National Testing Agency

Question Paper Name :	B Tech 6 Apr 2023 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 Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let

$$A = \{x \in R : [x+3] + [x+4] \leq 3\},$$

$$B = \left\{x \in R : 3^x \left(\sum_{r=1}^{\infty} \frac{3}{10^r}\right)^{x-3} < 3^{-3x}\right\},$$

where [t] denotes greatest integer function. Then,

Options :

A. $B \subset C, A \neq B$

B. $A \subset B, A \neq B$

C. $A = B$

D. $A \cap B = \phi$

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

If the system of equations

$$x + y + az = b$$
$$2x + 5y + 2z = 6$$
$$x + 2y + 3z = 3$$

has infinitely many solutions, then $2a + 3b$ is equal to :

Options :

A. 28

B. 25

C. 20

D. 23

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 straight lines l_1 and l_2 pass through the origin and trisect the line segment of the line L :

$$9x + 5y = 45$$

between the axes. If m_1 and m_2 are the slopes of the lines l_1 and l_2, then the point of intersection of the line

$$y = (m_1 + m_2)x$$

with L lies on :

Options :

A. $6x - y = 15$

B. $6x + y = 10$

C. $y - x = 5$

D. $y - 2x = 5$

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

One vertex of a rectangular parallelopiped is at the origin O and the lengths of its edges along x, y and z axes are 3,4 and 5 units respectively. Let P be the vertex (3,4,5). Then the shortest distance between the diagonal OP and an edge parallel to z axis, not passing through O or P is :

Options :

A. $\frac{12}{\sqrt{5}}$

B. $12\sqrt{5}$

C. $\frac{12}{5}$

D. $\frac{12}{5\sqrt{5}}$

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

The mean and variance of a set of 15 numbers are 12 and 14 respectively. The mean and variance of another set of 15 numbers are 14 and σ^2 respectively. If the variance of all the 30 numbers in the two sets is 13 , then σ^2 is equal to :

Options :

A. 12

B. 11

C. 10

D. 9

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

Let

$$A = \left[a_{ij}\right]_{2\times 2}$$

, where $a_{ij} \neq 0$ for all i, j and

$$A^2 = I$$

. Let a be the sum of all diagonal elements of A and

$$b = |A|$$

. Then $3a^2 + 4b^2$ is equal to :

Options :

A. 4

B. 3

C. 14

D. 7

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

$$5f(x)+4f\left(\frac{1}{x}\right)=\frac{1}{x}+3, x>0$$

. Then

$$18\int_{1}^{2} f(x)dx$$

is equal to :

Options :

A. $10\log_e 2+6$

B. $5\log_e 2-3$

C. $10\log_e 2-6$

D. $5\log_e 2+3$

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

Let

$$I(x)=\int \frac{x^2\left(x\sec^2 x+\tan x\right)}{(x\tan x+1)^2}dx$$

. If

$$I(0)=0$$

, then

$$I\left(\frac{\pi}{4}\right)$$

is equal to :

Options :

A. $\log_e \frac{(\pi+4)^2}{32}-\frac{\pi^2}{4(\pi+4)}$

B. $\log_e \frac{(\pi+4)^2}{16}-\frac{\pi^2}{4(\pi+4)}$

C. $\log_e \frac{(\pi+4)^2}{16}+\frac{\pi^2}{4(\pi+4)}$

D. $$\log_e \frac{(\pi+4)^2}{32} + \frac{\pi^2}{4(\pi+4)}$$

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

$$\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}, \vec{b} = \hat{i} - 2\hat{j} - 2\hat{k}$$

and

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

. If $\vec{d}$ is a vector perpendicular to both $\vec{b}$ and $\vec{c}$, and

$$\vec{a} \cdot \vec{d} = 18$$

, then $|\vec{a} \times \vec{d}|^2$ is equal to :

Options :

A. 680

B. 720

C. 760

D. 640

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

Let $a_1, a_2, a_3, \ldots, a_n$ be n positive consecutive terms of an arithmetic progression. If

$$d > 0$$

is its common difference, then

$$\lim_{n \to \infty} \sqrt{\frac{d}{n}} \left(\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \ldots \ldots \ldots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}} \right)$$

is

Options :

A. $$\frac{1}{\sqrt{d}}$$

B. 1

C. 0

D. $$\sqrt{d}$$

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 sum of all the roots of the equation

$$|x^2 - 8x + 15| - 2x + 7 = 0$$

is :

Options :

A. $11 + \sqrt{3}$

B. $9 + \sqrt{3}$

C. $9 - \sqrt{3}$

D. $11 - \sqrt{3}$

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

If the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of

$$\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$$

is $\sqrt{6}$: 1, then the third term from the beginning is :

Options :

A. $30\sqrt{2}$

B. $60\sqrt{3}$

C. $60\sqrt{2}$

D. $30\sqrt{3}$

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

If $2x^y + 3y^x = 20$, then $\frac{dy}{dx}$ at (2,2) is equal to :

Options :

A. $-\left(\frac{3 + \log_e 16}{4 + \log_e 8}\right)$

B. $-\left(\frac{2 + \log_e 8}{3 + \log_e 4}\right)$

C. $-\left(\frac{3+\log_e 8}{2+\log_e 4}\right)$

D. $-\left(\frac{3+\log_e 4}{2+\log_e 8}\right)$

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

The sum of the first 20 terms of the series $5 + 11 + 19 + 29 + 41 + \ldots$ is :

Options :

A. 3420

B. 3450

C. 3250

D. 3520

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

A pair of dice is thrown 5 times. For each throw, a total of 5 is considered a success. If the probability of at least 4 successes is $\frac{k}{3^{11}}$, then k is equal to :

Options :

A. 82

B. 164

C. 123

D. 75

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

If the equation of the plane passing through the line of intersection of the planes

$$2x - y + z = 3, 4x - 3y + 5z + 9 = 0$$

and parallel to the line

$$\frac{x+1}{-2} = \frac{y+3}{4} = \frac{z-2}{5}$$

is $ax + by + cz + 6 = 0$, then $a + b + c$ is equal to :

Options :

A. 13

B. 15

C. 14

D. 12

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 the position vectors of the points A, B, C and D be

$$5\hat{i}+5\hat{j}+2\lambda\hat{k}, \hat{i}+2\hat{j}+3\hat{k}, -2\hat{i}+\lambda\hat{j}+4\hat{k}$$

and $-\hat{i}+5\hat{j}+6\hat{k}$. Let the set

$$S=\{\lambda \in \mathbb{R}$$

: the points A, B, C and D are coplanar }.

Then

$$\sum_{\lambda \in S}(\lambda+2)^2$$

is equal to :

Options :

A. $\frac{37}{2}$

B. 25

C. 13

D. 41

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 top A of a vertical wall AB of height 30 m, the angles of depression of the top P and bottom Q of a vertical tower PQ are 15° and 60° respectively, B and Q are on the same horizontal level. If C is a point on AB such that

$$CB = PQ$$

, then the area (in m^2) of the quadrilateral BCPQ is equal to :

Options :

A. $200(3-\sqrt{3}\ )$

B. $300(\sqrt{3}\ -1)$

C. $300(\sqrt{3}\ +1)$

D. $600(\sqrt{3}-1)$

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

Statement $(P \Rightarrow Q) \wedge (R \Rightarrow Q)$ is logically equivalent to :

Options :

A. $(P \Rightarrow R) \wedge (Q \Rightarrow R)$

B. $(P \Rightarrow R) \vee (Q \Rightarrow R)$

C. $(P \wedge R) \Rightarrow Q$

D. $(P \vee R) \Rightarrow Q$

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

If

$$^{2n}C_3 : {}^{n}C_3 = 10 : 1$$

, then the ratio $\left(n^2+3n\right) : \left(n^2-3n+4\right)$ is :

Options :

A. $27 : 11$

B. $2 : 1$

C. $35 : 16$

D. $65 : 37$

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

$$y = y(x)$$

be a solution of the differential equation

$$(x\cos x)dy + (xy\sin x + y\cos x - 1)dx = 0, 0 < x < \frac{\pi}{2}$$

. If

$$\frac{\pi}{3}y\left(\frac{\pi}{3}\right) = \sqrt{3}$$

, then

$$\left|\frac{\pi}{6}y''\left(\frac{\pi}{6}\right) + 2y'\left(\frac{\pi}{6}\right)\right|$$

is equal to _____.

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

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

If the area of the region

$$S = \{(x, y) : 2y - y^2 \leq x^2 \leq 2y, x \geq y\}$$

is equal to

$$\frac{n+2}{n+1} - \frac{\pi}{n-1}$$

, then the natural number n 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 the point $(p, p+1)$ lie inside the region

$$E = \left\{(x, y) : 3 - x \leq y \leq \sqrt{9 - x^2}\ , 0 \leq x \leq 3\right\}$$

. If the set of all values of p is the interval (a, b), then $b^2 + b - a^2$ 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 Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $a \in \mathbb{Z}$ and [t] be the greatest integer $\leq$ t. Then the number of points, where the function

$$f(x) = [a + 13\sin x], x \in (0, \pi)$$

is not differentiable, is _____.

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

$$A = \{1,2,3,4, \ldots ., 10\}$$

and

$$B = \{0,1,2,3,4\}$$

. The number of elements in the relation

$$R = \left\{(a, b) \in A \times A : 2(a-b)^2 + 3(a-b) \in B\right\}$$

is _____.

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

A circle passing through the point $P(\alpha, \beta)$ in the first quadrant touches the two coordinate axes at the points A and B. The point P is above the line AB. The point Q on the line segment AB is the foot of perpendicular from P on AB. If PQ is equal to 11 units, then the value of $\alpha\beta$ is _____.

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 number of ways of giving 20 distinct oranges to 3 children such that each child gets at least one orange is _____.

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 the tangent to the curve $x^2 + 2x - 4y + 9 = 0$ at the point P(1,3) on it meet the y-axis at A. Let the line passing through P and parallel to the line $x - 3y = 6$ meet the parabola $y^2 = 4x$ at B. If B lies on the line $2x - 3y = 8$, then $(AB)^2$ is equal to _____.

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

The coefficient of x^{18} in the expansion of

$$\left(x^4 - \frac{1}{x^3}\right)^{15}$$

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

Let the image of the point P(1,2,3) in the plane $2x - y + z = 9$ be Q. If the coordinates of the point R are (6,10,7), then the square of the area of the triangle PQR 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 particle is moving with constant speed in a circular path. When the particle turns by an angle 90°, the ratio of instantaneous velocity to its average velocity is $\pi : x\sqrt{2}$. The value of x will be -

Options :

A. 1

B. 7

C. 5

D. 2

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

The induced emf can be produced in a coil by

A. moving the coil with uniform speed inside uniform magnetic field

B. moving the coil with non uniform speed inside uniform magnetic field

C. rotating the coil inside the uniform magnetic field

D. changing the area of the coil inside the uniform magnetic field

Choose the correct answer from the options given below:

Options :

A. A and C only

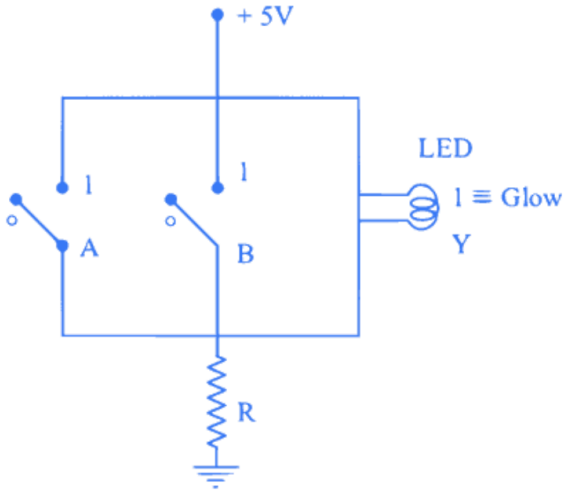
B. C and D only

C. B and D only

D. B and C only

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

Name the logic gate equivalent to the diagram attached



Options :

A. NOR

B. NAND

C. AND

D. OR

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

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R

Assertion A : When a body is projected at an angle 45°, it's range is maximum.

Reason R : For maximum range, the value of $\sin 2\theta$ should be equal to one.

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

Options :

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

B. **A** is true but **R** is false

C. **A** is false but **R** is true

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

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

A source supplies heat to a system at the rate of 1000 W. If the system performs work at a rate of 200 W. The rate at which internal energy of the system increases is

Options :

A. 600 W

B. 1200 W

C. 500 W

D. 800 W

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 small ball of mass M and density ρ is dropped in a viscous liquid of density ρ_0. After some time, the ball falls with a constant velocity. What is the viscous force on the ball ?

Options :

A. $$F = Mg\left(1 - \frac{\rho_O}{\rho}\right)$$

B. $$F = Mg\left(1 + \frac{\rho}{P_o}\right)$$

C. $$F = Mg\left(1 + \frac{\rho_o}{\rho}\right)$$

D. $F = Mg\left(1 \pm \rho\rho_0\right)$

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

A small block of mass 100 g is tied to a spring of spring constant 7.5 N/m and length 20 cm. The other end of spring is fixed at a particular point A. If the block moves in a circular path on a smooth horizontal surface with constant angular velocity 5 rad/s about point A, then tension in the spring is -

Options :

A. 0.50 N

B. 1.5 N

C. 0.75 N

D. 0.25 N

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

Given below are two statements : one is labelled as Assertion **A** and the other is labelled as Reason **R**.

Assertion A : Earth has atmosphere whereas moon doesn't have any atmosphere.

Reason R : The escape velocity on moon is very small as compared to that on earth.

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

Options :

A. **A** is false but **R** is true

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

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

D. **A** is true but **R** is false

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 kinetic energy of an electron, α-particle and a proton are given as 4 K, 2 K and K respectively. The de-Broglie wavelength associated with electron (λe), α-particle (($\lambda\alpha$) and the proton (λp) are as follows:

Options :

A. $\lambda\alpha < \lambda p < \lambda e$

B. $\lambda\alpha > \lambda p > \lambda e$

C. $\lambda\alpha = \lambda p < \lambda e$

D. $\lambda\alpha = \lambda p > \lambda e$

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

A monochromatic light wave with wavelength λ_1 and frequency υ_1 in air enters another medium. If the angle of incidence and angle of refraction at the interface are 45° and 30° respectively, then the wavelength λ_2 and frequency υ_2 of the refracted wave are:

Options :

A. $\lambda_2 = \lambda_1, \upsilon_2 = \frac{1}{\sqrt{2}}\upsilon_1$

B. $\lambda_2 = \lambda_1, \upsilon_2 = \sqrt{2}\ \upsilon_1$

C. $\lambda_2 = \sqrt{2}\ \lambda_1, \upsilon_2 = \upsilon_1$

D. $\lambda_2 = \frac{1}{\sqrt{2}}\lambda_1, \upsilon_2 = \upsilon_1$

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 long straight wire of circular cross-section (radius a) is carrying steady current I. The current I is uniformly distributed across this cross-section. The magnetic field is

Options :

A. uniform in the region $r < a$ and inversely proportional to distance r from the axis, in the region $r > a$

B. zero in the region $r < a$ and inversely proportional to r in the region $r > a$

C. directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$

D. inversely proportional to r in the region $r < a$ and uniform throughout in the region $r > a$

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

A planet has double the mass of the earth. Its average density is equal to that of the earth. An object weighing W on earth will weigh on that planet:

Options :

A. $2^{2/3}$ W

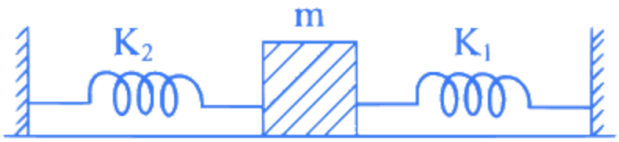
B. W

C. $2\,W$

D. $2^{1/3}\,W$

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 mass m is attached to two strings as shown in figure. The spring constants of two springs are K_1 and K_2. For the frictionless surface, the time period of oscillation of mass m is :



Options :

A. $2\pi\sqrt{\frac{m}{K_1+K_2}}$

B. $2\pi\sqrt{\frac{m}{K_1-K_2}}$

C. $\frac{1}{2\pi}\sqrt{\frac{K_1+K_2}{m}}$

D. $\frac{1}{2\pi}\sqrt{\frac{K_1-K_2}{m}}$

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

Two resistances are given as

$$R_1 = (10 \pm 0.5)\Omega$$

and

$$R_2 = (15 \pm 0.5)\Omega$$

. The percentage error in the measurement of equivalent resistance when they are connected in parallel is -

Options :

A. 2.33

B. 5.33

C. 4.33

D. 6.33

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

For the plane electromagnetic wave given by

$$E = E_0 \sin(\omega t - kx)$$

and

$$B = B_0 \sin(\omega t - kx)$$

, the ratio of average electric energy density to average magnetic energy density is

Options :

A. 1

B. 4

C. 2

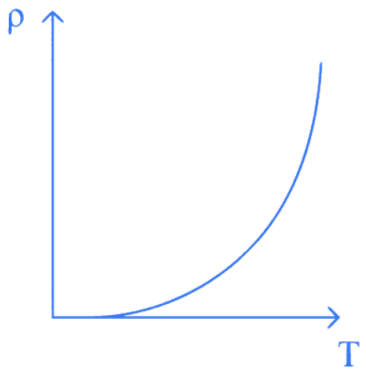
D. 1/2

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

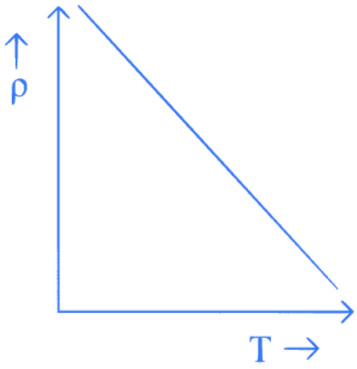
The resistivity (ρ) of semiconductor varies with temperature. Which of the following curve represents the correct behaviour :

Options :

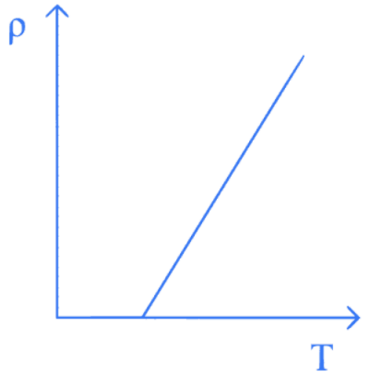
A.



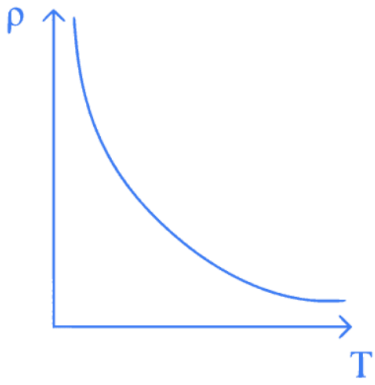
B.



C.

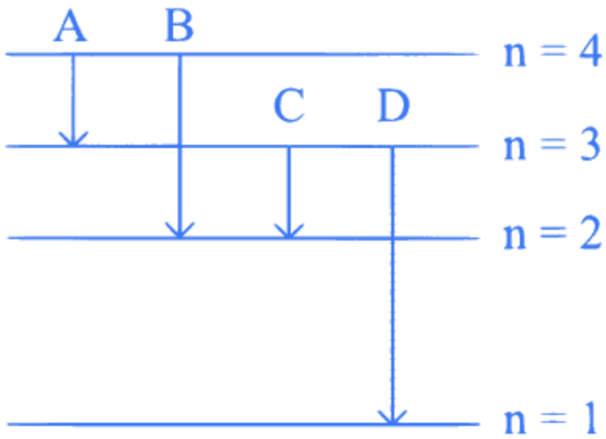


D.



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 energy levels of an hydrogen atom are shown below. The transition corresponding to emission of shortest wavelength is :



Options :

A. A

B. C

C. B

D. D

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

The number of air molecules per cm^3 increased from 3×10^{19} to 12×10^{19}. The ratio of collision frequency of air molecules before and after the increase in number respectively is:

Options :

A. 1.25

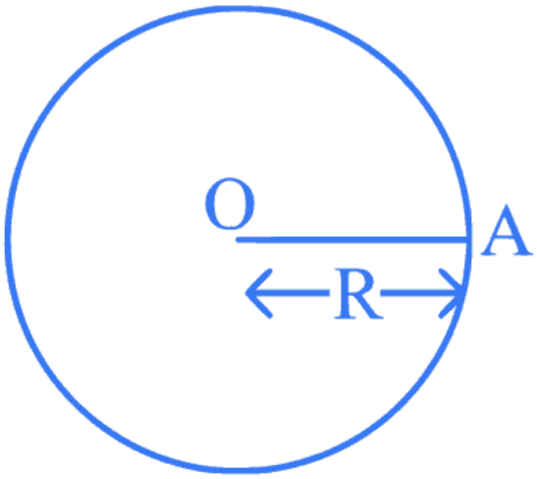
B. 0.25

C. 0.50

D. 0.75

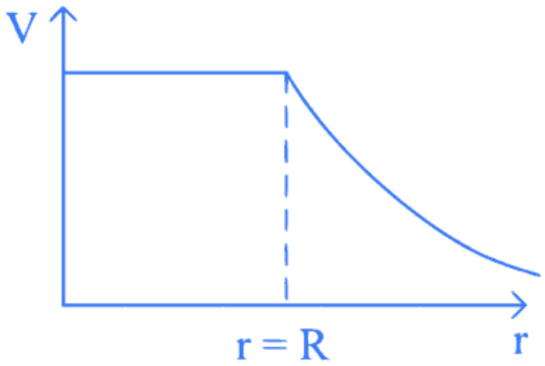
Question Number : 49 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For a uniformly charged thin spherical shell, the electric potential (V) radially away from the centre (O) of shell can be graphically represented as -

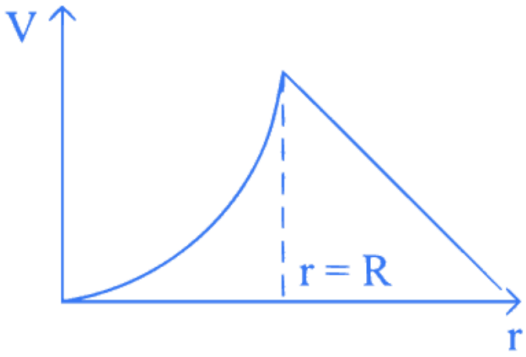


Options :

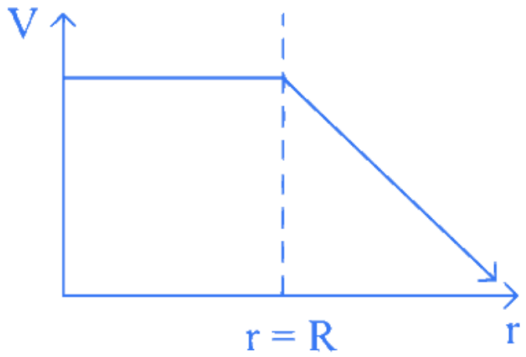
A.



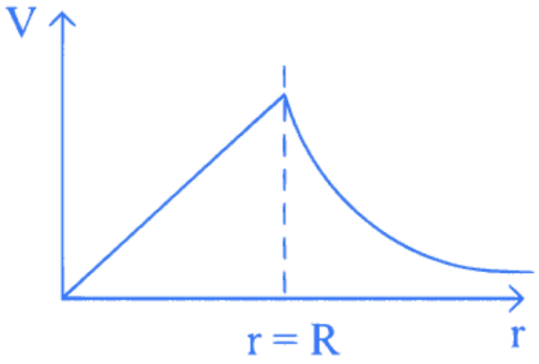
B.



C.



D.



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

By what percentage will the transmission range of a TV tower be affected when the height of the tower is increased by 21% ?

Options :

A. 12%

B. 15%

C. 10%

D. 14%

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 radius of fifth orbit of the Li^{++} is _____ $\times 10^{-12}$ m.

Take: radius of hydrogen atom

$$= 0.51 \text{ Å}$$

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

Two identical solid spheres each of mass 2 kg and radii 10 cm are fixed at the ends of a light rod. The separation between the centres of the spheres is 40 cm. The moment of inertia of the system about an axis perpendicular to the rod passing through its middle point is _____ $\times 10^{-3}$ kg m^2

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

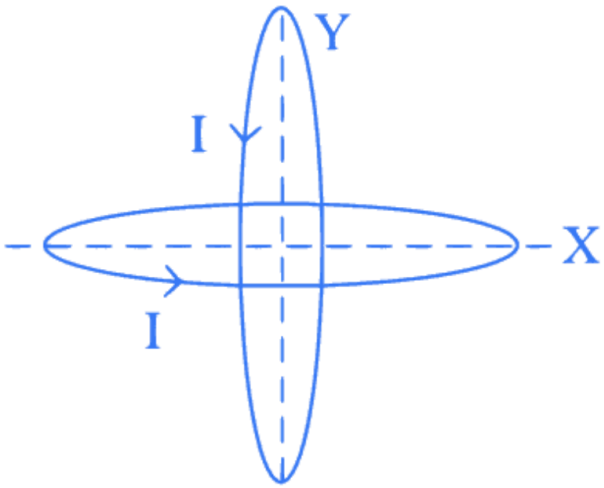
Question Number : 53 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A steel rod has a radius of 20 mm and a length of 2.0 m. A force of 62.8 kN stretches it along its length. Young's modulus of steel is 2.0×10^{11} N/m^2. The longitudinal strain produced in the wire is _____ $\times 10^{-5}$

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 identical circular wires of radius 20 cm and carrying current $\sqrt{2}$ A are placed in perpendicular planes as shown in figure. The net magnetic field at the centre of the circular wires is _____ $\times 10^{-8}$ T.



(Take $\pi = 3.14$)

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 pole is vertically submerged in swimming pool, such that it gives a length of shadow 2.15 m within water when sunlight is incident at angle of 30° with the surface of water. If swimming pool is filled to a height of 1.5 m, then the height of the pole above the water surface in centimeters is

$$\left(n_w = 4/3\right)$$

_____.

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

A particle of mass 10 g moves in a straight line with retardation $2x$, where x is the displacement in SI units. Its loss of kinetic energy for above displacement is

$$\left(\frac{10}{x}\right)^{-n}$$

J. The value of n will be _____

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 length of a metallic wire is increased by 20% and its area of cross section is reduced by 4%. The percentage change in resistance of the metallic wire is _____.

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

A parallel plate capacitor with plate area A and plate separation d is filled with a dielectric material of dielectric constant $K = 4$. The thickness of the dielectric material is x, where

$$x < d$$

.



Let C_1 and C_2 be the capacitance of the system for

$$\chi = \frac{1}{3}d$$

and

$$\chi = \frac{2d}{3}$$

, respectively. If

$$C_1 = 2\mu F$$

the value of C_2 is _____ μF

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 ideal transformer with purely resistive load operates at 12 kV on the primary side. It supplies electrical energy to a number of nearby houses at 120 V. The average rate of energy consumption in the houses served by the transformer is 60 kW. The value of resistive load (Rs) required in the secondary circuit will be _____ mΩ.

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

A person driving car at a constant speed of 15 m/s is approaching a vertical wall. The person notices a change of 40 Hz in the frequency of his car's horn upon reflection from the wall. The frequency of horn is _____ Hz.

(Given: Speed of sound :

330 m/s

)

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

Given below are two statements, one is labelled as Assertion **A** and the other is labelled as Reason **R**.

Assertion A: The spin only magnetic moment value for $\left[Fe(CN)_6\right]^{3-}$ is 1.74BM, whereas for $\left[Fe\left(H_2O\right)_6\right]^{3+}$ is 5.92BM.

Reason **R** : In both complexes, Fe is present in +3 oxidation state.

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

Options :

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

B. A is true but R is false

C. A is false but R is true

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

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

The standard electrode potential of M^+/M in aqueous solution does not depend on

Options :

A. Ionisation of a gaseous metal atom

B. Sublimation of a solid metal

C. Ionisation of a solid metal atom

D. Hydration of a gaseous metal ion

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

For the reaction



The correct statement is

Options :

A. The solvent used in the reaction solvates the ions formed in rate determining step.

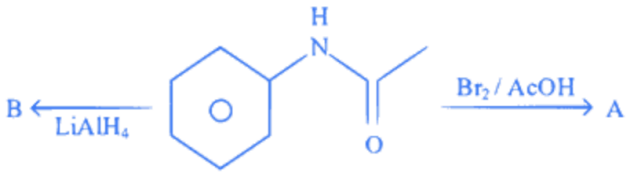
B. Br^- can act as competing nucleophile.

C. The reaction can occur in acetic acid also.

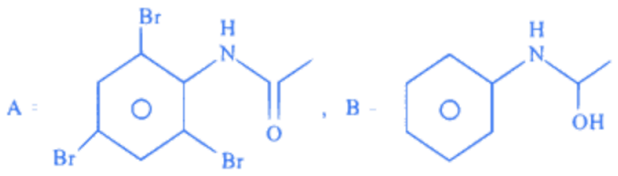
D. The transition state formed in the above reaction is less polar than the localised anion.

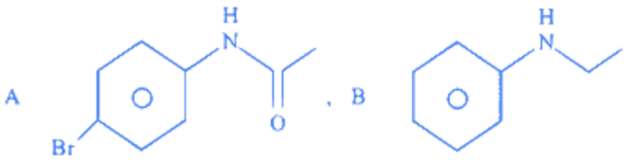
Question Number : 64 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

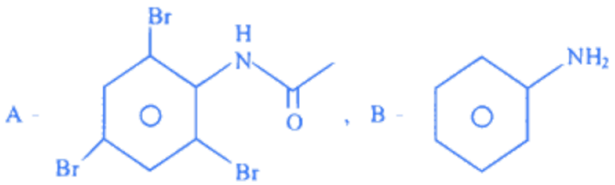
The major products A and B from the following reactions are:

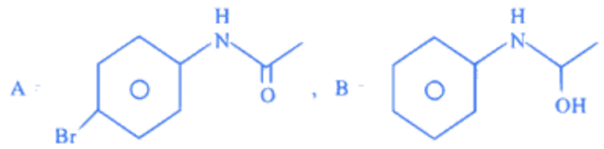


Options :

A. 

B. 

C. 

D. 

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

Which of the following options are correct for the reaction

$$2\left[Au(CN)_2\right]^-(aq) + Zn(s) \rightarrow 2Au(s) + \left[Zn(CN)_4\right]^{2-}(aq)$$

A. Redox reaction

B. Displacement reaction

C. Decomposition reaction

D. Combination reaction

Choose the correct answer from the options given below:

Options :

A. A and B only

B. C and D only

C. A only

D. A and D only

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

For a concentrated solution of a weak electrolyte (K_{eq} = equilibrium constant) A_2B_3 of concentration 'c', the degree of dissociation 'α' is :

Options :

A. $\left(\frac{K_{eq}}{25c^2}\right)^{\frac{1}{5}}$

B. $\left(\frac{K_{eq}}{108c^4}\right)^{\frac{1}{5}}$

C. $\left(\frac{K_{eq}}{5c^4}\right)^{\frac{1}{5}}$

D. $\left(\frac{K_{eq}}{6c^5}\right)^{\frac{1}{5}}$

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

Match List I with List II

	LIST I Oxide		**LIST II Type of bond**
A.	N_2O_4	I.	1 N = O bond
B.	NO_2	II.	1 N – O – N bond
C.	N_2O_5	III.	1 N – N bond
D.	N_2O	IV.	1 N=N / N ≡ N bond

Choose the correct answer from the options given below:

Options :

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

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

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

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

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

The difference between electron gain enthalpies will be maximum between :

Options :

A. Ar and Cl

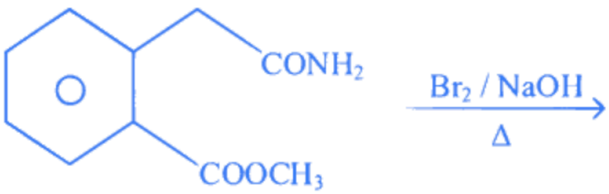
B. Ne and Cl

C. Ne and F

D. Ar and F

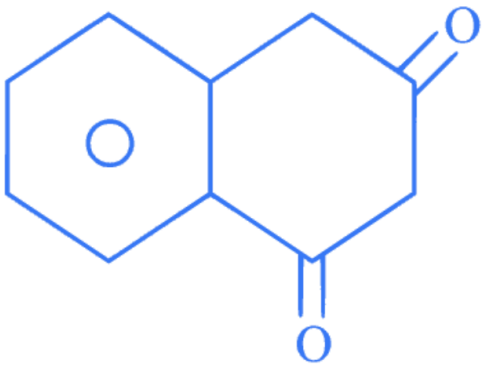
Question Number : 69 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The major product formed in the following reaction is

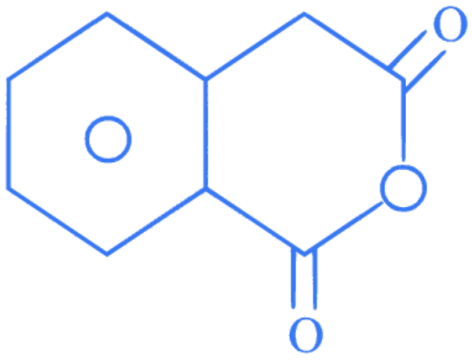


Options :

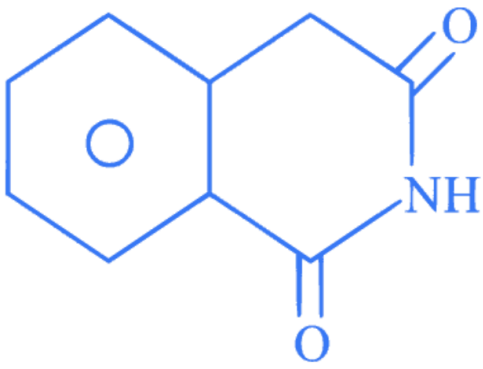
A.



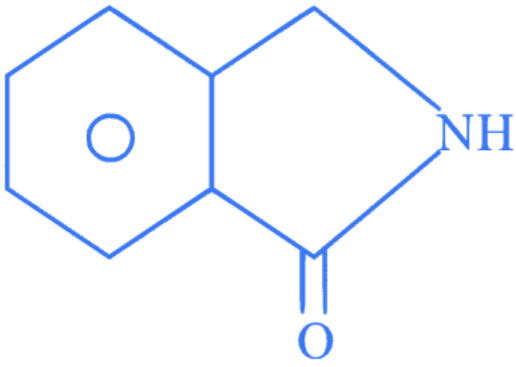
B.



C.



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

Match List I with List II

	LIST I Enzymatic reaction		**LIST II Enzyme**
A.	Sucrose → Glocuse and Fructose	I.	Zymase
B.	Glucose → ethyl alcohol and CO_2	II.	Pepsin
C.	Starch → Maltose	III.	Invertase
D.	Proteins → Amino acids	IV.	Diastase

Choose the correct answer from the options given below:

Options :

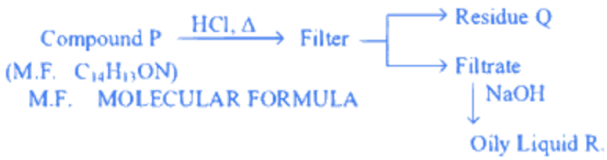
A. A-III, B-I, C-II, D-IV

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

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

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

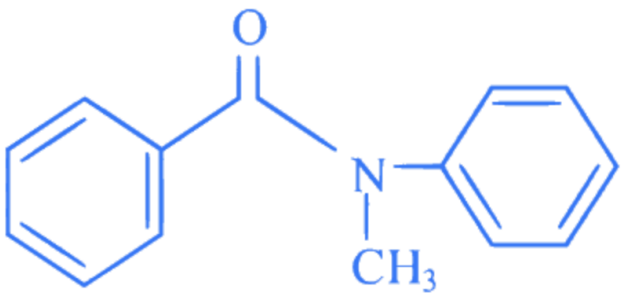
Question Number : 71 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



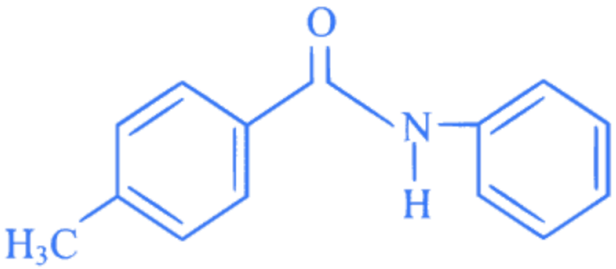
Compound P is neutral, Q gives effervescence with $NaHCO_3$ while R reacts with Hinsbergs reagent to give solid soluble in NaOH. Compound P is

Options :

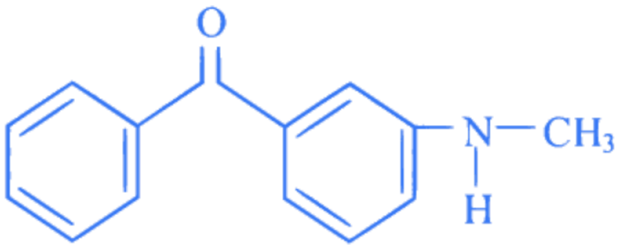
A.



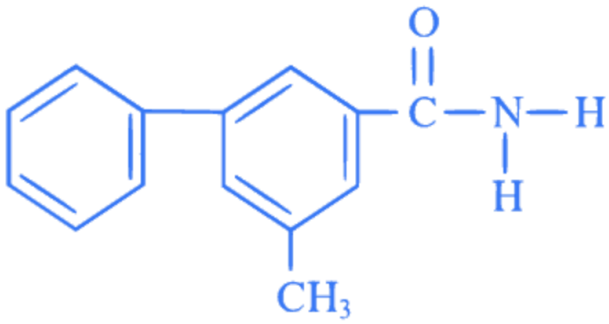
B.



C.



D.



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

Strong reducing and oxidizing agents among the following, respectively, are :

Options :

A. Ce^{4+} and Eu^{2+}

B. Eu^{2+} and Ce^{4+}

C. Ce^{4+} and Tb^{4+}

D. Ce^{3+} and Ce^{4+}

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

Match List I with List II

	LIST I Element detected		**LIST II Reagent used / Product formed**
A.	Nitrogen	I.	$Na_2[Fe(CN)_5NO]$
B.	Sulphur	II.	$AgNO_3$
C.	Phosphorous	III.	$Fe_4[Fe(CN)_6]_3$
D.	Halogen	IV.	$(NH_4)_2MoO_4$

Choose the correct answer from the options given below:

Options :

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

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

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

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

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

Polymer used in orlon is :

Options :

A. Polyethene

B. Polyacrylonitrile

C. Polycarbonate

D. Polyamide

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

Match List I with List II

	LIST I Vitamin		**LIST II Deficiency disease**
A.	Vitamin A	I.	Beri-Beri
B.	Thiamine	II.	Cheilosis
C.	Ascorbic acid	III.	Xeropthalmia
D.	Riboflavin	IV.	Scurvy

Choose the correct answer from the options given below:

Options :

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

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

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

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

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

The setting time of Cement is increased by adding :

Options :

A. Gypsum

B. Limestone

C. Clay

D. Silica

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

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Loss of electron from hydrogen atom results in nucleus of $\sim 1.5 \times 10^{-3}$pm size.

Reason R : Proton $\left(H^{+}\right)$ always exists in combined form.

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. A is correct but R is not correct

C. A is not correct but R is correct

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

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

Match List I with List II

	LIST I Name of reaction		**LIST II Reagent used**
A.	Hell-Volhard-Zelinsky reaction	I.	$NaOH + I_2$
B.	Iodoform reaction	II.	(i) CrO_2Cl_2, CS_2 (ii) H_2O
C.	Etard reaction	III.	(i) Br_2 / red phosphorus (ii) H_2O
D.	Gatterman-Koch reaction	IV.	$CO, HCl,$, anhyd. $AlCl_3$

Choose the correct answer from the options given below:

Options :

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

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

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

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

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

A compound is formed by two elements X and Y. The element Y forms cubic close packed arrangement and those of element X occupy one third of the tetrahedral voids. What is the formula of the compound?

Options :

A. XY_3

B. X_3Y_2

C. X_3Y

D. X_2Y_3

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 possibility of photochemical smog formation is more at :

Options :

A. Industrial areas

B. Himalayan villages in winter

C. The places with healthy vegetation

D. Marshy lands

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

Number of bromo derivatives obtained on treating ethane with excess of Br_2 in diffused sunlight is

_____

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

The wavelength of an electron of kinetic energy 4.50×10^{-29} J is _____ $\times 10^{-5}$ m. (Nearest integer)

Given : mass of electron is 9×10^{-31} kg, h

$$= 6.6 \times 10^{-34}$$

J s

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

The number of species from the following which have square pyramidal structure is _____

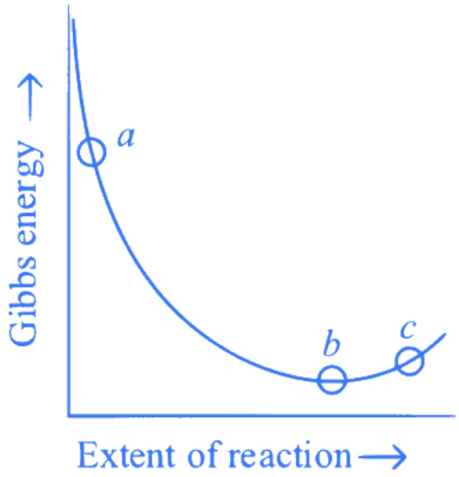
$$PF_5, BrF_4^-, IF_5, BrF_5, XeOF_4, ICl_4^-$$

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

Consider the graph of Gibbs free energy G vs Extent of reaction. The number of statement/s from the following which are true with respect to points (a), (b) and (c) is _____



A. Reaction is spontaneous at (a) and (b)

B. Reaction is at equilibrium at point (b) and non-spontaneous at point (c)

C. Reaction is spontaneous at (a) and non-spontaneous at (c)

D. Reaction is non-spontaneous at (a) and (b)

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

Mass of Urea $\left(NH_2CONH_2\right)$ required to be dissolved in 1000 g of water in order to reduce the vapour pressure of water by 25% is _____ g. (Nearest integer)

Given: Molar mass of N, C, O and H are 14,12,16 and 1 g mol^{-1} respectively

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

The value of $\log K$ for the reaction $A \rightleftharpoons B$ at 298 K is _____. (Nearest integer)

Given:

$$\Delta H^\circ = -54.07 \text{ kJ mol}^{-1}$$

$$\Delta S^\circ = 10 \text{ J K}^{-1} \text{ mol}^{-1}$$

(Take

$$2.303 \times 8.314 \times 298 = 5705$$

)

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

Number of ambidentate ligands in a representative metal complex $\left[M(en)(SCN)_4\right]$ is _____.

[en = ethylenediamine]

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

If 5 moles of $BaCl_2$ is mixed with 2 moles of Na_3PO_4, the maximum number of moles of $Ba_3\left(PO_4\right)_2$ formed is _____ (Nearest integer)

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 ammonium - phosphomolybdate, the oxidation state of Mo 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

For the adsorption of hydrogen on platinum, the activation energy is 30 k $Jmol^{-1}$ and for the adsorption of hydrogen on nickel, the activation energy is 41.4 k $Jmol^{-1}$. The logarithm of the ratio of the rates of chemisorption on equal areas of the metals at 300 K is _____ (Nearest integer)

Given:

$$\ln 10 = 2.3$$

$$R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$$

Response Type : Numeric
Evaluation Required For SA : Yes

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