# National Testing Agency

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|---|---|
| **Question Paper Name :** | B Tech 29 Jun 2022 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 Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

Let $\alpha$ be a root of the equation $1 + x^2 + x^4 = 0$. Then, the value of $\alpha^{1011} + \alpha^{2022} - \alpha^{3033}$ is equal to :

**Options :**

A. $1$

B. $\alpha$

C. $1 + \alpha$

D. $1 + 2\alpha$

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

Let arg(z) represent the principal argument of the complex number z. Then, $|z| = 3$ and $\arg(z - 1) - \arg(z + 1) = \frac{\pi}{4}$ intersect :

**Options :**

A. exactly at one point.

B. exactly at two points.

C. nowhere.

D. at infinitely many points.

**Question Number : 3 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

$$\lim_{x \to 1} \frac{(x^2 - 1)\sin^2(\pi x)}{x^4 - 2x^3 + 2x - 1}$$

is equal to:

**Options :**

A. $\frac{\pi^2}{6}$

B. $\frac{\pi^2}{3}$

C. $\frac{\pi^2}{2}$

D. $\pi^2$

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

Let f be a real valued continuous function on [0, 1] and

$$f(x) = x + \int_0^1 (x - t)f(t)dt$$

.

Then, which of the following points (x, y) lies on the curve y = f(x) ?

**Options :**

A. (2, 4)

B. (1, 2)

C. (4, 17)

D. (6, 8)

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

If

$$\int_0^2 \left(\sqrt{2x} - \sqrt{2x - x^2}\right)dx = \int_0^1 \left(1 - \sqrt{1 - y^2} - \frac{y^2}{2}\right)dy + \int_1^2 \left(2 - \frac{y^2}{2}\right)dy + I$$

, then I equals

**Options :**

A. $\int_0^1 \left(1 + \sqrt{1 - y^2}\right)dy$

B. $\int_0^1 \left(\frac{y^2}{2} - \sqrt{1 - y^2} + 1\right)dy$

C. $\int_0^1 \left(1 - \sqrt{1 - y^2}\right)dy$

D. $\int_0^1 \left(\frac{y^2}{2} + \sqrt{1 - y^2} + 1\right)dy$

**Question Number : 6 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) is the solution of the differential equation

$$\left(1 + e^{2x}\right)\frac{dy}{dx} + 2\left(1 + y^2\right)e^x = 0$$

and y (0) = 0, then $6\left(y'(0) + \left(y\left(\log_e\sqrt{3}\right)\right)^2\right)$ is equal to

**Options :**

A. $2$

B. $-2$

C. $-4$

D. $-1$

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

Let a triangle ABC be inscribed in the circle

$$x^2 - \sqrt{2}\,(x + y) + y^2 = 0$$

such that

$$\angle BAC = \frac{\pi}{2}$$

. If the length of side AB is $\sqrt{2}$ , then the area of the $\Delta ABC$ is equal to :

**Options :**

A. 1

B. $\left(\sqrt{6} + \sqrt{3}\right)/2$

C. $\left(3 + \sqrt{3}\right)/4$

D. $\left(\sqrt{6} + 2\sqrt{3}\right)/4$

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

The distance of the origin from the centroid of the triangle whose two sides have the equations $x - 2y + 1 = 0$ and $2x - y - 1 = 0$ and whose orthocenter is

$$\left(\frac{7}{3}, \frac{7}{3}\right)$$

is :

**Options :**

A. $\sqrt{2}$

B. 2

C. $2\sqrt{2}$

D. 4

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

Let A, B, C be three points whose position vectors respectively are

$$\vec{a} = \hat{i} + 4\hat{j} + 3\hat{k}$$

$$\vec{b} = 2\hat{i} + \alpha\hat{j} + 4\hat{k},\ \alpha \in R$$

$$\vec{c} = 3\hat{i} - 2\hat{j} + 5\hat{k}$$

If $\alpha$ is the smallest positive integer for which $\vec{a}$, $\vec{b}$, $\vec{c}$ are noncollinear, then the length of the median, in $\Delta$ ABC, through A is :

**Options :**

A. $\frac{\sqrt{82}}{2}$

B. $\frac{\sqrt{62}}{2}$

C. $\frac{\sqrt{69}}{2}$

D. $\frac{\sqrt{66}}{2}$

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

The probability that a relation R from {x, y} to {x, y} is both symmetric and transitive, is equal to :

**Options :**

A. $\frac{5}{16}$

B. $\frac{9}{16}$

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

D. $\frac{13}{16}$

**Question Number : 11 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 values of a $\in$ N such that the variance of 3, 7, 12, a, 43 $-$ a is a natural number is :

**Options :**

A. 0

B. 2

C. 5

D. infinite

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

Let

$$A = \begin{pmatrix} 2 & -1 \\ 0 & 2 \end{pmatrix}$$

. If

$$B = I - {}^5C_1(adjA) + {}^5C_2(adjA)^2 - \ ..... \ - {}^5C_5(adjA)^5$$

, then the sum of all elements of the matrix B is

**Options :**

A. $-5$

B. $-6$

C. $-7$

D. $-8$

**Question Number : 13 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 the infinite series

$$1 + \frac{5}{6} + \frac{12}{6^2} + \frac{22}{6^3} + \frac{35}{6^4} + \frac{51}{6^5} + \frac{70}{6^6} + \ .....$$

is equal to :

**Options :**

A. $\frac{425}{216}$

B. $\frac{429}{216}$

C. $\frac{288}{125}$

D. $\frac{280}{125}$

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

Let $f : R \to R$ be a function defined by $f(x) = (x - 3)^{n_1} (x - 5)^{n_2}$, $n_1, n_2 \in N$. Then, which of the following is NOT true?

**Options :**

A. For $n_1 = 3, n_2 = 4$, there exists $\alpha \in (3, 5)$ where f attains local maxima.

B. For $n_1 = 4, n_2 = 3$, there exists $\alpha \in (3, 5)$ where f attains local minima.

C. For $n_1 = 3, n_2 = 5$, there exists $\alpha \in (3, 5)$ where f attains local maxima.

D. For $n_1 = 4, n_2 = 6$, there exists $\alpha \in (3, 5)$ where f attains local maxima.

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

Let $P : y^2 = 4ax$, $a > 0$ be a parabola with focus S. Let the tangents to the parabola P make an angle of $\frac{\pi}{4}$ with the line $y = 3x + 5$ touch the parabola P at A and B. Then the value of a for which A, B and S are collinear is :

**Options :**

A. 8 only

B. 2 only

C. $\frac{1}{4}$ only

D. any $a > 0$

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

Let

$$\frac{x-2}{3} = \frac{y+1}{-2} = \frac{z+3}{-1}$$

lie on the plane $px - qy + z = 5$, for some $p, q \in R$. The shortest distance of the plane from the origin is :

**Options :**

A. $\sqrt{\frac{3}{109}}$

B. $\sqrt{\frac{5}{142}}$

C. $\frac{5}{\sqrt{71}}$

D. $\frac{1}{\sqrt{142}}$

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

Let Q be the mirror image of the point P(1, 2, 1) with respect to the plane x + 2y + 2z = 16. Let T be a plane passing through the point Q and contains the line

$$\vec{r} = -\hat{k} + \lambda\left(\hat{i} + \hat{j} + 2\hat{k}\right), \lambda \in R$$

. Then, which of the following points lies on T?

**Options :**

A. (2, 1, 0)

B. (1, 2, 1)

C. (1, 2, 2)

D. (1, 3, 2)

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

From the base of a pole of height 20 meter, the angle of elevation of the top of a tower is 60°. The pole subtends an angle 30° at the top of the tower. Then the height of the tower is :

**Options :**

A. $15\sqrt{3}$

B. $20\sqrt{3}$

C. $20 + 10\sqrt{3}$

D. 30

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

Negation of the Boolean statement $(p \vee q) \Rightarrow ((\sim r) \vee p)$ is equivalent to :

**Options :**

A. $p \wedge (\sim q) \wedge r$

B. $(\sim p) \wedge (\sim q) \wedge r$

C. $(\sim p) \wedge q \wedge r$

D. $p \wedge q \wedge (\sim r)$

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

Let $n \geq 5$ be an integer. If $9^n - 8n - 1 = 64\alpha$ and $6^n - 5n - 1 = 25\beta$, then $\alpha - \beta$ is equal to

**Options :**

A. $1 + {}^nC_2 (8 - 5) + {}^nC_3 (8^2 - 5^2) + ..... + {}^nC_n (8^{n-1} - 5^{n-1})$

B. $1 + {}^nC_3 (8 - 5) + {}^nC_4 (8^2 - 5^2) + ..... + {}^nC_n (8^{n-2} - 5^{n-2})$

C. ${}^nC_3 (8 - 5) + {}^nC_4 (8^2 - 5^2) + ..... + {}^nC_n (8^{n-2} - 5^{n-2})$

D. ${}^nC_4 (8 - 5) + {}^nC_5 (8^2 - 5^2) + ..... + {}^nC_n (8^{n-3} - 5^{n-3})$

## Mathematics Section B

| | |
|---|---|
| **Section Number :** | 2 |
| **Section type :** | Online |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 10 |
| **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 Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let

$$\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$$

,

$$\vec{b} = \hat{i} + \hat{j} + \hat{k}$$

and $\vec{c}$ be a vector such that

$$\vec{a} + \left(\vec{b} \times \vec{c}\right) = \vec{0}$$

and

$$\vec{b} \cdot \vec{c} = 5$$

. Then the value of $3\left(\vec{c} \cdot \vec{a}\right)$ 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 Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let y = y(x), x > 1, be the solution of the differential equation

$$(x-1)\frac{dy}{dx} + 2xy = \frac{1}{x-1}$$

, with

$$y(2) = \frac{1+e^4}{2e^4}$$

. If

$$y(3) = \frac{e^\alpha + 1}{\beta e^\alpha}$$

, then the value of $\alpha + \beta$ is equal to _____.

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

**Question Number : 23 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let 3, 6, 9, 12, ..... upto 78 terms and 5, 9, 13, 17, ..... upto 59 terms be two series. Then, the sum of the terms common to both the series 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 Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

For real numbers a, b (a > b > 0), let

Area

$$\left\{(x,y): x^2+y^2 \le a^2 \; and \; \frac{x^2}{a^2}+\frac{y^2}{b^2} \ge 1\right\} = 30\pi$$

and

Area

$$\left\{(x,y): x^2+y^2 \le b^2 \; and \; \frac{x^2}{a^2}+\frac{y^2}{b^2} \le 1\right\} = 18\pi$$

Then, the value of $(a-b)^2$ 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 Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let f and g be twice differentiable even functions on $(-2, 2)$ such that

$$f\left(\frac{1}{4}\right) = 0$$

,

$$f\left(\frac{1}{2}\right) = 0$$

,

$$f(1) = 1$$

and

$$g\left(\frac{3}{4}\right) = 0$$

,

$$g(1) = 2$$

. Then, the minimum number of solutions of

$$f(x)g''(x) + f'(x)g'(x) = 0$$

in $(-2,2)$ is equal to _____.

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

**Question Number : 26 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let the coefficients of $x^{-1}$ and $x^{-3}$ in the expansion of

$$\left(2x^{\frac{1}{5}} - \frac{1}{x^{\frac{1}{5}}}\right)^{15}, x > 0$$

, be m and n respectively. If r is a positive integer such that

$$mn^2 = {}^{15}C_r \cdot 2^r$$

, then the value of r is equal to _____.

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

**Question Number : 27 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The total number of four digit numbers such that each of first three digits is divisible by the last digit, is equal to _____.

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

**Question Number : 28 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let

$$M = \begin{bmatrix} 0 & -\alpha \\ \alpha & 0 \end{bmatrix}$$

, where $\alpha$ is a non-zero real number an

$$N = \sum_{k=1}^{49} M^{2k}$$

. If

$$(I - M^2)N = -2I$$

, then the positive integral value of $\alpha$ is _____.

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

**Question Number : 29 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Let f(x) and g(x) be two real polynomials of degree 2 and 1 respectively. If

$$f(g(x)) = 8x^2 - 2x$$

and

$$g(f(x)) = 4x^2 + 6x + 1$$

, then the value of $f(2) + g(2)$ is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes

Answers Type : Equal
Text Areas : PlainText

**Question Number : 30 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The number of solutions of the equation

$$\sin x = \cos^2 x$$

in the interval (0, 10) is _____.

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

## Physics Section A

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

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

A small toy starts moving from the position of rest under a constant acceleration. If it travels a distance of 10m in t s, the distance travelled by the toy in the next t s will be :

**Options :**

A. 10 m

B. 20 m

C. 30 m

D. 40 m

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

At what temperature a gold ring of diameter 6.230 cm be heated so that it can be fitted on a wooden bangle of diameter 6.241 cm ? Both the diameters have been measured at room temperature (27°C).

(Given : coefficient of linear thermal expansion of gold $\alpha_L = 1.4 \times 10^{-5}\ K^{-1}$)

**Options :**

A. 125.7°C

B. 91.7°C

C. 425.7°C

D. 152.7°C

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

Two point charges Q each are placed at a distance d apart. A third point charge q is placed at a distance x from mid-point on the perpendicular bisector. The value of x at which charge q will experience the maximum Coulomb's force is :

**Options :**

A. x = d

B. $x = \frac{d}{2}$

C. $x = \frac{d}{\sqrt{2}}$

D. $x = \frac{d}{2\sqrt{2}}$

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

The speed of light in media 'A' and 'B' are $2.0 \times 10^{10}$ cm/s and $1.5 \times 10^{10}$ cm/s respectively. A ray of light enters from the medium B to A at an incident angle '$\theta$'. If the ray suffers total internal reflection, then

**Options :**

A. $\theta = \sin^{-1}\left(\frac{3}{4}\right)$

B. $\theta > \sin^{-1}\left(\frac{2}{3}\right)$

C. $\theta < \sin^{-1}\left(\frac{3}{4}\right)$

D. $\theta > \sin^{-1}\left(\frac{3}{4}\right)$

**Question Number : 35 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 at a point associated with a light wave is given by

$E = 200\,[\sin(6 \times 10^{15})t + \sin(9 \times 10^{15})t]\ Vm^{-1}$

Given : $h = 4.14 \times 10^{-15}$ eVs

If this light falls on a metal surface having a work function of 2.50 eV, the maximum kinetic energy of the photoelectrons will be

**Options :**

A. 1.90 eV

B. 3.27 eV

C. 3.60 eV

D. 3.42 eV

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

A capacitor is discharging through a resistor R. Consider in time $t_1$, the energy stored in the capacitor reduces to half of its initial value and in time $t_2$, the charge stored reduces to one eighth of its initial value. The ratio $t_1/t_2$ will be

**Options :**

A. 1/2

B. 1/3

C. 1/4

D. 1/6

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

Starting with the same initial conditions, an ideal gas expands from volume $V_1$ to $V_2$ in three different ways. The work done by the gas is $W_1$ if the process is purely isothermal, $W_2$, if the process is purely adiabatic and $W_3$ if the process is purely isobaric. Then, choose the correct option

**Options :**

A. $W_1 < W_2 < W_3$

B. $W_2 < W_3 < W_1$

C. $W_3 < W_1 < W_2$

D. $W_2 < W_1 < W_3$

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

Two long current carrying conductors are placed to each other at a distance of 8 cm between them. The magnitude of magnetic field produced at mid-point between the two conductors due to current flowing in them is 300 $\mu$T. The equal current flowing in the two conductors is :

**Options :**

A. 30A in the same direction.

B. 30A in the opposite direction.

C. 60A in the opposite direction.

D. 300A in the opposite direction.

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

The time period of a satellite revolving around earth in a given orbit is 7 hours. If the radius of orbit is increased to three times its previous value, then approximate new time period of the satellite will be

**Options :**

A. 40 hours

B. 36 hours

C. 30 hours

D. 25 hours

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

The motion of a simple pendulum executing S.H.M. is represented by the following equation.

$$y = A\sin(\pi t + \phi)$$

, where time is measured in second. The length of pendulum is

**Options :**

A. 97.23 cm

B. 25.3 cm

C. 99.4 cm

D. 406.1 cm

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

A vessel contains 16g of hydrogen and 128g of oxygen at standard temperature and pressure. The volume of the vessel in $cm^3$ is :

**Options :**

A. $72 \times 10^5$

B. $32 \times 10^5$

C. $27 \times 10^4$

D. $54 \times 10^4$

**Question Number : 42 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 electric force changes the speed of the charged particle and hence changes its kinetic energy; whereas the magnetic force does not change the kinetic energy of the charged particle.

**Statement II** : The electric force accelerates the positively charged particle perpendicular to the direction of electric field. The magnetic force accelerates the moving charged particle along the direction of magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below :

**Options :**

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

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

A block of mass 40 kg slides over a surface, when a mass of 4 kg is suspended through an inextensible massless string passing over frictionless pulley as shown below.

The coefficient of kinetic friction between the surface and block is 0.02. The acceleration of block is. (Given $g = 10\ ms^{-2}$.)




**Options :**

A. $1\ ms^{-2}$

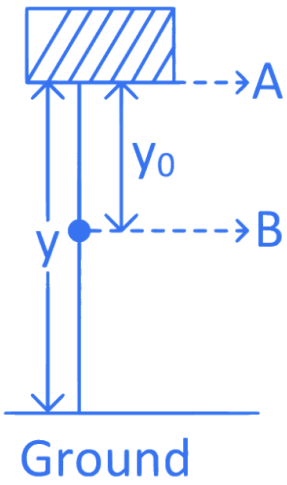
B. $1/5\ ms^{-2}$

C. $4/5\ ms^{-2}$

D. $8/11\ ms^{-2}$

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

In the given figure, the block of mass m is dropped from the point 'A'. The expression for kinetic energy of block when it reaches point 'B' is




**Options :**

A. $\frac{1}{2}mg\,y_0^{\,2}$

B. $\frac{1}{2}mg\,y^2$

C. $mg(y - y_0)$

D. $mgy_0$

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

A block of mass M placed inside a box descends vertically with acceleration 'a'. The block exerts a force equal to one-fourth of its weight on the floor of the box. The value of 'a' will be

**Options :**

A. $\frac{g}{4}$

B. $\frac{g}{2}$

C. $\frac{3g}{4}$

D. g

**Question Number : 46 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

If the electric potential at any point (x, y, z) m in space is given by $V = 3x^2$ volt. The electric field at the point (1, 0, 3) m will be :

**Options :**

A. 3 $Vm^{-1}$, directed along positive x-axis.

B. 3 $Vm^{-1}$, directed along negative x-axis.

C. 6 $Vm^{-1}$, directed along positive x-axis.

D. 6 $Vm^{-1}$, directed along negative x-axis.

**Question Number : 47 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

The combination of two identical cells, whether connected in series or parallel combination provides the same current through an external resistance of 2Ω. The value of internal resistance of each cell is

**Options :**

A. 2Ω

B. 4Ω

C. 6Ω

D. 8Ω

**Question Number : 48 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

A person can throw a ball upto a maximum range of 100 m. How high above the ground he can throw the same ball?

**Options :**

A. 25 m

B. 50 m

C. 100 m

D. 200 m

**Question Number : 49 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

In the following nuclear reaction,

$$D \xrightarrow{\alpha} D_1 \xrightarrow{\beta^-} D_2 \xrightarrow{\alpha} D_3 \xrightarrow{\gamma} D_4$$

Mass number of D is 182 and atomic number is 74. Mass number and atomic number of $D_4$ respectively will be _____.

**Options :**

A. 174 and 71

B. 174 and 69

C. 172 and 69

D. 172 and 71

**Question Number : 50 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

The TV transmission tower at a particular station has a height of 125 m. For doubling the coverage of its range, the height of the tower should be increased by

**Options :**

A. 125 m

B. 250 m

C. 375 m

D. 500 m

## Physics Section B

| | |
|---|---|
| **Section Number :** | 4 |
| **Section type :** | Online |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 10 |
| **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 : 51 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The Vernier constant of Vernier callipers is 0.1 mm and it has zero error of $(-0.05)$ cm. While measuring diameter of a sphere, the main scale reading is 1.7 cm and coinciding vernier division is 5. The corrected diameter will be _____ $\times 10^{-2}$ cm.

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

**Question Number : 52 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

A small spherical ball of radius 0.1 mm and density $10^4$ kg $m^{-3}$ falls freely under gravity through a distance h before entering a tank of water. If, after entering the water the velocity of ball does not change and it continue to fall with same constant velocity inside water, then the value of h will be _____ m.

(Given g = 10 $ms^{-2}$, viscosity of water = $1.0 \times 10^{-5}$ N-$sm^{-2}$).

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

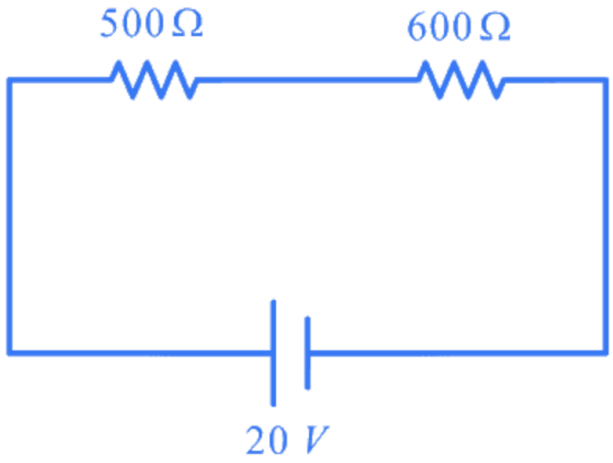
**Question Number : 53 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

In an experiment to determine the velocity of sound in air at room temperature using a resonance tube, the first resonance is observed when the air column has a length of 20.0 cm for a tuning fork of frequency 400 Hz is used. The velocity of the sound at room temperature is 336 $ms^{-1}$. The third resonance is observed when the air column has a length of _____ cm.

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

**Question Number : 54 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Two resistors are connected in series across a battery as shown in figure. If a voltmeter of resistance 2000 Ω is used to measure the potential difference across 500 Ω resistor, the reading of the voltmeter will be _____ V.




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

**Question Number : 55 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

A potential barrier of 0.4 V exists across a p-n junction. An electron enters the junction from the n-side with a speed of $6.0 \times 10^5$ $ms^{-1}$. The speed with which electron enters the p side will be

$$\frac{x}{3} \times 10^5$$

$ms^{-1}$ the value of x is _____.

(Given mass of electron = $9 \times 10^{-31}$ kg, charge on electron = $1.6 \times 10^{-19}$ C.)

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

**Question Number : 56 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The displacement current of 4.425 $\mu$A is developed in the space between the plates of parallel plate capacitor when voltage is changing at a rate of $10^6$ $Vs^{-1}$. The area of each plate of the capacitor is 40 $cm^2$. The distance between each plate of the capacitor is $x \times 10^{-3}$ m. The value of x is _____.

(Permittivity of free space, $E_0 = 8.85 \times 10^{-12}$ $C^2$ $N^{-1}$ $m^{-2}$).

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

**Question Number : 57 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The moment of inertia of a uniform thin rod about a perpendicular axis passing through one end is $I_1$. The same rod is bent into a ring and its moment of inertia about a diameter is $I_2$. If $\frac{I_1}{I_2}$ is $\frac{x\pi^2}{3}$, then the value of x will be _____.

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

**Question Number : 58 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

In a double slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the plane of slits. If the screen is moved by $5 \times 10^{-2}$ m towards the slits, the change in fringe width is $3 \times 10^{-3}$ cm. If the distance between the slits is 1 mm, then the wavelength of the light will be _____ nm.

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

**Question Number : 59 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

An inductor of 0.5 mH, a capacitor of 200 $\mu$F and a resistor of 2 $\Omega$ are connected in series with a 220 V ac source. If the current is in phase with the emf, the frequency of ac source will be _____ $\times 10^2$ Hz.

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

**Question Number : 60 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The half life of a radioactive substance is 5 years. After x years a given sample of the radioactive substance gets reduced to 6.25% of its initial value. The value of x is _____.

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

## Chemistry Section A

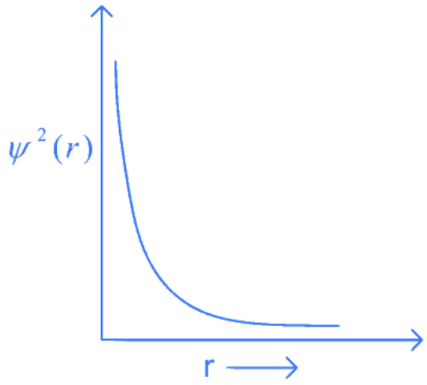
| | |
|---|---|
| **Section Number :** | 5 |
| **Section type :** | Online |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 20 |
| **Number of Questions to be attempted :** | 20 |
| **Section Marks :** | 80 |
| **Maximum Instruction Time :** | 0 |
| **Sub-Section Number :**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

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

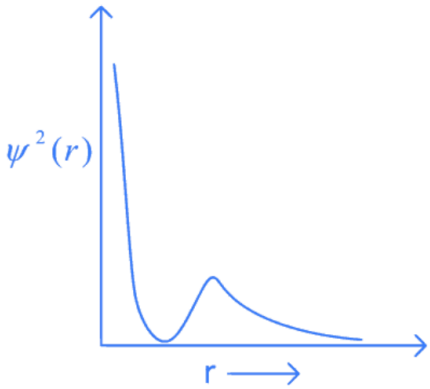
Which of the following is the correct plot for the probability density $\psi^2$ (r) as a function of distance 'r' of the electron from the nucleus for 2s orbital?

**Options :**

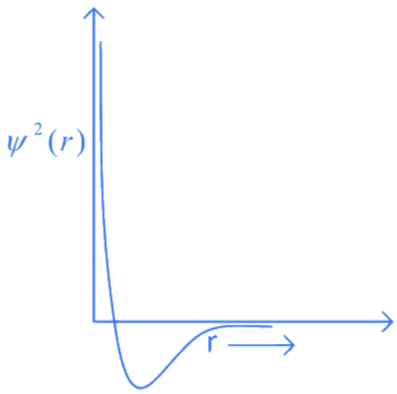
A.



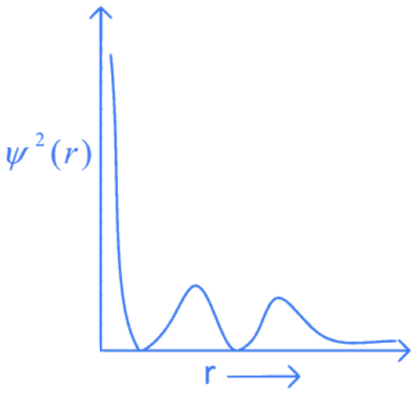

B.




C.




D.



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

Consider the species $CH_4$, $NH_4^+$ and $BH_4^-$. Choose the correct option with respect to the these species.

**Options :**

A. They are isoelectronic and only two have tetrahedral structures.

B. They are isoelectronic and all have tetrahedral structures.

C. Only two are isoelectronic and all have tetrahedral structures.

D. Only two are isoelectronic and only two have tetrahedral structures.

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

4.0 moles of argon and 5.0 moles of $PCl_5$ are introduced into an evacuated flask of 100 litre capacity at 610 K. The system is allowed to equilibrate. At equilibrium, the total pressure of mixture was found to be 6.0 atm. The $K_p$ for the reaction is :

[Given : R = 0.082 L atm $K^{-1}$ $mol^{-1}$]

**Options :**

A. 2.25

B. 6.24

C. 12.13

D. 15.24

**Question Number : 64 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. One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : The first ionization enthalpy for oxygen is lower than that of nitrogen.

Reason R : The four electrons in 2p orbitals of oxygen experience more electron-electron repulsion.

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

**Options :**

A. Both A and R are are correct and R is the correct explanation of A.

B. Both A and R are are correct but R is NOT the correct explanation of A.

C. A is correct but R is not correct.

D. A is not correct but R is correct.

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

Given below are two statements.

- Statement I : In $CuSO_4 . 5H_2O$, Cu-O bonds are present.
- Statement II : In $CuSO_4 . 5H_2O$, ligands coordinating with Cu(II) ion are O-and S-based ligands.

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

**Options :**

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

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

Number of lone pair(s) of electrons on central atom and the shape $BrF_3$ molecule respectively, are

**Options :**

A. 0, triangular planar.

B. 1, pyramidal.

C. 2, bent T-shape.

D. 1, bent T-shape.

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

Sulphur dioxide is one of the components of polluted air. $SO_2$ is also a major contributor to acid rain. The correct and complete reaction to represent acid rain caused by $SO_2$ is :

**Options :**

A. $2SO_2 + O_2 \rightarrow 2SO_3$

B. $SO_2 + O_3 \rightarrow SO_3 + O_2$

C. $SO_2 + H_2O_2 \rightarrow H_2SO_4$

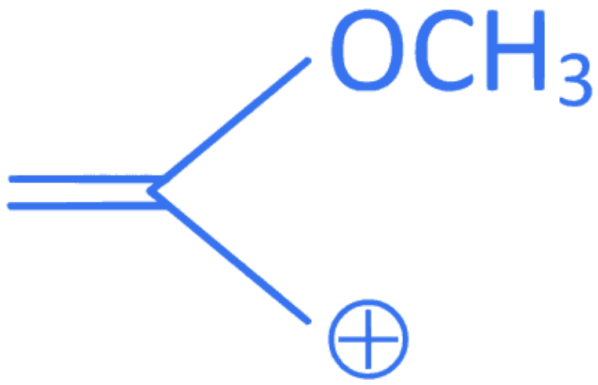
D. $2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$

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

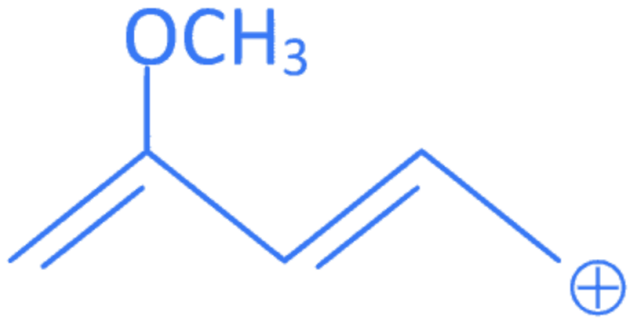
Which of the following carbocations is most stable?

**Options :**

A.




B.



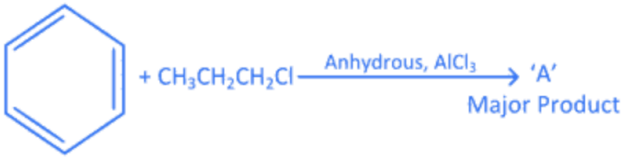

C.




D.



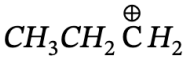

**Question Number : 69 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**




The stable carbocation formed in the above reaction is

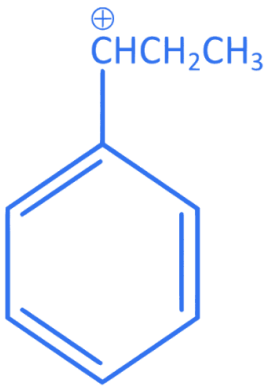
**Options :**

A.



B. $CH_3\overset{\oplus}{C}H_2$

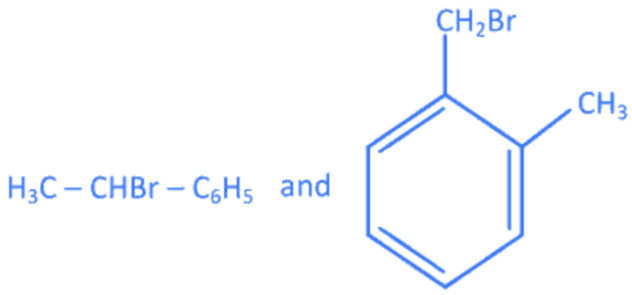
C. $CH_3 - \overset{\oplus}{C}H - CH_3$

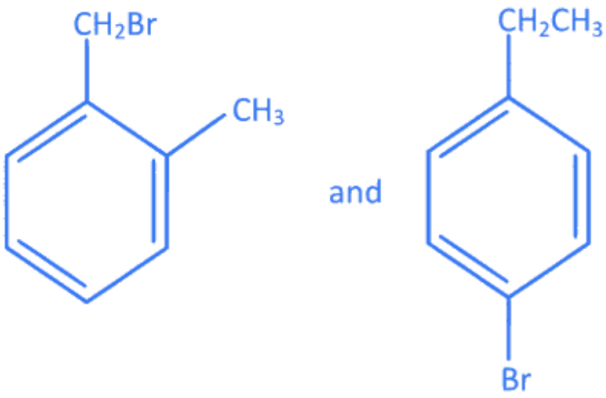
D. 

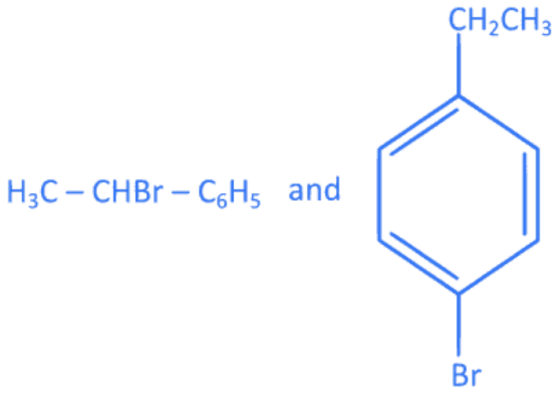

**Question Number : 70 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

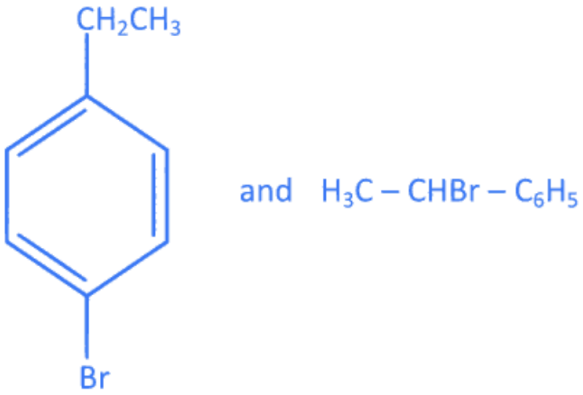
Two isomers (A) and (B) with Molar mass 184 g/mol and elemental composition C, 52.2%; H, 4.9% and Br 42.9% gave benzoic acid and p-bromobenzoic acid, respectively on oxidation with $KMnO_4$. Isomer 'A' is optically active and gives a pale yellow precipitate when warmed with alcoholic $AgNO_3$. Isomer 'A' and 'B' are, respectively

**Options :**

A. 


B. 

C. 


D. 


**Question Number : 71 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

In Friedel-Crafts alkylation of aniline, one gets

**Options :**

A. alkylated product with ortho and para substitution.

B. secondary amine after acidic treatment.

C. an amide product.

D. positively charged nitrogen at benzene ring.

**Question Number : 72 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

The structure of protein that is unaffected by heating is

**Options :**

A. secondary structure

B. tertiary structure

C. primary structure

D. quaternary structure

**Question Number : 73 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

A white precipitate was formed when $BaCl_2$ was added to water extract of an inorganic salt. Further, a gas 'X' with characteristic odour was released when the formed white precipitate was dissolved in dilute HCl. The anion present in the inorganic salt is

**Options :**

A. $I^-$

B. $SO_3^{2-}$

C. $S^{2-}$

D. $NO_2^-$

**Question Number : 74 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

Using the rules for significant figures, the correct answer for the expression

$$\frac{0.02858 \times 0.112}{0.5702}$$

will be

**Options :**

A. 0.005613

B. 0.00561

C. 0.0056

D. 0.006

**Question Number : 75 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

A 42.12% (w/v) solution of NaCl causes precipitation of a certain sol in 10 hours. The coagulating value of NaCl for the sol in 2 hours is :

[Given : Molar mass : Na = 23.0 g $mol^{-1}$ ; Cl = 35.5 g $mol^{-1}$]

**Options :**

A. 36 m mol $L^{-1}$

B. 36 mol $L^{-1}$

C. 1440 mol $L^{-1}$

D. $1440 \text{ m mol } L^{-1}$

**Question Number : 76 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 Ore** | | **List-II Composition** |
|---|---|---|---|
| (A) | Siderite | (I) | $FeCO_3$ |
| (B) | Malachite | (II) | $CuCO_3 . Cu(OH)_2$ |
| (C) | Sphalerite | (III) | ZnS |
| (D) | Calamine | (IV) | $ZnCO_3$ |

Choose the correct answer from the options given below :

**Options :**

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

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

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

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

**Question Number : 77 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

Amongst baking soda, caustic soda and washing soda, carbonate anion is present in :

**Options :**

A. washing soda only.

B. washing soda and caustic soda only.

C. washing soda and baking soda only.

D. baking soda, caustic soda and washing soda.

**Question Number : 78 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

Aqueous solution of which of the following boron compounds will be strongly basic in nature?

**Options :**

A. $NaBH_4$

B. $LiBH_4$

C. $B_2H_6$

D. $Na_2B_4O_7$

**Question Number : 79 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 : One is labelled as Assertion A and the other is labelled as Reason R.

**Assertion A** : Dacron is an example of polyester polymer.

**Reason R** : Dacron is made up of ethylene glycol and terephthalic acid monomers.

In the light of the above statements, choose the most appropriate answer from the options given below.

**Options :**

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is NOT the correct explanation of A.

C. A is correct but R is not correct.

D. A is not correct but R is correct.

**Question Number : 80 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical**

The mixture of chloroxylenol and terpineol is an example of

**Options :**

A. antiseptic

B. pesticide

C. disinfectant

D. narcotic analgesic

## Chemistry Section B

| | |
|---|---|
| **Section Number :** | 6 |
| **Section type :** | Online |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 10 |
| **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 : 81 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

A box contains 0.90 g of liquid water in equilibrium with water vapour at 27°C. The equilibrium vapour pressure of water at 27°C is 32.0 Torr. When the volume of the box is increased, some of the liquid water evaporates to maintain the equilibrium pressure. If all the liquid water evaporates, then the volume of the box must be _____ litre. [nearest integer]

(Given : R = 0.082 L atm $K^{-1}$ $mol^{-1}$)

(Ignore the volume of the liquid water and assume water vapours behave as an ideal gas.)

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

**Question Number : 82 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

2.2 g of nitrous oxide ($N_2O$) gas is cooled at a constant pressure of 1 atm from 310 K to 270 K causing the compression of the gas from 217.1 mL to 167.75 mL. The change in internal energy of the process, $\Delta U$ is '– x' J. The value of 'x' is _____. [nearest integer]

(Given : atomic mass of N = 14 g $mol^{-1}$ and of O = 16 g $mol^{-1}$. Molar heat capacity of $N_2O$ is 100 J $K^{-1}$ $mol^{-1}$)

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

**Question Number : 83 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Elevation in boiling point for 1.5 molal solution of glucose in water is 4 K. The depression in freezing point for 4.5 molal solution of glucose in water is 4 K. The ratio of molal elevation constant to molal depression constant ($K_b/K_f$) is _____.

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

**Question Number : 84 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The cell potential for the given cell at 298 K

$Pt|\ H_2\ (g, 1\ bar)\ |\ H^+\ (aq)\ ||\ Cu^{2+}\ (aq)\ |\ Cu(s)$

is 0.31 V. The pH of the acidic solution is found to be 3, whereas the concentration of $Cu^{2+}$ is $10^{-x}$ M. The value of x is _____.

(Given :

$$E^{\Theta}_{Cu^{2+}/Cu}$$

= 0.34 V and

$$\frac{2.303\,RT}{F}$$

= 0.06 V)

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

**Question Number : 85 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The equation

$k = (6.5 \times 10^{12} s^{-1}) e^{-26000K/T}$

is followed for the decomposition of compound A. The activation energy for the reaction is _____ kJ $mol^{-1}$. [nearest integer]

(Given : R = 8.314 J $K^{-1}$ $mol^{-1}$)

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

**Question Number : 86 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

Spin only magnetic moment of $[MnBr_6]^{4-}$ is _____ B.M. (round off to the closest integer)

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

**Question Number : 87 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

For the reaction given below :

$CoCl_3\ .\ xNH_3 + AgNO_3\ (aq) \rightarrow$

If two equivalents of AgCl precipitate out, then the value of x will be _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes

Answers Type : Equal
Text Areas : PlainText

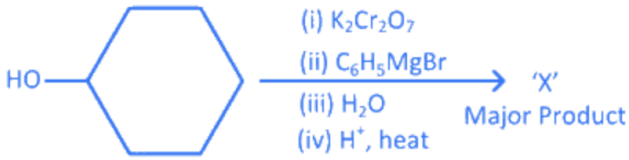
**Question Number : 88 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

The number of chiral alcohol(s) with molecular formula $C_4H_{10}O$ is _____.

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

**Question Number : 89 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

In the given reaction,

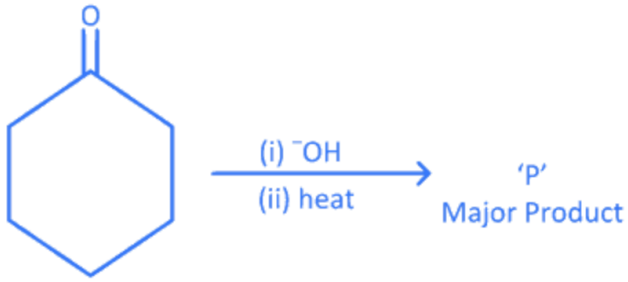



the number of $sp^2$ hybridised carbon(s) in compound 'X' is _____.

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

**Question Number : 90 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript**

In the given reaction,




The number of $\pi$ electrons present in the product 'P' is _____.

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