

# National Testing Agency

|                       |                              |
|-----------------------|------------------------------|
| Question Paper Name : | B Tech 21st Jan 2026 Shift 1 |
| 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 : 8606541132 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the coefficient of  $x$  in the expansion of  $(ax^2 + bx + c)(1 - 2x)^{26}$  is  $-56$  and the coefficients of  $x^2$  and  $x^3$  are both zero, then  $a + b + c$  is equal to :

Options :

8606543850. 1300

8606543851. 1403

8606543852. 1483

8606543853. 1500

Question Number : 2 Question Id : 8606541129 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If  $x^2 + x + 1 = 0$ , then the value of  $\left(x + \frac{1}{x}\right)^4 + \left(x^2 + \frac{1}{x^2}\right)^4 + \left(x^3 + \frac{1}{x^3}\right)^4 + \dots + \left(x^{25} + \frac{1}{x^{25}}\right)^4$  is :

**Options :**

8606543838. 128

8606543839. 145

8606543840. 162

8606543841. 175

**Question Number : 3 Question Id : 8606541145 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

Let  $f : \mathbf{R} \rightarrow (0, \infty)$  be a twice differentiable function such that  $f(3) = 18$ ,  $f'(3) = 0$  and  $f''(3) = 4$ . Then

$\lim_{x \rightarrow 1} \left( \log_e \left( \frac{f(2+x)}{f(3)} \right)^{\frac{18}{(x-1)^2}} \right)$  is equal to :

**Options :**

8606543902. 1

8606543903. 2

8606543904. 9

8606543905. 18

**Question Number : 4 Question Id : 8606541137 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

Let O be the vertex of the parabola  $x^2 = 4y$  and Q be any point on it. Let the locus of the point P, which divides the line segment OQ internally in the ratio 2 : 3 be the conic C. Then the equation of the chord of C, which is bisected at the point (1, 2), is :

**Options :**

8606543870.  $4x - 5y + 6 = 0$

8606543871.  $5x - y - 3 = 0$

8606543872.  $5x - 4y + 3 = 0$

8606543873.  $x - 2y + 3 = 0$

Question Number : 5 Question Id : 8606541142 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The value of  $\int_{-\pi/6}^{\pi/6} \left( \frac{\pi + 4x^{11}}{1 - \sin(|x| + \pi/6)} \right) dx$  is equal to :

Options :

8606543890.  $2\pi$

8606543891.  $4\pi$

8606543892.  $6\pi$

8606543893.  $8\pi$

Question Number : 6 Question Id : 8606541126 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 relations, defined on the set  $\{a, b, c, d\}$ , which are both reflexive and symmetric, is equal to :

Options :

8606543826. 16

8606543827. 64

8606543828. 256

8606543829. 1024

Question Number : 7 Question Id : 8606541130 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let  $a_1, a_2, a_3, \dots$  be a G.P. of increasing positive terms such that  $a_2 \cdot a_3 \cdot a_4 = 64$  and  $a_1 + a_3 + a_5 = \frac{813}{7}$ .

Then  $a_3 + a_5 + a_7$  is equal to :

Options :

8606543842. 3244

8606543843. 3248

8606543844. 3252

8606543845. 3256

Question Number : 8 Question Id : 8606541131 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 strictly increasing functions  $f$  from the set  $\{1, 2, 3, 4, 5, 6\}$  to the set  $\{1, 2, 3, \dots, 9\}$  such that  $f(i) \neq i$  for  $1 \leq i \leq 6$ , is equal to :

Options :

8606543846. 21

8606543847. 22

8606543848. 27

8606543849. 28

Question Number : 9 Question Id : 8606541141 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let  $\vec{a} = -\hat{i} + 2\hat{j} + 2\hat{k}$ ,  $\vec{b} = 8\hat{i} + 7\hat{j} - 3\hat{k}$  and  $\vec{c}$  be a vector such that  $\vec{a} \times \vec{c} = \vec{b}$ .

If  $\vec{c} \cdot (\hat{i} + \hat{j} + \hat{k}) = 4$ , then  $|\vec{a} + \vec{c}|^2$  is equal to :

Options :

8606543886. 27

8606543887. 30

8606543888. 33

8606543889. 35

Question Number : 10 Question Id : 8606541136 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let PQ and MN be two straight lines touching the circle  $x^2 + y^2 - 4x - 6y - 3 = 0$  at the points A and B respectively. Let O be the centre of the circle and  $\angle AOB = \frac{\pi}{3}$ . Then the locus of the point of intersection of the lines PQ and MN is :

Options :

8606543866.  $x^2 + y^2 - 12x - 18y - 25 = 0$

8606543867.  $3(x^2 + y^2) - 12x - 18y - 25 = 0$

8606543868.  $3(x^2 + y^2) - 18x - 12y + 25 = 0$

8606543869.  $x^2 + y^2 - 18x - 12y - 25 = 0$

Question Number : 11 Question Id : 8606541143 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, inside the ellipse  $x^2 + 4y^2 = 4$  and outside the region bounded by the curves  $y = |x| - 1$  and  $y = 1 - |x|$ , is :

Options :

8606543894.  $2\pi - 1$

8606543895.  $2(\pi - 1)$

8606543896.  $2\pi - \frac{1}{2}$

8606543897.  $3(\pi - 1)$

Question Number : 12 Question Id : 8606541134 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the foci of a hyperbola coincide with the foci of the ellipse  $\frac{x^2}{36} + \frac{y^2}{16} = 1$ . If the eccentricity of the hyperbola is 5, then the length of its latus rectum is :

Options :

8606543858. 12

8606543859. 16

8606543860.  $24\sqrt{5}$

8606543861.  $\frac{96}{\sqrt{5}}$

Question Number : 13 Question Id : 8606541128 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 roots of the equation  $(x-1)^2 - 5|x-1| + 6 = 0$ , is :

Options :

8606543834. 4

8606543835. 3

8606543836. 5

8606543837. 1

Question Number : 14 Question Id : 8606541139 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let  $(\alpha, \beta, \gamma)$  be the co-ordinates of the foot of the perpendicular drawn from the point  $(5, 4, 2)$  on the line  $\vec{r} = (-\hat{i} + 3\hat{j} + \hat{k}) + \lambda(2\hat{i} + 3\hat{j} - \hat{k})$ .

Then the length of the projection of the vector  $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$  on the vector  $6\hat{i} + 2\hat{j} + 3\hat{k}$  is :

Options :

8606543878. 4

8606543879. 3

8606543880.  $\frac{18}{7}$

8606543881.  $\frac{15}{7}$

Question Number : 15 Question Id : 8606541135 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let a point A lie between the parallel lines  $L_1$  and  $L_2$  such that its distances from  $L_1$  and  $L_2$  are 6 and 3 units, respectively. Then the area (in sq. units) of the equilateral triangle ABC, where the points B and C lie on the lines  $L_1$  and  $L_2$  respectively, is :

Options :

8606543862.  $12\sqrt{2}$

8606543863.  $15\sqrt{6}$

8606543864.  $21\sqrt{3}$

8606543865. 27

Question Number : 16 Question Id : 8606541138 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The value of  $\operatorname{cosec}10^\circ - \sqrt{3} \sec10^\circ$  is equal to :

Options :

8606543874. 2

8606543875. 4

8606543876. 6

8606543877. 8

Question Number : 17 Question Id : 8606541127 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the domain of the function  $f(x) = \cos^{-1}\left(\frac{2x-5}{11-3x}\right) + \sin^{-1}(2x^2-3x+1)$  is the interval  $[\alpha, \beta]$ , then  $\alpha + 2\beta$  is equal to :

Options :

8606543830. 1

8606543831. 2

8606543832. 3

8606543833. 5

Question Number : 18 Question Id : 8606541144 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let  $y=y(x)$  be the solution curve of the differential equation  $(1+x^2)dy + (y - \tan^{-1}x) dx = 0$ ,  $y(0) = 1$ . Then the value of  $y(1)$  is :

Options :

8606543898.  $\frac{2}{e^{\pi/4}} - \frac{\pi}{4} - 1$

8606543899.  $\frac{2}{e^{\pi/4}} + \frac{\pi}{4} - 1$

8606543900.  $\frac{4}{e^{\pi/4}} - \frac{\pi}{2} - 1$

8606543901.  $\frac{4}{e^{\pi/4}} + \frac{\pi}{2} - 1$

Question Number : 19 Question Id : 8606541140 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let  $\vec{c}$  and  $\vec{d}$  be vectors such that  $|\vec{c} + \vec{d}| = \sqrt{29}$  and  $\vec{c} \times (2\hat{i} + 3\hat{j} + 4\hat{k}) = (2\hat{i} + 3\hat{j} + 4\hat{k}) \times \vec{d}$ . If  $\lambda_1, \lambda_2$  ( $\lambda_1 > \lambda_2$ ) are the possible values of  $(\vec{c} + \vec{d}) \cdot (-7\hat{i} + 2\hat{j} + 3\hat{k})$ , then the equation

$K^2x^2 + (K^2 - 5K + \lambda_1)xy + \left(3K + \frac{\lambda_2}{2}\right)y^2 - 8x + 12y + \lambda_2 = 0$  represents a circle, for K equal to :

Options :

8606543882. -1

8606543883. 1

8606543884. 2

8606543885. 4

Question Number : 20 Question Id : 8606541133 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the mean and variance of 7 observations 2, 4, 10,  $x$ , 12, 14,  $y$ ,  $x > y$ , be 8 and 16 respectively. Two numbers are chosen from  $\{1, 2, 3, x - 4, y, 5\}$  one after another without replacement, then the probability, that the smaller number among the two chosen numbers is less than 4, is :

Options :

8606543854.  $\frac{4}{5}$

8606543855.  $\frac{3}{5}$

8606543856.  $\frac{2}{5}$

8606543857.  $\frac{1}{3}$

## 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 : 8606541149 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let  $f: \mathbf{R} \rightarrow \mathbf{R}$  be a twice differentiable function such that the quadratic equation

$f(x)m^2 - 2f'(x)m + f''(x) = 0$  in  $m$ , has two equal roots for every  $x \in \mathbf{R}$ . If  $f(0) = 1$ ,  $f'(0) = 2$ , and  $(\alpha, \beta)$  is the largest interval in which the function  $f(\log_e x - x)$  is increasing, then  $\alpha + \beta$  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 : 8606541148 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let  $S = \{(m, n) : m, n \in \{1, 2, 3, \dots, 50\}\}$ . If the number of elements  $(m, n)$  in  $S$  such that  $6^m + 9^n$  is a multiple of 5 is  $p$  and the number of elements  $(m, n)$  in  $S$  such that  $m + n$  is a square of a prime number is  $q$ , then  $p + q$  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 : 8606541146 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

For some  $\alpha, \beta \in \mathbb{R}$ , let  $A = \begin{bmatrix} \alpha & 2 \\ 1 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 1 \\ 1 & \beta \end{bmatrix}$  be such that  $A^2 - 4A + 2I = B^2 - 3B + I = O$ . Then  $(\det(\text{adj}(A^3 - B^3)))^2$  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 : 8606541147 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let  $a_1 = 1$  and for  $n \geq 1$ ,  $a_{n+1} = \frac{1}{2} a_n + \frac{n^2 - 2n - 1}{n^2 (n+1)^2}$ . Then  $\left| \sum_{n=1}^{\infty} \left( a_n - \frac{2}{n^2} \right) \right|$  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 : 8606541150 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

$6 \int_0^{\pi} |(\sin 3x + \sin 2x + \sin x)| dx$  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 : 8606541169 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A point charge of  $10^{-8}$  C is placed at origin. The work done in moving a point charge  $2 \mu\text{C}$  from point A(4, 4, 2) m to B(2, 2, 1) m is \_\_\_\_\_ J. ( $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$  in SI units)

Options :

8606543983. 0

8606543984.  $15 \times 10^{-6}$

8606543985.  $45 \times 10^{-6}$

8606543986.  $30 \times 10^{-6}$

Question Number : 27 Question Id : 8606541154 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An aluminium and steel rods having same lengths and cross-sections are joined to make total length of 120 cm at  $30^\circ\text{C}$ . The coefficient of linear expansion of aluminium and steel are  $24 \times 10^{-6}/^\circ\text{C}$  and  $1.2 \times 10^{-5}/^\circ\text{C}$ , respectively. The length of this composite rod when its temperature is raised to  $100^\circ\text{C}$ , is \_\_\_\_\_ cm.

Options :

8606543923. 120.15

8606543924. 120.06

8606543925. 120.03

8606543926. 120.20

Question Number : 28 Question Id : 8606541165 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A light wave described by  $E = 60[\sin(3 \times 10^{15})t + \sin(12 \times 10^{15})t]$  (in SI units) falls on a metal surface of work function 2.8 eV. The maximum kinetic energy of ejected photoelectron is (approximately) \_\_\_\_\_ eV. ( $h = 6.6 \times 10^{-34}$  J.s. and  $e = 1.6 \times 10^{-19}$  C)

Options :

8606543967. 7.8

8606543968. 3.8

8606543969. 5.1

8606543970. 6.0

Question Number : 29 Question Id : 8606541160 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 has capacitance  $C$ , when there is vacuum within the parallel plates.

A sheet having thickness  $\left(\frac{1}{3}\right)^{\text{rd}}$  of the separation between the plates and relative permittivity  $K$  is introduced between the plates. The new capacitance of the system is :

Options :

8606543947.  $\frac{3 KC}{2K + 1}$

8606543948.  $\frac{4 KC}{3K - 1}$

8606543949.  $\frac{CK}{2 + K}$

8606543950.  $\frac{3CK^2}{(2K + 1)^2}$

Question Number : 30 Question Id : 8606541170 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In an experiment the values of two spring constants were measured as  $k_1 = (10 \pm 0.2)$  N/m and  $k_2 = (20 \pm 0.3)$  N/m. If these springs are connected in parallel, then the percentage error in equivalent spring constant is :

Options :

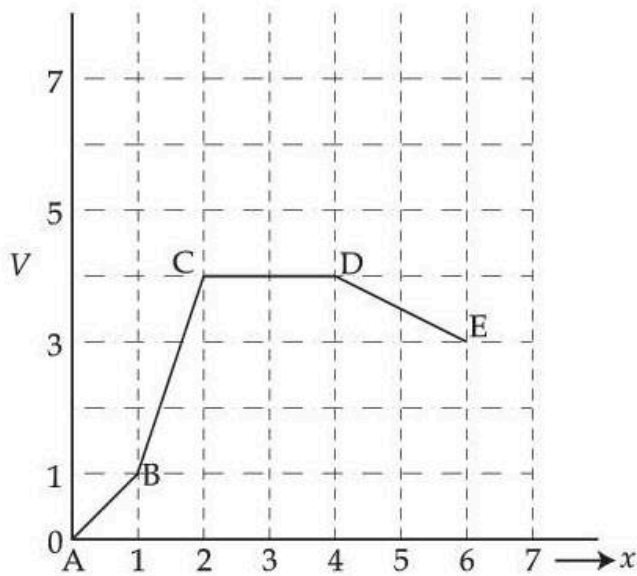
8606543987. 2.33%

8606543988. 1.67%

8606543989. 1.33%

8606543990. 2.67%

Potential energy ( $V$ ) versus distance ( $x$ ) is given by the graph. Rank various regions as per the magnitudes of the force ( $F$ ) acting on a particle from high to low.



Options :

8606543915.  $F_{CD} > F_{AB} > F_{BC} > F_{DE}$

8606543916.  $F_{BC} > F_{AB} > F_{DE} > F_{CD}$

8606543917.  $F_{CD} > F_{DE} > F_{AB} > F_{BC}$

8606543918.  $F_{BC} > F_{CD} > F_{DE} > F_{AB}$

Question Number : 32 Question Id : 8606541151 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider a modified Bernoulli equation.

$$\left( P + \frac{A}{Bt^2} \right) + \rho g(h + Bt) + \frac{1}{2} \rho V^2 = \text{constant}$$

If  $t$  has the dimension of time then the dimensions of  $A$  and  $B$  are \_\_\_\_\_, \_\_\_\_\_ respectively.

Options :

8606543911.  $[ML^0T^{-1}]$  and  $[M^0LT]$

8606543912.  $[ML^0T^{-1}]$  and  $[M^0LT^{-1}]$

8606543913.  $[ML^0T^{-2}]$  and  $[M^0LT^{-1}]$

8606543914.  $[ML^0T^{-2}]$  and  $[M^0LT^{-2}]$

Question Number : 33 Question Id : 8606541156 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The electric field in a plane electromagnetic wave is given by :

$$E_y = 69 \sin[0.6 \times 10^3 x - 1.8 \times 10^{11} t] \text{ V/m.}$$

The expression for magnetic field associated with this electromagnetic wave is \_\_\_\_\_ T.

Options :

8606543931.  $B_y = 69 \sin[0.6 \times 10^3 x + 1.8 \times 10^{11} t]$

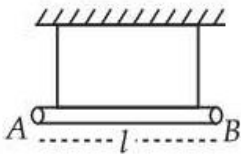
8606543932.  $B_y = 2.3 \times 10^{-7} \sin[0.6 \times 10^3 x - 1.8 \times 10^{11} t]$

8606543933.  $B_z = 2.3 \times 10^{-7} \sin[0.6 \times 10^3 x - 1.8 \times 10^{11} t]$

8606543934.  $B_z = 2.3 \times 10^{-7} \sin[0.6 \times 10^3 x + 1.8 \times 10^{11} t]$

Question Number : 34 Question Id : 8606541159 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A uniform rod of mass  $m$  and length  $l$  suspended by means of two identical inextensible light strings as shown in figure. Tension in one string immediately after the other string is cut, is \_\_\_\_\_. ( $g$  acceleration due to gravity)



Options :

8606543943.  $mg$

8606543944.  $mg/2$

8606543945.  $mg/3$

8606543946.  $mg/4$

Question Number : 35 Question Id : 8606541167 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A gas based geyser heats water flowing at the rate of 5.0 litres per minute from  $27^\circ\text{C}$  to  $87^\circ\text{C}$ . The rate of consumption of the gas is \_\_\_\_\_ g/s.

(Take heat of combustion of gas =  $5.0 \times 10^4 \text{ J/g}$ ) specific heat capacity of water =  $4200 \text{ J/kg}^\circ\text{C}$

Options :

8606543975. 2.1

8606543976. 4.2

8606543977. 0.21

8606543978. 0.42

Question Number : 36 Question Id : 8606541161 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A current carrying solenoid is placed vertically and a particle of mass  $m$  with charge  $Q$  is released from rest. The particle moves along the axis of solenoid. If  $g$  is acceleration due to gravity then the acceleration ( $a$ ) of the charged particle will satisfy :

Options :

8606543951.  $a > g$

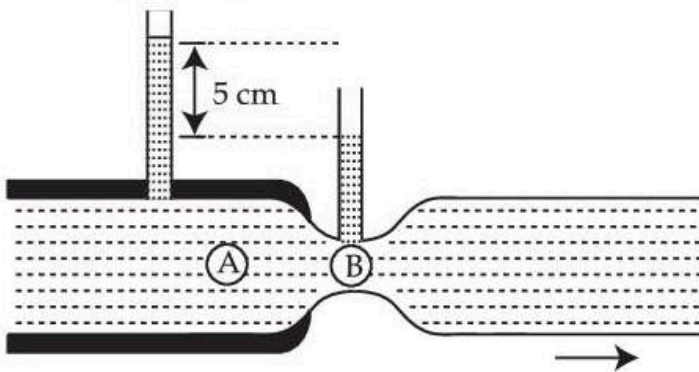
8606543952.  $a = 0$

8606543953.  $a = g$

8606543954.  $0 < a < g$

Question Number : 37 Question Id : 8606541155 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Water flows through a horizontal tube as shown in the figure. The difference in height between the water columns in vertical tubes is 5 cm and the area of cross-sections at A and B are  $6 \text{ cm}^2$  and  $3 \text{ cm}^2$  respectively. The rate of flow will be \_\_\_\_\_  $\text{cm}^3/\text{s}$ . (take  $g = 10 \text{ m/s}^2$ )



Options :

8606543927.  $100\sqrt{3}$

8606543928.  $\frac{200}{\sqrt{3}}$

8606543929.  $200\sqrt{6}$

8606543930.  $200\sqrt{3}$

A 4 kg mass moves under the influence of a force  $\vec{F} = (4t^3\hat{i} - 3t\hat{j})$  N where  $t$  is the time in second. If mass starts from origin at  $t=0$ , the velocity and position after  $t=2$  s will be :

Options :

8606543919.  $\vec{v} = 4\hat{i} - \frac{3}{2}\hat{j} \quad \vec{r} = \frac{6}{5}\hat{i} - \hat{j}$

8606543920.  $\vec{v} = 3\hat{i} + \frac{3}{2}\hat{j} \quad \vec{r} = \frac{6}{5}\hat{i} + \hat{j}$

8606543921.  $\vec{v} = 4\hat{i} + \frac{5}{2}\hat{j} \quad \vec{r} = \frac{8}{5}\hat{i} + 2\hat{j}$

8606543922.  $\vec{v} = 4\hat{i} - \frac{3}{2}\hat{j} \quad \vec{r} = \frac{8}{5}\hat{i} - \hat{j}$

Question Number : 39 Question Id : 8606541162 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A conducting circular loop of area  $1.0 \text{ m}^2$  is placed perpendicular to a magnetic field which varies as  $B = \sin(100t)$  Tesla. If the resistance of the loop is  $100 \Omega$ , then the average thermal energy dissipated in the loop in one period is \_\_\_\_\_ J.

Options :

8606543955.  $\pi$

8606543956.  $2\pi$

8606543957.  $\frac{\pi}{2}$

8606543958.  $\pi^2$

Question Number : 40 Question Id : 8606541157 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two strings (A, B) having linear densities  $\mu_A = 2 \times 10^{-4} \text{ kg/m}$  and,  $\mu_B = 4 \times 10^{-4} \text{ kg/m}$  and lengths  $L_A = 2.5 \text{ m}$  and  $L_B = 1.5 \text{ m}$  respectively are joined. Free ends of A and B are tied to two rigid supports C and D, respectively creating a tension of 500 N in the wire. Two identical pulses, sent from C and D ends, take time  $t_1$  and  $t_2$ , respectively, to reach the joint. The ratio  $t_1/t_2$  is :

Options :

8606543935. 1.08

8606543936. 1.18

8606543937. 1.67

8606543938. 1.90

Question Number : 41 Question Id : 8606541158 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Initially a satellite of 100 kg is in a circular orbit of radius  $1.5R_E$ . This satellite can be moved to a circular orbit of radius  $3R_E$  by supplying  $\alpha \times 10^6$  J of energy. The value of  $\alpha$  is \_\_\_\_\_. (Take Radius of Earth  $R_E = 6 \times 10^6$  m and  $g = 10$  m/s<sup>2</sup>)

Options :

8606543939. 100

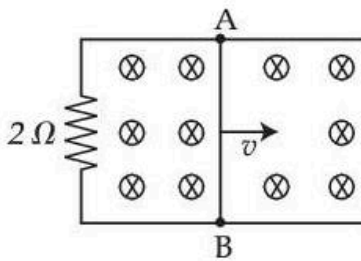
8606543940. 1000

8606543941. 150

8606543942. 500

Question Number : 42 Question Id : 8606541163 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A 1 m long metal rod AB completes the circuit as shown in figure. The area of circuit is perpendicular to the magnetic field of 0.10 T. If the resistance of the total circuit is  $2 \Omega$  then the force needed to move the rod towards right with constant speed ( $v$ ) of 1.5 m/s is \_\_\_\_\_ N.



Options :

8606543959.  $7.5 \times 10^{-3}$

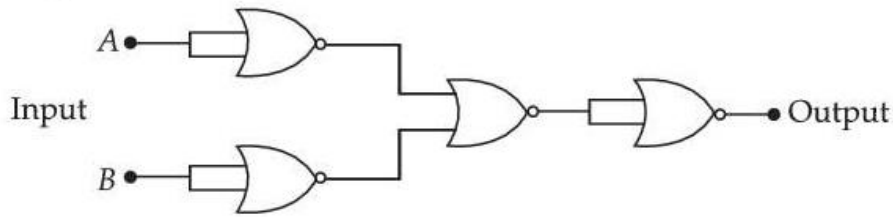
8606543960.  $7.5 \times 10^{-2}$

8606543961.  $5.7 \times 10^{-3}$

8606543962.  $5.7 \times 10^{-2}$

Question Number : 43 Question Id : 8606541168 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The given circuit works as :



Options :

8606543979. AND gate

8606543980. NAND gate

8606543981. NOR gate

8606543982. OR gate

Question Number : 44 Question Id : 8606541164 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In a double slit experiment the distance between the slits is 0.1 cm and the screen is placed at 50 cm from the slits plane. When one slit is covered with a transparent sheet having thickness  $t$  and refractive index  $n(=1.5)$ , the central fringe shifts by 0.2 cm. The value of  $t$  is \_\_\_\_\_ cm.

Options :

8606543963.  $5.0 \times 10^{-3}$

8606543964.  $5.6 \times 10^{-4}$

8606543965.  $6.0 \times 10^{-3}$

8606543966.  $8 \times 10^{-4}$

Question Number : 45 Question Id : 8606541166 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If an alpha particle with energy 7.7 MeV is bombarded on a thin gold foil, the closest distance from nucleus it can reach is \_\_\_\_\_ m. (Atomic number of gold = 79 and  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$  in SI units)

Options :

8606543971.  $3.85 \times 10^{-16}$

8606543972.  $2.95 \times 10^{-16}$

8606543973.  $3.85 \times 10^{-14}$

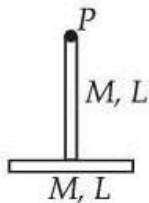
8606543974.  $2.95 \times 10^{-14}$

## 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 : 8606541171 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

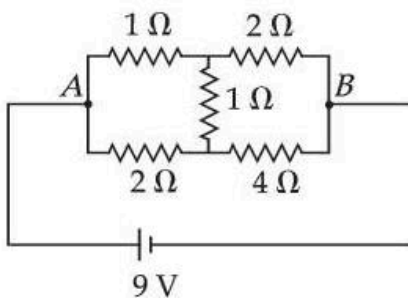
Two identical thin rods of mass  $M$  kg and length  $L$  m are connected as shown in figure. Moment of inertia of the combined rod system about an axis passing through point  $P$  and perpendicular to the plane of the rods is  $\frac{x}{12}ML^2$  kg m<sup>2</sup>. The value of  $x$  is \_\_\_\_\_.



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

Question Number : 47 Question Id : 8606541174 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The heat generated in 1 minute between points  $A$  and  $B$  in the given circuit, when a battery of 9 V with internal resistance of  $1 \Omega$  is connected across these points is \_\_\_\_\_ J.



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

Question Number : 48 Question Id : 8606541173 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In a microscope the objective is having focal length  $f_o = 2$  cm and eye-piece is having focal length  $f_e = 4$  cm. The tube length is 32 cm. The magnification produced by this microscope for normal adjustment is \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 49 Question Id : 8606541172 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A collimated beam of light of diameter 2 mm is propagating along  $x$ -axis. The beam is required to be expanded in a collimated beam of diameter 14 mm using a system of two convex lenses. If first lens has focal length 40 mm, then the focal length of second lens is \_\_\_\_\_ mm.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 50 Question Id : 8606541175 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

10 mole of oxygen is heated at constant volume from 30 °C to 40 °C. The change in the internal energy of the gas is \_\_\_\_\_ cal. (The molecular specific heat of oxygen at constant pressure,  $C_p = 7$  cal/mol.°C and  $R = 2$  cal./mol.°C.)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

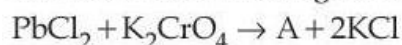
Text Areas : PlainText

## Chemistry Section A

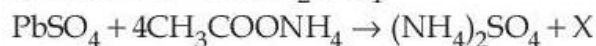
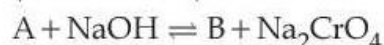
|                                       |           |
|---------------------------------------|-----------|
| Section Number :                      | 5         |
| Section type :                        | Online    |
| Mandatory or Optional :               | Mandatory |
| Number of Questions :                 | 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 : 8606541195 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the following reactions.



(Hot solution)



In the above reactions, A, B and X are respectively.

Options :

8606544072.  $\text{PbCrO}_4$ ,  $\text{Na}_2[\text{Pb}(\text{OH})_4]$  and  $[\text{Pb}(\text{NH}_3)_4] \text{SO}_4$

8606544073.  $\text{PbCrO}_4$ ,  $\text{Na}_2[\text{Pb}(\text{OH})_4]$  and  $(\text{NH}_4)_2[\text{Pb}(\text{CH}_3\text{COO})_4]$

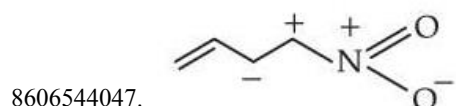
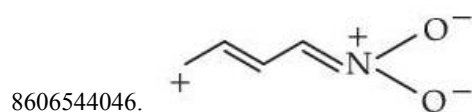
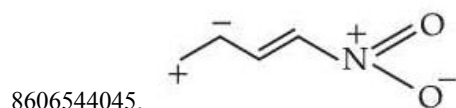
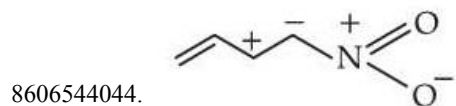
8606544074.  $\text{Na}_2[\text{Pb}(\text{OH})_2]$ ,  $\text{PbCrO}_4$  and  $[\text{Pb}(\text{NH}_3)_4] \text{SO}_4$

8606544075.  $\text{Na}_2[\text{Pb}(\text{OH})_2]$ ,  $\text{PbCrO}_4$  and  $(\text{NH}_4)_2[\text{Pb}(\text{CH}_3\text{COO})_4]$

Question Number : 52 Question Id : 8606541188 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

From the following, the least stable structure is :

Options :



Question Number : 53 Question Id : 8606541176 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

80 mL of a hydrocarbon on mixing with 264 mL of oxygen in a closed U-tube undergoes complete combustion. The residual gases after cooling to 273 K occupy 224 mL. When the system is treated with KOH solution, the volume decreases to 64 mL. The formula of the hydrocarbon is :

Options :

8606543996.  $\text{C}_2\text{H}_4$

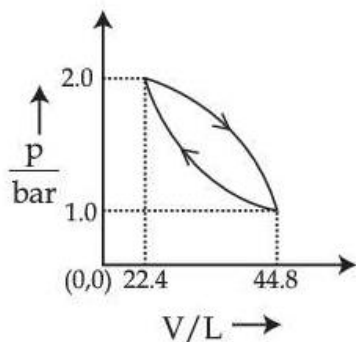
8606543997.  $\text{C}_2\text{H}_2$

8606543998.  $\text{C}_4\text{H}_{10}$

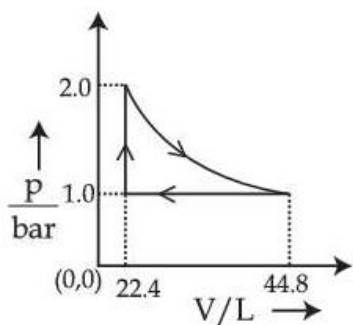
8606543999.  $\text{C}_2\text{H}_6$

Which of the following graphs between pressure 'p' versus volume 'V' represents the maximum work done ?

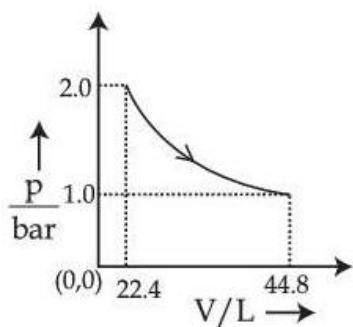
Options :



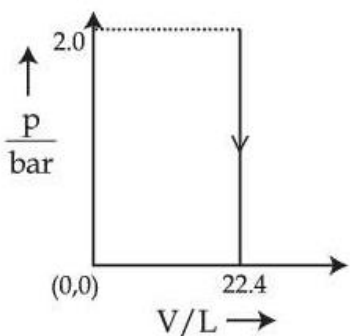
8606544016.



8606544017.



8606544018.



8606544019.

Question Number : 55 Question Id : 8606541183 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 represents the correct trend for the mentioned property ?

- |                                   |   |                         |
|-----------------------------------|---|-------------------------|
| A. $F > P > S > B$                | - | First Ionization Energy |
| B. $Cl > F > S > P$               | - | Electron Affinity       |
| C. $K > Al > Mg > B$              | - | Metallic character      |
| D. $K_2O > Na_2O > MgO > Al_2O_3$ | - | Basic character         |

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

Options :

8606544024. A, B, C and D

8606544025. B and C only

8606544026. A, B and D only

8606544027. A and B only

Question Number : 56 Question Id : 8606541185 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

$MnO_4^{2-}$ , in acidic medium, disproportionates to :

Options :

8606544032.  $Mn_2O_7$  and  $MnO_2$

8606544033.  $MnO_4^-$  and  $MnO$

8606544034.  $MnO_4^-$  and  $MnO_2$

8606544035.  $Mn_2O_7$  and  $MnO$

Question Number : 57 Question Id : 8606541187 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, 0.75 g of an organic compound gave 1.2 g of barium sulphate, find percentage of sulphur (molar mass  $32 \text{ g mol}^{-1}$ ). Molar mass of barium sulphate is  $233 \text{ g mol}^{-1}$ .

Options :

8606544040. 4.55%

8606544041. 21.97%

8606544042. 10.30%

8606544043. 16.48%

Question Number : 58 Question Id : 8606541189 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Identify **correct** statements from the following :

- A. Propanal and propanone are functional isomers.
- B. Ethoxyethane and methoxypropane are metamers.
- C. But-2-ene shows optical isomerism.
- D. But-1-ene and but-2-ene are functional isomers.
- E. Pentane and 2, 2-dimethyl propane are chain isomers.

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

Options :

8606544048. A, B and C only

8606544049. B, C and D only

8606544050. C, D and E only

8606544051. A, B and E only

Question Number : 59 Question Id : 8606541182 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Elements P and Q form two types of non-volatile, non-ionizable compounds PQ and PQ<sub>2</sub>. When 1 g of PQ is dissolved in 50 g of solvent 'A',  $\Delta T_b$  was 1.176 K while when 1 g of PQ<sub>2</sub> is dissolved in 50 g of solvent 'A',  $\Delta T_b$  was 0.689 K. ( $K_b$  of 'A' = 5 K kg mol<sup>-1</sup>). The molar masses of elements P and Q (in g mol<sup>-1</sup>) respectively, are :

Options :

8606544020. 65, 145

8606544021. 60, 25

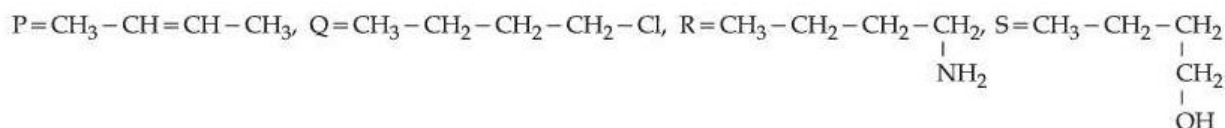
8606544022. 25, 60

8606544023. 70, 110

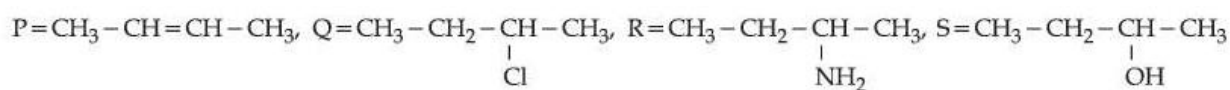
Question Number : 60 Question Id : 8606541190 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A hydrocarbon 'P' (C<sub>4</sub>H<sub>8</sub>) on reaction with HCl gives an optically active compound 'Q' (C<sub>4</sub>H<sub>9</sub>Cl) which on reaction with one mole of ammonia gives compound 'R' (C<sub>4</sub>H<sub>11</sub>N). 'R' on diazotization followed by hydrolysis gives 'S'. Identify P, Q, R and S.

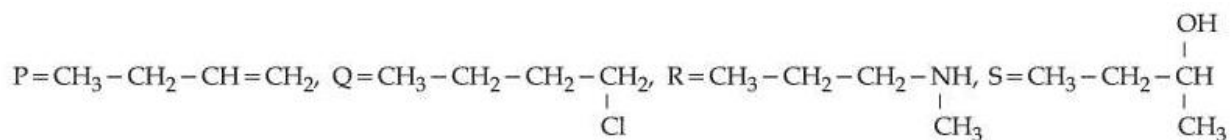
Options :



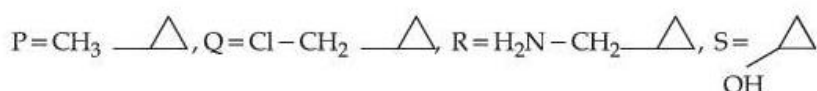
8606544052.



8606544053.



8606544054.



8606544055.

Question Number : 61 Question Id : 8606541193 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An organic compound (P) on treatment with aqueous ammonia under hot condition forms compound (Q) which on heating with  $\text{Br}_2$  and KOH forms compound (R) having molecular formula  $\text{C}_6\text{H}_7\text{N}$ . Names of P, Q and R respectively are.

Options :

8606544064. Benzoic acid, 4-methylbenzamide, 4-methylaniline

8606544065. Phenylethanoic acid, phenylethanamide, benzamine

8606544066. Toluic acid, methylbenzamide, 2-methylaniline

8606544067. Benzoic acid, benzamide, aniline

Question Number : 62 Question Id : 8606541179 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 :** When an electric discharge is passed through gaseous hydrogen, the hydrogen molecules dissociate and the energetically excited hydrogen atoms produce electromagnetic radiation of discrete frequencies.

**Statement II :** The frequency of second line of Balmer series obtained from  $\text{He}^+$  is equal to that of first line of Lyman series obtained from hydrogen atom.

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

Options :

8606544008. Both **Statement I** and **Statement II** are true

8606544009. Both **Statement I** and **Statement II** are false

8606544010. **Statement I** is true but **Statement II** is false

8606544011. **Statement I** is false but **Statement II** is true

Question Number : 63 Question Id : 8606541186 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

**Statement I :** Among  $[\text{Cu}(\text{NH}_3)_4]^{2+}$ ,  $[\text{Ni}(\text{en})_3]^{2+}$ ,  $[\text{Ni}(\text{NH}_3)_6]^{2+}$  and  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ ,  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  has the maximum number of unpaired electrons.

**Statement II :** The number of pairs among  $\{[\text{NiCl}_4]^{2-}, [\text{Ni}(\text{CO})_4]\}$ ,  $\{[\text{NiCl}_4]^{2-}, [\text{Ni}(\text{CN})_4]^{2-}\}$  and  $\{[\text{Ni}(\text{CO})_4], [\text{Ni}(\text{CN})_4]^{2-}\}$  that contain only diamagnetic species is two.

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

**Options :**

8606544036. Both **Statement I** and **Statement II** are true

8606544037. Both **Statement I** and **Statement II** are false

8606544038. **Statement I** is true but **Statement II** is false

8606544039. **Statement I** is false but **Statement II** is true

Question Number : 64 Question Id : 8606541184 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

**Statement I :** The number of pairs among  $[\text{SiO}_2, \text{CO}_2]$ ,  $[\text{SnO}, \text{SnO}_2]$ ,  $[\text{PbO}, \text{PbO}_2]$  and  $[\text{GeO}, \text{GeO}_2]$ , which contain oxides that are both amphoteric is 2.

**Statement II :**  $\text{BF}_3$  is an electron deficient molecule, can act as a Lewis acid, forms adduct with  $\text{NH}_3$  and has a trigonal planar geometry.

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

**Options :**

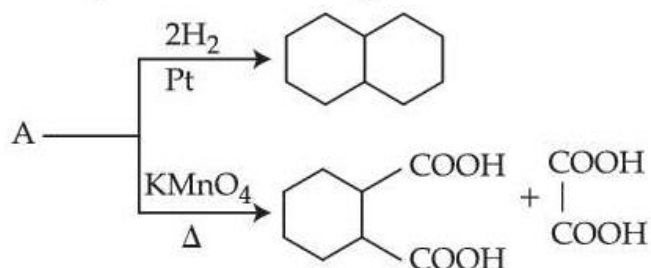
8606544028. Both **Statement I** and **Statement II** are true

8606544029. Both **Statement I** and **Statement II** are false

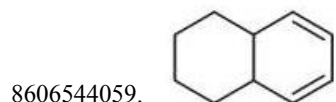
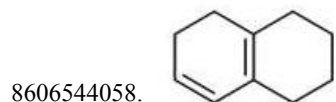
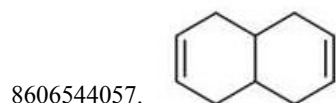
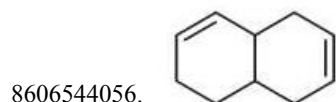
8606544030. **Statement I** is true but **Statement II** is false

8606544031. **Statement I** is false but **Statement II** is true

Identify A in the following reaction.



Options :



Question Number : 66 Question Id : 8606541177 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

14.0 g of calcium metal is allowed to react with excess HCl at 1.0 atm pressure and 273 K.

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

[Given : Molar mass in  $\text{g mol}^{-1}$  of Ca – 40, Cl – 35.5, H – 1]

Options :

8606544000. 0.35 mol of  $\text{H}_2$  gas is evolved.

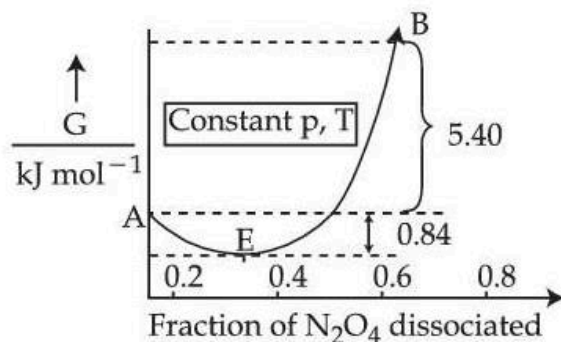
8606544001. 7.84 L of  $\text{H}_2$  gas is evolved.

8606544002. 33.3 g of  $\text{CaCl}_2$  is produced.

8606544003. The limiting reagent is calcium metal.

For the reaction,  $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2$ , graph is plotted as shown below. Identify **correct** statements.

- A. Standard free energy change for the reaction is  $-5.40 \text{ kJ mol}^{-1}$ .
- B. As  $\Delta G^\ominus$  in graph is positive,  $\text{N}_2\text{O}_4$  will not dissociate into  $\text{NO}_2$  at all.
- C. Reverse reaction will go to completion.
- D. When 1 mole of  $\text{N}_2\text{O}_4$  changes into equilibrium mixture, value of  $\Delta G^\ominus = -0.84 \text{ kJ mol}^{-1}$
- E. When 2 mole of  $\text{NO}_2$  changes into equilibrium mixture,  $\Delta G^\ominus$  for equilibrium mixture is  $-6.24 \text{ kJ mol}^{-1}$ .



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

Options :

8606544012. A and D only

8606544013. C and E only

8606544014. D and E only

8606544015. B and C only

Identify the **correct** statements.

- A. Arginine and Tryptophan are essential amino acids.
- B. Histidine does not contain heterocyclic ring in its structure.
- C. Proline is a six membered cyclic ring amino acid.
- D. Glycine does not have chiral centre.
- E. Cysteine has characteristic feature of side chain as  $\text{MeS}-\text{CH}_2-\text{CH}_2-$ .

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

Options :

8606544068. B and E Only

8606544069. A and D Only

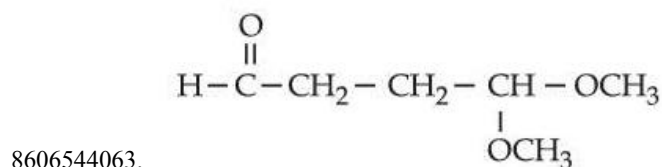
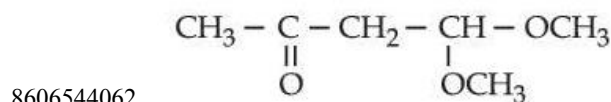
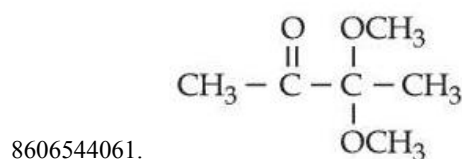
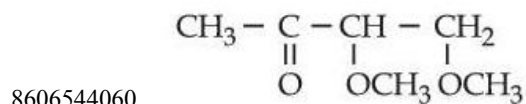
8606544070. C and D Only

8606544071. C and E Only

Question Number : 69 Question Id : 8606541192 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An organic compound "P" of molecular formula  $C_6H_{12}O_3$  gives positive Iodoform test but negative Tollen's test. When "P" is treated with dilute acid, it produces "Q". "Q" gives positive Tollen's test and also iodoform test. The structure of "P" is :

Options :



Question Number : 70 Question Id : 8606541178 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements :

**Statement I :**

The number of species among  $\text{SF}_4$ ,  $\text{NH}_4^+$ ,  $[\text{NiCl}_4]^{2-}$ ,  $\text{XeF}_4$ ,  $[\text{PtCl}_4]^{2-}$ ,  $\text{SeF}_4$  and  $[\text{Ni}(\text{CN})_4]^{2-}$ , that have tetrahedral geometry is 3.

**Statement II :**

In the set  $[\text{NO}_2]$ ,  $\text{BeH}_2$ ,  $\text{BF}_3$ ,  $\text{AlCl}_3$ , all the molecules have incomplete octet around central atom.

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

Options :

8606544004. Both **Statement I** and **Statement II** are true

8606544005. Both **Statement I** and **Statement II** are false

8606544006. **Statement I** is true but **Statement II** is false

8606544007. **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 : 8606541200 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Pre-exponential factors of two different reactions of same order are identical. Let activation energy of first reaction exceeds the activation energy of second reaction by  $20 \text{ kJ mol}^{-1}$ . If  $k_1$  and  $k_2$  are the rate constants of first and second reaction respectively at 300 K, then  $\ln \frac{k_2}{k_1}$  will be \_\_\_\_\_. (nearest integer) [ $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

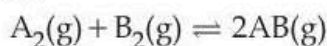
Text Areas : PlainText

Question Number : 72 Question Id : 8606541198 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Use the following data :

| Substance          | $\Delta_f H^\ominus (500\text{K})$<br>$\text{kJ mol}^{-1}$ | $S^\ominus (500\text{K})$<br>$\text{J K}^{-1} \text{ mol}^{-1}$ |
|--------------------|------------------------------------------------------------|-----------------------------------------------------------------|
| AB(g)              | 32                                                         | 222                                                             |
| A <sub>2</sub> (g) | 6                                                          | 146                                                             |
| B <sub>2</sub> (g) | $x$                                                        | 280                                                             |

One mole each of A<sub>2</sub>(g) and B<sub>2</sub>(g) are taken in a 1 L closed flask and allowed to establish the equilibrium at 500K.



The value of  $x$  (in  $\text{kJ mol}^{-1}$ ) is \_\_\_\_\_. (Nearest integer)

(Given :  $\log K = 2.2$       $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ )

Response Type : Numeric

Evaluation Required For SA : Yes

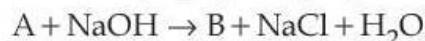
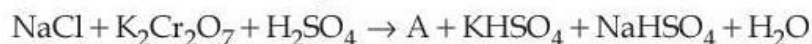
Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 73 Question Id : 8606541197 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the following reactions :



In the product 'C', 'X' is the number of  $\text{O}_2^{2-}$  units, 'Y' is the total number oxygen atoms present and 'Z' is the oxidation state of Cr. The value of  $X + Y + Z$  is \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

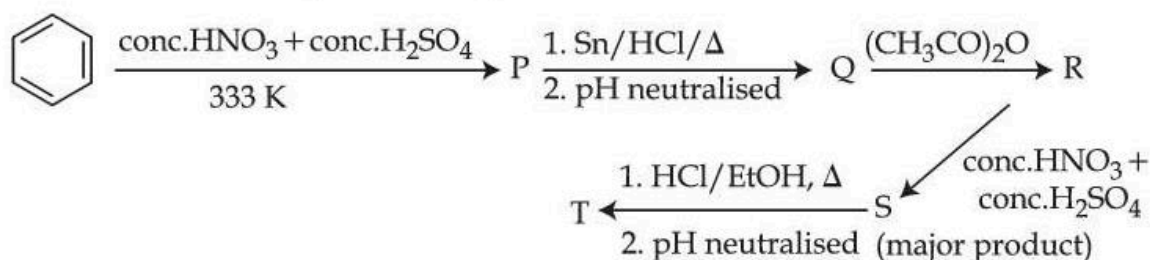
Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 74 Question Id : 8606541196 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Consider the following reaction sequence



The percentage of nitrogen in product 'T' formed is \_\_\_\_\_%. (Nearest integer)  
(Given molar mass in  $\text{g mol}^{-1}$  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

Question Number : 75 Question Id : 8606541199 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The pH and conductance of a weak acid (HX) was found to be 5 and  $4 \times 10^{-5} \text{ S}$ , respectively. The conductance was measured under standard condition using a cell where the electrode plates having a surface area of  $1 \text{ cm}^2$  were at a distance of 15 cm apart. The value of the limiting molar conductivity is \_\_\_\_\_  $\text{S m}^2 \text{ mol}^{-1}$ . (nearest integer)

(Given : degree of dissociation of the weak acid  $(\alpha) \ll 1$ )

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText