{9+\sqrt{x}})\cos y \, dy = (1+2\sin y)dx, x > 0 \text{ and } y(256) = \frac{\pi}{2}, y(49) = \alpha, \text{ then } 2\sin\alpha \text{ is equal to :}$$

Options :

8606543392. $2\sqrt{2} - 1$

8606543393. $\sqrt{2} - 1$

8606543394. $2(\sqrt{2} - 1)$

8606543395. $3(\sqrt{2} - 1)$

Question Number : 17 Question Id : 860654992 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $\lim_{x \rightarrow 0} \frac{e^{(a-1)x} + 2\cos bx + (c-2)e^{-x}}{x \cos x - \log_e(1+x)} = 2$, then $a^2 + b^2 + c^2$ is equal to :

Options :

8606543380. 3

8606543381. 5

8606543382. 7

8606543383. 9

Question Number : 18 Question Id : 860654977 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let f and g be functions satisfying $f(x+y) = f(x)f(y)$, $f(1) = 7$ and $g(x+y) = g(xy)$, $g(1) = 1$, for all

$x, y \in \mathbf{N}$. If $\sum_{x=1}^n \left(\frac{f(x)}{g(x)} \right) = 19607$, then n is equal to :

Options :

8606543320. 4

8606543321. 5

8606543322. 6

8606543323. 7

Question Number : 19 Question Id : 860654990 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let L be the line $\frac{x+1}{2} = \frac{y+1}{3} = \frac{z+3}{6}$ and let S be the set of all points (a, b, c) on L, whose distance from the line $\frac{x+1}{2} = \frac{y+1}{3} = \frac{z-9}{0}$ along the line L is 7. Then $\sum_{(a, b, c) \in S} (a+b+c)$ is equal to :

Options :

8606543372. 6

8606543373. 28

8606543374. 34

8606543375. 40

Question Number : 20 Question Id : 860654985 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let S and S' be the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ and P(α , β) be a point on the ellipse in the first quadrant. If $(SP)^2 + (S'P)^2 - SP \cdot S'P = 37$, then $\alpha^2 + \beta^2$ is equal to :

Options :

8606543352. 11

8606543353. 13

8606543354. 15

8606543355. 17

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 : 860654996 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Suppose a, b, c are in A.P. and $a^2, 2b^2, c^2$ are in G.P. If $a < b < c$ and $a + b + c = 1$, then $9(a^2 + b^2 + c^2)$ 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 : 860654997 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let S be the set of the first 11 natural numbers. Then the number of elements in $A = \{B \subseteq S : n(B) \geq 2 \text{ and the product of all elements of } B \text{ is even}\}$ is _____.

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

Question Number : 23 Question Id : 860654998 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $\cos(\alpha + \beta) = -\frac{1}{10}$ and $\sin(\alpha - \beta) = \frac{3}{8}$, where $0 < \alpha < \frac{\pi}{3}$ and $0 < \beta < \frac{\pi}{4}$.

If $\tan 2\alpha = \frac{3(1 - r\sqrt{5})}{\sqrt{11}(s + \sqrt{5})}$, $r, s \in \mathbb{N}$, then $r + s$ 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 : 8606541000 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $[\cdot]$ be the greatest integer function. If $\alpha = \int_0^{64} (x^{1/3} - [x^{1/3}]) dx$, then $\frac{1}{\pi} \int_0^{\alpha\pi} \left(\frac{\sin^2 \theta}{\sin^6 \theta + \cos^6 \theta} \right) d\theta$ is equal to _____.

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

Question Number : 25 Question Id : 860654999 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let a vector $\vec{a} = \sqrt{2}\hat{i} - \hat{j} + \lambda\hat{k}$, $\lambda > 0$, make an obtuse angle with the vector $\vec{b} = -\lambda^2\hat{i} + 4\sqrt{2}\hat{j} + 4\sqrt{2}\hat{k}$ and an angle θ , $\frac{\pi}{6} < \theta < \frac{\pi}{2}$, with the positive z -axis. If the set of all possible values of λ is $(\alpha, \beta) - \{\gamma\}$, then $\alpha + \beta + \gamma$ is equal to _____.

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 : 8606541017 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 are true for a single slit diffraction ?

- A. Width of central maxima increases with increase in wavelength keeping slit width constant.
- B. Width of central maxima increases with decrease in wavelength keeping slit width constant.
- C. Width of central maxima increases with decrease in slit width at constant wavelength.
- D. Width of central maxima increases with increase in slit width at constant wavelength.
- E. Brightness of central maxima increases for decrease in wavelength at constant slit width.

Options :

8606543465. A, D, E only

8606543466. A, D only

8606543467. B, D only

8606543468. B, C only

Question Number : 27 Question Id : 8606541011 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In an open organ pipe ν_3 and ν_6 are 3rd and 6th harmonic frequencies, respectively.

If $\nu_6 - \nu_3 = 2200$ Hz then length of the pipe is _____ mm .

(Take velocity of sound in air is 330 m/s.)

Options :

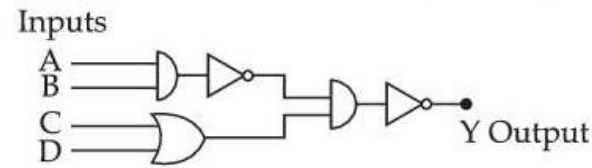
8606543441. 200

8606543442. 225

8606543443. 250

Question Number : 28 Question Id : 8606541020 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The correct truth table for the given input data of the following logic gate is :



Options :

Inputs				Output
A	B	C	D	Y
1	1	0	1	1
0	0	1	1	0
1	0	1	0	1
1	1	1	1	0

8606543477.

Inputs				Output
A	B	C	D	Y
1	1	0	1	0
0	0	1	1	0
1	0	1	0	1
1	1	1	1	1

8606543478.

Inputs				Output
A	B	C	D	Y
1	1	0	1	1
0	0	1	1	0
1	0	1	0	0
1	1	1	1	1

8606543479.

Inputs				Output
A	B	C	D	Y
1	1	0	1	0
0	0	1	1	1
1	0	1	0	1
1	1	1	1	1

8606543480.

Given below are two statements :

Statement I : An object moves from position r_1 to position r_2 under a conservative force field $\vec{F}$.
The work done by the force is $W = - \int_{r_1}^{r_2} \vec{F} \cdot d\vec{r}$.

Statement II : Any object moving from one location to another location can follow infinite number of paths. Therefore, the amount of work done by the object changes with the path it follows for a conservative force.

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

Options :

8606543413. Both **Statement I** and **Statement II** are true
8606543414. Both **Statement I** and **Statement II** are false
8606543415. **Statement I** is true but **Statement II** is false
8606543416. **Statement I** is false but **Statement II** is true

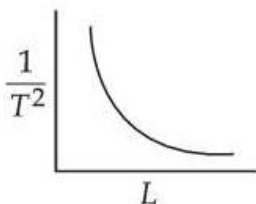
Light is incident on a metallic plate having work function 110×10^{-20} J. If the produced photoelectrons have zero kinetic energy then the angular frequency of the incident light is _____ rad/s. ($h = 6.63 \times 10^{-34}$ J.s).

Options :

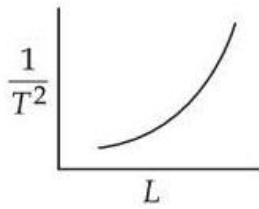
8606543469. 1.04×10^{13}
8606543470. 1.66×10^{15}
8606543471. 1.66×10^{16}
8606543472. 1.04×10^{16}

Using a simple pendulum experiment g is determined by measuring its time period T . Which of the following plots represent the correct relation between the pendulum length L and time period T ?

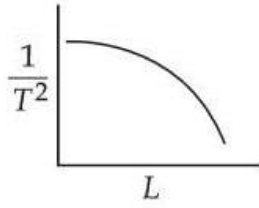
Options :



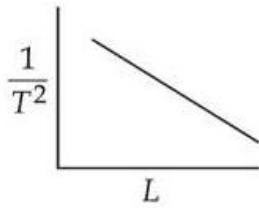
- 8606543401.



8606543402.



8606543403.



8606543404.

Question Number : 32 Question Id : 8606541019 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The smallest wavelength of Lyman series is 91 nm. The difference between the largest wavelengths of *Paschen* and *Balmer* series is nearly _____ nm.

Options :

8606543473. 1550

8606543474. 1875

8606543475. 1784

8606543476. 1217

Question Number : 33 Question Id : 8606541013 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An electric power line having total resistance of $2\ \Omega$, delivers 1 kW of power at 250 V. The percentage efficiency of transmission line is _____.

Options :

8606543449. 100

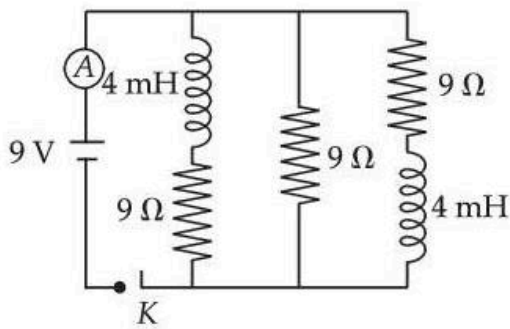
8606543450. 86.5

8606543451. 92.5

8606543452. 96.9

Question Number : 34 Question Id : 8606541009 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Figure shows the circuit that contains three resistances ($9\ \Omega$ each) and two inductors ($4\ \text{mH}$ each). The reading of ammeter at the moment switch K is turned ON, is _____ A.



Options :

- 8606543433. 1
- 8606543434. 2
- 8606543435. 3
- 8606543436. zero

Question Number : 35 Question Id : 8606541015 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The wavelength of light, while it is passing through water is $540\ \text{nm}$. The refractive index of water is $\frac{4}{3}$. The wavelength of the same light when it is passing through a transparent medium having refractive index of $\frac{3}{2}$ is _____ nm.

Options :

- 8606543457. 480
- 8606543458. 840
- 8606543459. 540
- 8606543460. 380

Given below are two statements :

Statement I : For a mechanical system of many particles total kinetic energy is the sum of kinetic energies of all the particles.

Statement II : The total kinetic energy can be the sum of kinetic energy of the center of mass w.r.t to the origin and the kinetic energy of all the particles w.r.t. the center of mass as the reference.

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

Options :

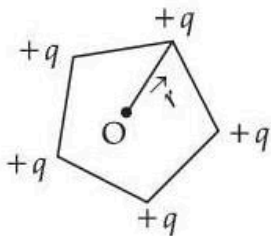
8606543417. Both **Statement I** and **Statement II** are true

8606543418. Both **Statement I** and **Statement II** are false

8606543419. **Statement I** is true but **Statement II** is false

8606543420. **Statement I** is false but **Statement II** is true

Five positive charges each having charge q are placed at the vertices of a pentagon as shown in the figure. The electric potential (V) and the electric field ($\vec{E}$) at the center O of the pentagon due to these five positive charges are :



Options :

8606543445. $V=0$ and $\vec{E} = 0$

8606543446. $V = \frac{5q}{4\pi\epsilon_0 r}$ and $\vec{E} = \frac{5q}{4\pi\epsilon_0 r^2} \hat{r}$

8606543447. $V = \frac{5q}{4\pi\epsilon_0 r}$ and $\vec{E} = 0$

8606543448. $V = \frac{5q}{4\pi\epsilon_0 r}$ and $\vec{E} = \frac{5\sqrt{3}q}{8\pi\epsilon_0 r^2} \hat{r}$

Question Number : 38 Question Id : 8606541010 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider two boxes containing ideal gases A and B such that their temperatures, pressures and number densities are same. The molecular size of A is half of that of B and mass of molecule A is four times that of B . If the collision frequency in gas B is $32 \times 10^{18}/s$ then collision frequency in gas A is _____/s.

Options :

8606543437. 2×10^8

8606543438. 4×10^8

8606543439. 8×10^8

8606543440. 32×10^8

Question Number : 39 Question Id : 8606541006 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

Statement I : A satellite is moving around earth in the orbit very close to the earth surface. The time period of revolution of satellite depends upon the density of earth.

Statement II : The time period of revolution of the satellite is $T = 2\pi \sqrt{\frac{R_e}{g}}$ (for satellite very close to the earth surface), where R_e radius of earth and g acceleration due to gravity.

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

Options :

8606543421. Both **Statement I** and **Statement II** are true

8606543422. Both **Statement I** and **Statement II** are false

8606543423. **Statement I** is true but **Statement II** is false

8606543424. **Statement I** is false but **Statement II** is true

Question Number : 40 Question Id : 8606541016 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In parallax method for the determination of focal length of a concave mirror, the object should always be placed :

Options :

8606543461. between the pole(P) and the focus(F) of the concave mirror ONLY

8606543462. between the focus(F) and the centre of curvature(C) of the mirror ONLY

8606543463. beyond the centre of the curvature(C) of the mirror ONLY

8606543464. at any point beyond the focus(F) of the mirror

Question Number : 41 Question Id : 8606541007 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

When a part of a straight capillary tube is placed vertically in a liquid, the liquid raises upto certain height h . If the inner radius of the capillary tube, density of the liquid and surface tension of the liquid decrease by 1% each, then the height of the liquid in the tube will change by _____ %.

Options :

8606543425. +1

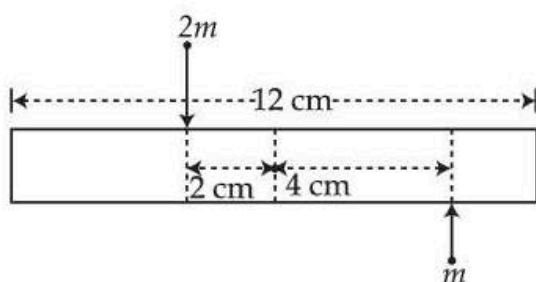
8606543426. -1

8606543427. +3

8606543428. -3

Question Number : 42 Question Id : 8606541003 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A uniform bar of length 12 cm and mass $20m$ lies on a smooth horizontal table. Two point masses m and $2m$ are moving in opposite directions with same speed of v and in the same plane as the bar, as shown in figure. These masses strike the bar simultaneously and get stuck to it. After collision the entire system is rotating with angular frequency ω . The ratio of v and ω is :



Options :

8606543409. 32

8606543410. 33

8606543411. $2\sqrt{88}$

8606543412. 66

Question Number : 43 Question Id : 8606541014 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A laser beam has intensity of $4.0 \times 10^{14} \text{ W/m}^2$. The amplitude of magnetic field associated with beam is _____ T. (Take $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$ and $c = 3 \times 10^8 \text{ m/s}$)

Options :

8606543453. 5.5

8606543454. 18.3

8606543455. 1.83

8606543456. 2.0

Question Number : 44 Question Id : 8606541008 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Three small identical bubbles of water having same charge on each coalesce to form a bigger bubble. Then the ratio of the potentials on one initial bubble and that on the resultant bigger bubble is :

Options :

8606543429. $1 : 3^{2/3}$

8606543430. $1 : 3^{1/3}$

8606543431. $1 : 2^{2/3}$

8606543432. $3^{2/3} : 1$

Question Number : 45 Question Id : 8606541002 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If ϵ , E and t represent the free space permittivity, electric field and time respectively, then the unit of $\frac{\epsilon E}{t}$ will be :

Options :

8606543405. A/m^2

8606543406. Am^2

8606543407. Am

8606543408. A/m

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 : 8606541022 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A capacitor P with capacitance $10 \times 10^{-6} \text{ F}$ is fully charged with a potential difference of 6.0 V and disconnected from the battery. The charged capacitor P is connected across another capacitor Q with capacitance $20 \times 10^{-6} \text{ F}$. The charge on capacitor Q when equilibrium is established will be $\alpha \times 10^{-5} \text{ C}$ (assume capacitor Q does not have any charge initially), 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 : 47 Question Id : 8606541025 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A conducting circular loop is rotated about its diameter at a constant angular speed of 100 rad/s in a magnetic field of 0.5 T perpendicular to the axis of rotation. When the loop is rotated by 30° from the horizontal position, the induced EMF is 15.4 mV . The radius of the loop is _____ mm.

$$\left(\text{Take } \pi = \frac{22}{7} \right)$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 48 Question Id : 8606541023 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A cylindrical conductor of length 2 m and area of cross-section 0.2 mm^2 carries an electric current of 1.6 A when its ends are connected to a 2 V battery. Mobility of electrons in the conductor is $\alpha \times 10^{-3} \text{ m}^2/\text{V.s}$. The value of α is :

(electron concentration = $5 \times 10^{28}/\text{m}^3$ and electron charge = $1.6 \times 10^{-19} \text{ C}$)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 49 Question Id : 8606541021 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Two masses m and $2m$ are connected by a light string going over a pulley (disc) of mass $30m$ with radius $r = 0.1 \text{ m}$. The pulley is mounted in a vertical plane and it is free to rotate about its axis. The $2m$ mass is released from rest and its speed when it has descended through a height of 3.6 m is _____ m/s . (Assume string does not slip and $g = 10 \text{ m/s}^2$)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 50 Question Id : 8606541024 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

An insulated cylinder of volume 60 cm^3 is filled with a gas at 27°C and 2 atmospheric pressure. Then the gas is compressed making the final volume as 20 cm^3 while allowing the temperature to rise to 77°C . The final pressure is _____ atmospheric pressure.

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 : 8606541036 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

$[\text{Ni}(\text{PPh}_3)_2\text{Cl}_2]$ is a paramagnetic complex. Identify the **INCORRECT** statements about this complex.

- A. The complex exhibits geometrical isomerism.
- B. The complex is white in colour.
- C. The calculated spin-only magnetic moment of the complex is 2.84 BM.
- D. The calculated CFSE (Crystal Field Stabilization Energy) of Ni in this complex is $-0.8 \Delta_o$.
- E. The geometrical arrangement of ligands in this complex is similar to that in $\text{Ni}(\text{CO})_4$.

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

Options :

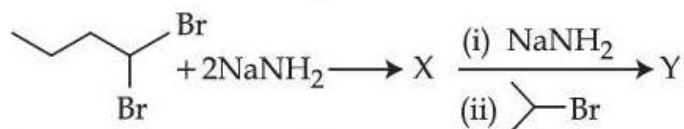
8606543526. A, B and D Only

8606543527. C and D Only

8606543528. A and B Only

8606543529. C, D and E Only

Consider the following reaction :

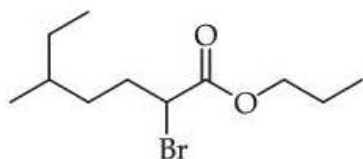


The product Y formed is :

Options :

- 8606543542. 5-methylhex-2-yne
- 8606543543. 2-methylhex-3-yne
- 8606543544. 2-methylhex-2-yne
- 8606543545. Isopropylbut-1-yne

The IUPAC name of the following compound is :



Options :

- 8606543538. 2-bromo-5-methylpropanoate
- 8606543539. n-propyl-2-bromo-5-methylheptanoate
- 8606543540. n-propyl-1-bromo-4-methylhexanoate
- 8606543541. 2-bromo-5-methylhexylpropanoate

Given below are two statements :

Statement I : The first ionization enthalpy of Cr is lower than that of Mn.

Statement II : The second and third ionization enthalpies of Cr are higher than those of Mn.

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

Options :

- 8606543522. Both **Statement I** and **Statement II** are true

8606543523. Both **Statement I** and **Statement II** are false

8606543524. **Statement I** is true but **Statement II** is false

8606543525. **Statement I** is false but **Statement II** is true

Question Number : 55 Question Id : 8606541028 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

At T(K), 100 g of 98% H_2SO_4 (w/w) aqueous solution is mixed with 100 g of 49% H_2SO_4 (w/w) aqueous solution. What is the mole fraction of H_2SO_4 in the resultant solution ?

(Given : Atomic mass H = 1 u ; S = 32 u ; O = 16 u).

(Assume that temperature after mixing remains constant)

Options :

8606543494. 0.663

8606543495. 0.1

8606543496. 0.9

8606543497. 0.337

Question Number : 56 Question Id : 8606541042 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The compound A, $\text{C}_8\text{H}_8\text{O}_2$ reacts with acetophenone to form a single product via cross-Aldol condensation. The compound A on reaction with conc. NaOH forms a substituted benzyl alcohol as one of the two products. The compound A is :

Options :

8606543550. 4-methoxy benzaldehyde

8606543551. 4-hydroxy benzylaldehyde

8606543552. 2-hydroxy acetophenone

8606543553. 4-methyl benzoic acid

Question Number : 57 Question Id : 8606541031 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 Arrhenius equation among the following are :

- A. Factor $e^{-E_a/RT}$ corresponds to fraction of molecules having kinetic energy less than E_a .
- B. At a given temperature, lower the E_a , faster is the reaction.
- C. Increase in temperature by about 10°C doubles the rate of reaction.
- D. Plot of $\log k$ vs $\frac{1}{T}$ gives a straight line with slope $= -\frac{E_a}{R}$.

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

Options :

8606543506. A and C Only

8606543507. B and D Only

8606543508. B and C Only

8606543509. A and B Only

Question Number : 58 Question Id : 8606541029 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 mixture gives a buffer solution with $\text{pH} = 9.25$?

Given : $\text{pK}_b(\text{NH}_4\text{OH}) = 4.75$

Options :

8606543498. 0.4 M NH_4OH (1 L) + 0.1 M HCl (1 L)

8606543499. 0.2 M NH_4OH (0.4 L) + 0.1 M HCl (1 L)

8606543500. 0.2 M NH_4OH (0.5 L) + 0.1 M HCl (0.5 L)

8606543501. 0.5 M NH_4OH (0.2 L) + 0.2 M HCl (0.5 L)

Question Number : 59 Question Id : 8606541032 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Among H_2S , H_2O , NF_3 , NH_3 and CHCl_3 , identify the molecule (X) with lowest dipole moment value. The number of lone pairs of electrons present on the central atom of the molecule (X) is :

Options :

8606543510. 0

8606543511. 1

8606543512. 2

8606543513. 3

Question Number : 60 Question Id : 8606541034 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 : Elements 'X' and 'Y' are the most and least electronegative elements, respectively among N, As, Sb and P. The nature of the oxides X_2O_3 and Y_2O_3 is acidic and amphoteric, respectively.

Statement II : BCl_3 is covalent in nature and gets hydrolysed in water. It produces $[B(OH)_4]^-$ and $[B(H_2O)_6]^{3+}$ in aqueous medium.

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

Options :

8606543518. Both **Statement I** and **Statement II** are true

8606543519. Both **Statement I** and **Statement II** are false

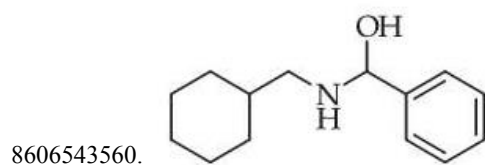
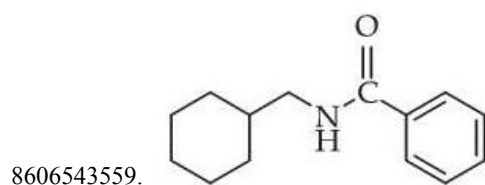
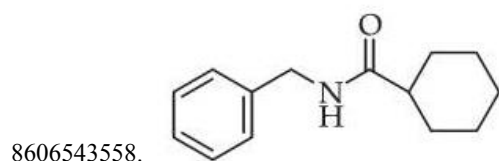
8606543520. **Statement I** is true but **Statement II** is false

8606543521. **Statement I** is false but **Statement II** is true

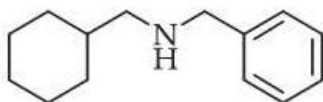
Question Number : 61 Question Id : 8606541044 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



Options :



8606543561.



Question Number : 62 Question Id : 8606541045 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match List - I with List - II.

List - I

Reaction of Glucose with

- A. Hydroxylamine
- B. Br_2 water
- C. Excess acetic anhydride
- D. Concentrated HNO_3

List - II

Product formed

- I. Gluconic acid
- II. Glucose pentacetate
- III. Saccharic acid
- IV. Glucosime

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

Options :

8606543562. A-IV, B-I, C-II, D-III

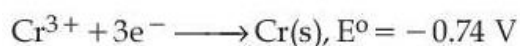
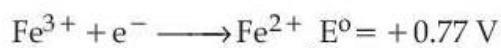
8606543563. A-IV, B-III, C-II, D-I

8606543564. A-III, B-I, C-IV, D-II

8606543565. A-I, B-III, C-IV, D-II

Question Number : 63 Question Id : 8606541030 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the following reduction processes :



The tendency to act as reducing agent decreases in the order :

Options :

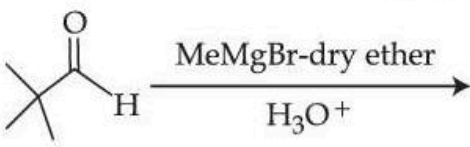
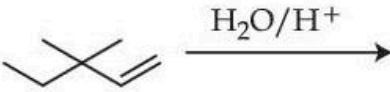
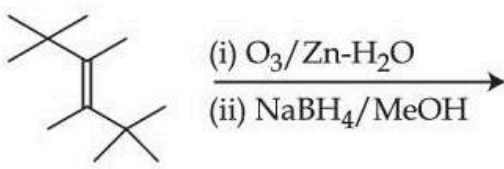
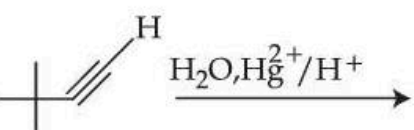
8606543502. $\text{Al} > \text{Cr} > \text{Co}^{2+} > \text{Fe}^{2+}$

8606543503. $\text{Al} > \text{Cr} > \text{Fe}^{2+} > \text{Co}^{2+}$

8606543504. $\text{Al} > \text{Fe}^{2+} > \text{Cr} > \text{Co}^{2+}$

8606543505. $\text{Cr} > \text{Fe}^{2+} > \text{Al} > \text{Co}^{2+}$

3, 3-Dimethyl-2-butanol **cannot** be prepared by :

- A. 
- B. 
- C. 
- D. 
- E. 

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

Options :

8606543554. B and C Only

8606543555. B Only

8606543556. B, C and E Only

8606543557. B and E Only

Question Number : 65 Question Id : 8606541026 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



36.0 g of 'A' (Molar mass : 60 g mol^{-1}) and 56.0 g of 'B' (Molar mass : 80 g mol^{-1}) are allowed to react. Which of the following statements are **correct** ?

- A. 'A' is the limiting reagent.
- B. 77.0 g of AB_2 is formed.
- C. Molar mass of AB_2 is 140 g mol^{-1} .
- D. 15.0 g of A is left unreacted after the completion of reaction.

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

Options :

8606543486. A and B Only

8606543487. B and D Only

8606543488. C and D Only

8606543489. A and C Only

Question Number : 66 Question Id : 8606541038 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

When 1 g of compound (X) is subjected to Kjeldahl's method for estimation of nitrogen, 15 mL 1 M H_2SO_4 was neutralized by ammonia evolved. The percentage of nitrogen in compound (X) is :

Options :

8606543534. 0.21

8606543535. 21

8606543536. 42

8606543537. 0.42

Question Number : 67 Question Id : 8606541027 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The energy of first (lowest) Balmer line of H atom is x J. The energy (in J) of second Balmer line of H atom is :

Options :

8606543490. $2x$

8606543491. $1.35x$

8606543492. $\frac{x}{1.35}$

8606543493. x^2

Question Number : 68 Question Id : 8606541037 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** statements :

- A. Hydrated salts can be used as primary standard.
- B. Primary standard should not undergo any reaction with air.
- C. Reactions of primary standard with another substance should be instantaneous and stoichiometric.
- D. Primary standard should not be soluble in water.
- E. Primary standard should have low relative molar mass.

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

Options :

8606543530. A, B, C and E Only

8606543531. A, B and E Only

8606543532. A, B and C Only

8606543533. D and E Only

Question Number : 69 Question Id : 8606541033 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 : $C < O < N < F$ is the correct order in terms of first ionization enthalpy values.

Statement II : $S > Se > Te > Po > O$ is the correct order in terms of the magnitude of electron gain enthalpy values.

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

Options :

8606543514. Both **Statement I** and **Statement II** are true

8606543515. Both **Statement I** and **Statement II** are false

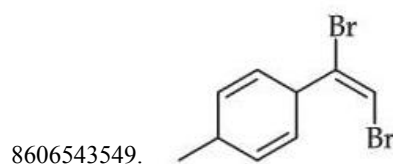
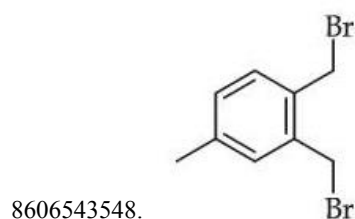
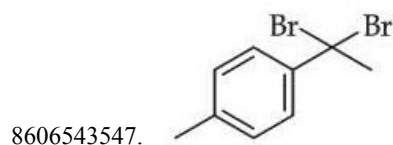
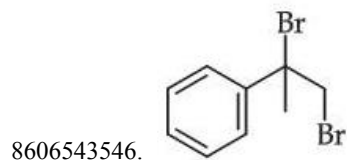
8606543516. **Statement I** is true but **Statement II** is false

8606543517. **Statement I** is false but **Statement II** is true

Question Number : 70 Question Id : 8606541041 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The dibromo compound [P] (molecular formula : $C_9H_{10}Br_2$) when heated with excess sodamide followed by treatment with dilute HCl gives [Q]. On warming [Q] with mercuric sulphate and dilute sulphuric acid yield [R] which gives positive Iodoform test but negative Tollen's test. The compound [P] is :

Options :



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 : 8606541046 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If the enthalpy of sublimation of Li is 155 kJ mol^{-1} , enthalpy of dissociation of F_2 is 150 kJ mol^{-1} , ionization enthalpy of Li is 520 kJ mol^{-1} , electron gain enthalpy of F is -313 kJ mol^{-1} , standard enthalpy of formation of LiF is -594 kJ mol^{-1} . The magnitude of lattice enthalpy of LiF is _____ kJ mol^{-1} . (Nearest Integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 72 Question Id : 8606541048 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider $A \xrightarrow{k_1} B$ and $C \xrightarrow{k_2} D$ are two reactions. If the rate constant (k_1) of the $A \longrightarrow B$ reaction can be expressed by the following equation $\log_{10} k = 14.34 - \frac{1.5 \times 10^4}{T/K}$ and activation energy of $C \longrightarrow D$ reaction (E_{a2}) is $\frac{1}{5}$ th of the $A \longrightarrow B$ reaction (E_{a1}), then the value of (E_{a2}) is _____ kJ mol^{-1} . (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 : 8606541049 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Among the following oxides of 3d elements, the number of mixed oxides are _____.
 Ti_2O_3 , V_2O_4 , Cr_2O_3 , Mn_3O_4 , Fe_3O_4 , Fe_2O_3 , Co_3O_4

Response Type : Numeric

Evaluation Required For SA : Yes

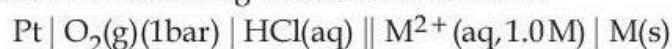
Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 74 Question Id : 8606541047 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the following electrochemical cell :



The pH above which, oxygen gas would start to evolve at anode is _____ (nearest integer).

$$\left[\begin{array}{l} \text{Given : } \left. \begin{array}{l} E^\circ_{\text{M}^{2+}/\text{M}} = 0.994\text{ V} \\ E^\circ_{\text{O}_2/\text{H}_2\text{O}} = 1.23\text{ V} \end{array} \right\} \text{standard reduction potential} \\ \text{and } \frac{RT}{F}(2.303) = 0.059\text{ V at the given condition} \end{array} \right]$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 75 Question Id : 8606541050 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The mass of benzanilide obtained from the benzoylation reaction of 5.8 g of aniline, if yield of product is 82%, is _____ g (nearest integer).

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

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText