National Testing Agency

Question Paper Name :	B Tech 28 Jul 2022 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 the solution curve of the differential equation

$$x\,dy = \left(\sqrt{x^2+y^2}\ + y\right)dx, x > 0$$

, intersect the line $x = 1$ at $y = 0$ and the line $x = 2$ at $y = \alpha$. Then the value of α is :

Options :

A. $\frac{1}{2}$

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

C. $\frac{-}{\frac{3}{2}}$

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

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

Considering only the principal values of the inverse trigonometric functions, the domain of the function

$$f(x) = \cos^{-1}\left(\frac{x^2 - 4x + 2}{x^2 + 3}\right)$$

is :

Options :

A. $\left(-\infty, \frac{1}{4}\right]$

B. $\left[-\frac{1}{4}, \infty\right)$

C. $(-1/3, \infty)$

D. $\left(-\infty, \frac{1}{3}\right]$

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

Let the vectors

$$\vec{a} = (1+t)\hat{i} + (1-t)\hat{j} + \hat{k}, \vec{b} = (1-t)\hat{i} + (1+t)\hat{j} + 2\hat{k}$$

and

$$\vec{c} = t\hat{i} - t\hat{j} + \hat{k}, t \in \mathbf{R}$$

be such that for

$$\alpha, \beta, \gamma \in \mathbf{R}, \alpha\vec{a} + \beta\vec{b} + \gamma\vec{c} = \vec{0} \Rightarrow \alpha = \beta = \gamma = 0$$

. Then, the set of all values of t is :

Options :

A. a non-empty finite set

B. equal to $\mathbf{N}$

C. equal to $\mathbf{R} - \{0\}$

D. equal to $\mathbf{R}$

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

Considering the principal values of the inverse trigonometric functions, the sum of all the solutions of the equation

$$\cos^{-1}(x) - 2\sin^{-1}(x) = \cos^{-1}(2x)$$

is equal to :

Options :

A. 0

B. 1

C. $\frac{1}{2}$

D. $-\frac{1}{2}$

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

Let a vector $\vec{a}$ has magnitude 9. Let a vector $\vec{b}$ be such that for every $(x, y) \in \mathbf{R} \times \mathbf{R} - \{(0,0)\}$, the vector $(x\vec{a} + y\vec{b})$ is perpendicular to the vector $(6y\vec{a} - 18x\vec{b})$. Then the value of $|\vec{a} \times \vec{b}|$ is equal to :

Options :

A. $9\sqrt{3}$

B. $27\sqrt{3}$

C. 9

D. 81

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

For t $\in (0,2\pi)$, if ABC is an equilateral triangle with vertices A$(\sin t, -\cos t)$, B$(\cos t, \sin t)$ and $C(a, b)$ such that its orthocentre lies on a circle with centre

$$\left(1, \frac{1}{3}\right)$$

, then $\left(a^2 - b^2\right)$ is equal to :

Options :

A. $\frac{8}{3}$

B. 8

C. $\frac{77}{9}$

D. $\frac{80}{9}$

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

For $\alpha \in \mathbf{N}$, consider a relation R on $\mathbf{N}$ given by

$$R = \{(x, y) : 3x + \alpha y$$

is a multiple of 7}. The relation *R* is an equivalence relation if and only if :

Options :

A. $\alpha = 14$

B. α is a multiple of 4

C. 4 is the remainder when α is divided by 10

D. 4 is the remainder when α is divided by 7

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

Out of 60% female and 40% male candidates appearing in an exam, 60% candidates qualify it. The number of females qualifying the exam is twice the number of males qualifying it. A candidate is randomly chosen from the qualified candidates. The probability, that the chosen candidate is a female, is :

Options :

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

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

C. $\frac{23}{32}$

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

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

If

$$y = y(x), x \in (0, \pi/2)$$

be the solution curve of the differential equation

$$\left(\sin^2 2x\right)\frac{dy}{dx} + \left(8\sin^2 2x + 2\sin 4x\right)y = 2e^{-4x}(2\sin 2x + \cos 2x)$$

,

with

$$y(\pi/4) = e^{-\pi}$$

, then $y(\pi/6)$ is equal to :

Options :

A. $\frac{2}{\sqrt{3}}e^{-2\pi/3}$

B. $\frac{2}{\sqrt{3}}e^{2\pi/3}$

C. $\frac{1}{\sqrt{3}}e^{-2\pi/3}$

D. $\frac{1}{\sqrt{3}}e^{2\pi/3}$

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 C be the centre of the circle

$$x^2 + y^2 - x + 2y = \frac{11}{4}$$

and P be a point on the circle. A line passes through the point C, makes an angle of $\frac{\pi}{4}$ with the line CP and intersects the circle at the points Q and R. Then the area of the triangle PQR (in unit ^{2}) is :

Options :

A. 2

B. $2\sqrt{2}$

C. $8\sin\left(\frac{\pi}{8}\right)$

D. $8\cos\left(\frac{\pi}{8}\right)$

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 remainder when $7^{2022} + 3^{2022}$ is divided by 5 is :

Options :

A. 0

B. 2

C. 3

D. 4

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

$$S_1 = \left\{ z_1 \in \mathbf{C} : |z_1 - 3| = \frac{1}{2} \right\}$$

and

$$S_2 = \{ z_2 \in \mathbf{C} : |z_2 - |z_2 + 1|| = |z_2 + |z_2 - 1|| \}$$

. Then, for $z_1 \in S_1$ and $z_2 \in S_2$, the least value of $|z_2 - z_1|$ is :

Options :

A. 0

B. $\frac{1}{2}$

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

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

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 the minimum value of

$$f(x) = \frac{5x^2}{2} + \frac{\alpha}{x^5}, x > 0$$

, is 14 , then the value of α is equal to :

Options :

A. 32

B. 64

C. 128

D. 256

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 α, β and γ be three positive real numbers. Let

$$f(x) = \alpha x^5 + \beta x^3 + \gamma x, x \in \mathbf{R}$$

and $g : \mathbf{R} \to \mathbf{R}$ be such that

$$g(f(x)) = x$$

for all $x \in \mathbf{R}$. If $a_1, a_2, a_3, \ldots, a_n$ be in arithmetic progression with mean zero, then the value of

$$f\left(g\left(\frac{1}{n}\sum_{i=1}^{n} f(a_i)\right)\right)$$

is equal to :

Options :

A. 0

B. 3

C. 9

D. 27

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

The minimum value of the twice differentiable function

$$f(x) = \int_0^x e^{x-t} f'(t)dt - \left(x^2 - x + 1\right)e^x$$

, $x \in \mathbf{R}$, is :

Options :

A. $-\frac{2}{\sqrt{e}}$

B. $-2\sqrt{e}$

C. $-\sqrt{e}$

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

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 the operations $*, \odot \in \{\wedge, \vee\}$. If $(p * q) \odot (p \odot \sim q)$ is a tautology, then the ordered pair $(*, \odot)$ is :

Options :

A. $(\vee, \wedge)$

B. $(\vee, \vee)$

C. $(\wedge, \wedge)$

D. $(\wedge, \vee)$

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

If the tangents drawn at the points P and Q on the parabola $y^2 = 2x - 3$ intersect at the point $R(0,1)$, then the orthocentre of the triangle PQR is :

Options :

A. $(0, 1)$

B. $(2, -1)$

C. $(6, 3)$

D. $(2, 1)$

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

Let the matrix

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

and the matrix $B_0 = A^{49} + 2A^{98}$. If

$$B_n = Adj(B_{n-1})$$

for all $n \geq 1$, then $\det(B_4)$ is equal to :

Options :

A. 3^{28}

B. 3^{30}

C. 3^{32}

D. 3^{36}

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

The foot of the perpendicular from a point on the circle

$$x^2 + y^2 = 1, z = 0$$

to the plane $2x + 3y + z = 6$ lies on which one of the following curves?

Options :

A. $(6x + 5y - 12)^2 + 4(3x + 7y - 8)^2 = 1, z = 6 - 2x - 3y$

B. $(5x + 6y - 12)^2 + 4(3x + 5y - 9)^2 = 1, z = 6 - 2x - 3y$

C. $(6x + 5y - 14)^2 + 9(3x + 5y - 7)^2 = 1, z = 6 - 2x - 3y$

D. $(5x + 6y - 14)^2 + 9(3x + 7y - 8)^2 = 1, z = 6 - 2x - 3y$

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

Consider the sequence $a_1, a_2, a_3, \ldots$ such that

$$a_1 = 1, a_2 = 2$$

and

$$a_{n+2} = \frac{2}{a_{n+1}} + a_n$$

for

$$n = 1,2,3, \ldots .$$

If

$$\left(\frac{a_1 + \frac{1}{a_2}}{a_3}\right) \cdot \left(\frac{a_2 + \frac{1}{a_3}}{a_4}\right) \cdot \left(\frac{a_3 + \frac{1}{a_4}}{a_5}\right) \ldots \left(\frac{a_{30} + \frac{1}{a_{31}}}{a_{32}}\right) = 2^{\alpha}\left({}^{61}C_{31}\right)$$

, then α is equal to :

Options :

A. -30

B. -31

C. -60

D. -61

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 S be the set of all passwords which are six to eight characters long, where each character is either an alphabet from $\{A, B, C, D, E\}$ or a number from $\{1,2,3,4,5\}$ with the repetition of characters allowed. If the number of passwords in S whose at least one character is a number from $\{1,2,3,4,5\}$ is $\alpha \times 5^6$, then α 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 $P(-2, -1, 1)$ and

$$Q\left(\frac{56}{17}, \frac{43}{17}, \frac{111}{17}\right)$$

be the vertices of the rhombus PRQS. If the direction ratios of the diagonal RS are $\alpha, -1, \beta$, where both α and β are integers of minimum absolute values, then $\alpha^2 + \beta^2$ 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 $f : [0,1] \to \mathbf{R}$ be a twice differentiable function in $(0,1)$ such that

$$f(0) = 3$$

and

$$f(1) = 5$$

. If the line $y = 2x + 3$ intersects the graph of f at only two distinct points in $(0,1)$, then the least number of points $x \in (0,1)$, at which

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

, is _____.

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

If

$$\int_0^{\sqrt{3}} \frac{15x^3}{\sqrt{1+x^2+\sqrt{(1+x^2)^3}}}\,dx = \alpha\sqrt{2} + \beta\sqrt{3}$$

, where α, β are integers, then $\alpha + \beta$ is equal to _____.

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

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

Let

$$A = \begin{bmatrix} 1 & -1 \\ 2 & \alpha \end{bmatrix}$$

and

$$B = \begin{bmatrix} \beta & 1 \\ 1 & 0 \end{bmatrix}, \alpha, \beta \in \mathbf{R}$$

. Let α_1 be the value of α which satisfies

$$(\mathrm{A}+\mathrm{B})^2 = \mathrm{A}^2 + \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$$

and α_2 be the value of α which satisfies

$$(\mathrm{A}+\mathrm{B})^2 = \mathrm{B}^2$$

. Then $|\alpha_1 - \alpha_2|$ 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

For $\mathrm{p}, \mathrm{q} \in \mathbf{R}$, consider the real valued function

$$f(x) = (x - \mathrm{p})^2 - \mathrm{q}, x \in \mathbf{R}$$

and

$$\mathrm{q} > 0$$

. Let a_1, a_2, a_3 and a_4 be in an arithmetic progression with mean p and positive common difference. If

$$|f(\mathrm{a}_i)| = 500$$

for all

$$i = 1,2,3,4$$

, then the absolute difference between the roots of

$$f(x) = 0$$

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

Let $x_1, x_2, x_3, \ldots, x_{20}$ be in geometric progression with $x_1 = 3$ and the common ratio $\frac{1}{2}$. A new data is constructed replacing each x_i by $(x_i - i)^2$. If $\overline{x}$ is the mean of new data, then the greatest integer less than or equal to $\overline{x}$ 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

$$\lim_{x \to 0}\left(\frac{(x+2\cos x)^3 + 2(x+2\cos x)^2 + 3\sin(x+2\cos x)}{(x+2)^3 + 2(x+2)^2 + 3\sin(x+2)}\right)^{\frac{100}{x}}$$

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 sum of all real values of x for which

$$\frac{3x^2 - 9x + 17}{x^2 + 3x + 10} = \frac{5x^2 - 7x + 19}{3x^2 + 5x + 12}$$

is equal to _____.

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

For the hyperbola

$$H: x^2 - y^2 = 1$$

and the ellipse

$$E: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

, a

$$> b > 0$$

, let the

(1) eccentricity of E be reciprocal of the eccentricity of H, and

(2) the line

$$y = \sqrt{\frac{5}{2}}x + K$$

be a common tangent of E and H.

Then $4\left(a^2 + b^2\right)$ is equal to _____.

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

Physics Section A

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

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

The dimensions of

$$\left(\frac{B^2}{\mu_0}\right)$$

will be :

(if μ_0 : permeability of free space and B : magnetic field)

Options :

A. $\left[M L^2 T^{-2}\right]$

B. $\left[M L T^{-2}\right]$

C. $\left[\mathrm{M\,L^{-1}\,T^{-2}}\right]$

D. $\left[\mathrm{M\,L^{2}\,T^{-2}\,A^{-1}}\right]$

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

A NCC parade is going at a uniform speed of 9 km/h under a mango tree on which a monkey is sitting at a height of 19.6 m. At any particular instant, the monkey drops a mango. A cadet will receive the mango whose distance from the tree at time of drop is: (Given

$$g = 9.8\ \mathrm{m/s^2}$$

)

Options :

A. 5 m

B. 10 m

C. 19.8 m

D. 24.5 m

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

In two different experiments, an object of mass 5 kg moving with a speed of 25 $\mathrm{ms^{-1}}$ hits two different walls and comes to rest within (i) 3 second, (ii) 5 seconds, respectively. Choose the correct option out of the following :

Options :

A. Impulse and average force acting on the object will be same for both the cases.

B. Impulse will be same for both the cases but the average force will be different.

C. Average force will be same for both the cases but the impulse will be different.

D. Average force and impulse will be different for both the cases.

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

A balloon has mass of 10 g in air. The air escapes from the balloon at a uniform rate with velocity 4.5 cm/s. If the balloon shrinks in 5 s completely. Then, the average force acting on that balloon will be (in dyne).

Options :

A. 3

B. 9

C. 12

D. 18

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

If the radius of earth shrinks by 2% while its mass remains same. The acceleration due to gravity on the earth's surface will approximately :

Options :

A. decrease by 2%

B. decrease by 4%

C. increase by 2%

D. increase by 4%

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

The force required to stretch a wire of cross-section 1 cm^2 to double its length will be : (Given Yong's modulus of the wire

$$= 2 \times 10^{11}\ N/m^2$$

)

Options :

A. $1 \times 10^7\ N$

B. $1.5 \times 10^7\ N$

C. $2 \times 10^7\ N$

D. $2.5 \times 10^7\ N$

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

Given below are two statements :

Statement I : The average momentum of a molecule in a sample of an ideal gas depends on temperature.

Statement II : The rms speed of oxygen molecules in a gas is v. If the temperature is doubled and the oxygen molecules dissociate into oxygen atoms, the rms speed will become $2v$.

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 true

B. Both Statement I and Statement II are false

C. Statement I is true but Statement II is false

D. Statement I is false but Statement II is true

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

In the wave equation

$$y = 0.5 \sin \frac{2\pi}{\lambda}(400\text{t} - x)\,\text{m}$$

the velocity of the wave will be:

Options :

A. 200 m/s

B. $200\sqrt{2}$ m/s

C. 400 m/s

D. $400\sqrt{2}$ m/s

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

Two capacitors, each having capacitance $40\,\mu$F are connected in series. The space between one of the capacitors is filled with dielectric material of dielectric constant K such that the equivalence capacitance of the system became $24\,\mu$F. The value of K will be :

Options :

A. 1.5

B. 2.5

C. 1.2

D. 3

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 wire of resistance R_1 is drawn out so that its length is increased by twice of its original length. The ratio of new resistance to original resistance is :

Options :

A. 9 : 1

B. 1 : 9

C. 4 : 1

D. 3 : 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

The current sensitivity of a galvanometer can be increased by :

(A) decreasing the number of turns

(B) increasing the magnetic field

(C) decreasing the area of the coil

(D) decreasing the torsional constant of the spring

Choose the most appropriate answer from the options given below :

Options :

A. (B) and (C) only

B. (C) and (D) only

C. (A) and (C) only

D. (B) and (D) only

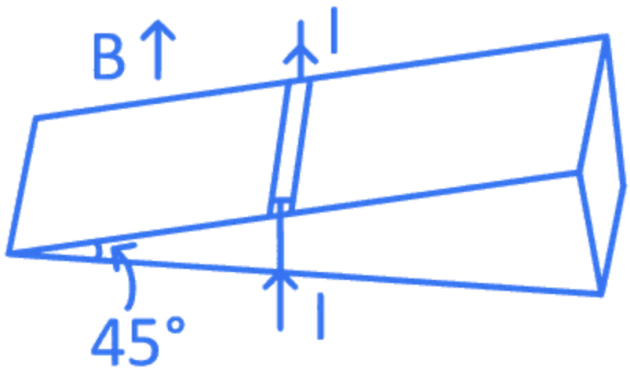
Question Number : 42 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

As shown in the figure, a metallic rod of linear density 0.45 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 45° with the horizontal. The minimum current flowing in the rod required to keep it stationary, when 0.15 T magnetic field is acting on it in the vertical upward direction, will be :

{Use

$$g = 10\ m/s^2$$

}



Options :

A. 30 A

B. 15 A

C. 10 A

D. 3 A

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

The equation of current in a purely inductive circuit is $5\sin(49\pi t - 30^\circ)$. If the inductance is 30 mH then the equation for the voltage across the inductor, will be :

{ Let

$$\pi = \frac{22}{7}\}$$

Options :

A. $1.47\sin(49\pi t - 30^\circ)$

B. $1.47\sin(49\pi t + 60^\circ)$

C. $23.1\sin(49\pi t - 30^\circ)$

D. $23.1\sin(49\pi t + 60^\circ)$

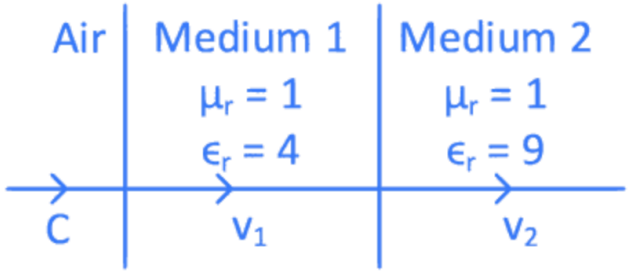
Question Number : 44 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

As shown in the figure, after passing through the medium 1 . The speed of light v_2 in medium 2 will be :

(Given

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

)



Options :

A. $1.0 \times 10^8 \text{ ms}^{-1}$

B. $0.5 \times 10^8 \text{ ms}^{-1}$

C. $1.5 \times 10^8 \text{ ms}^{-1}$

D. $3.0 \times 10^8 \text{ ms}^{-1}$

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

In normal adujstment, for a refracting telescope, the distance between objective and eye piece is 30 cm. The focal length of the objective, when the angular magnification of the telescope is 2 , will be :

Options :

A. 20 cm

B. 30 cm

C. 10 cm

D. 15 cm

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 equation

$$\lambda = \frac{1.227}{x}\ \text{nm}$$

can be used to find the de-Brogli wavelength of an electron. In this equation x stands for :

Where

$$\text{m} =$$

mass of electron

$$\text{P} =$$

momentum of electron

$$\text{K} =$$

Kinetic energy of electron

$$\text{V} =$$

Accelerating potential in volts for electron

Options :

A. $\sqrt{\text{mK}}$

B. $\sqrt{\text{P}}$

C. $\sqrt{\text{K}}$

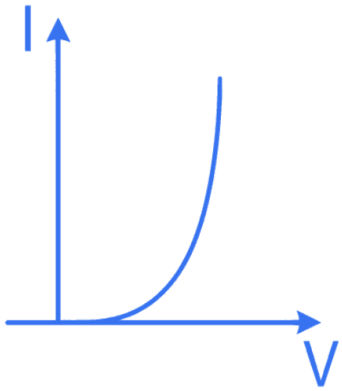
D. $\sqrt{\text{V}}$

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

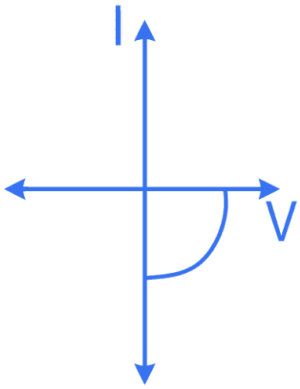
Identify the solar cell characteristics from the following options :

Options :

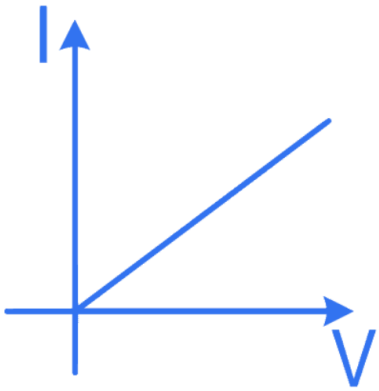
A.



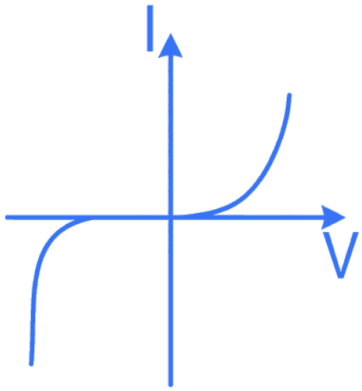
B.



C.



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

A Carnot engine has efficiency of 50%. If the temperature of sink is reduced by 40°C, its efficiency increases by 30%. The temperature of the source will be:

Options :

A. 166.7 K

B. 255.1 K

C. 266.7 K

D. 367.7 K

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

The half life period of a radioactive substance is 60 days. The time taken for $\frac{7}{8}$th of its original mass to disintegrate will be :

Options :

A. 120 days

B. 130 days

C. 180 days

D. 20 days

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

In the case of amplitude modulation to avoid distortion the modulation index (μ) should be :

Options :

A. $\mu \leq 1$

B. $\mu \geq 1$

C. $\mu = 2$

D. $\mu = 0$

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

If the projection of $2\hat{i} + 4\hat{j} - 2\hat{k}$ on $\hat{i} + 2\hat{j} + \alpha\hat{k}$ is zero. Then, the value of α will be _____.

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

In a Young's double slit experiment, a laser light of 560 nm produces an interference pattern with consecutive bright fringes' separation of 7.2 mm. Now another light is used to produce an interference pattern with consecutive bright fringes' separation of 8.1 mm. The wavelength of second light is _____ nm.

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

The frequencies at which the current amplitude in an LCR series circuit becomes

$$\frac{1}{\sqrt{2}}$$

times its maximum value, are 212 rad s^{-1} and 232 rad s^{-1}. The value of resistance in the circuit is

$$R = 5\,\Omega$$

. The self inductance in the circuit is _____ mH.

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 electric dipoles of dipole moments 1.2×10^{-30} Cm and 2.4×10^{-30} Cm are placed in two different uniform electric fields of strengths 5×10^4 NC^{-1} and 15×10^4 NC^{-1} respectively. The ratio of maximum torque experienced by the electric dipoles will be $\frac{1}{x}$. The value of x is _____.

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

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

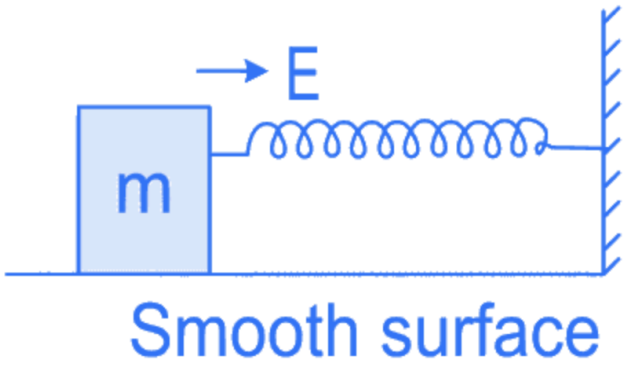
The diameter of an air bubble which was initially 2 mm, rises steadily through a solution of density 1750 kg m^{-3} at the rate of 0.35 cms^{-1}. The coefficient of viscosity of the solution is _____ poise (in nearest integer). (the density of air is negligible).

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 block of mass 'm' (as shown in figure) moving with kinetic energy E compresses a spring through a distance 25 cm when, its speed is halved. The value of spring constant of used spring will be nE Nm^{-1} for n =

_____.



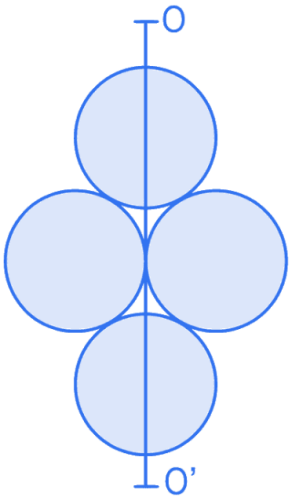
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

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

Four identical discs each of mass 'M' and diameter 'a' are arranged in a small plane as shown in figure. If the moment of inertia of the system about OO' is

$$\frac{x}{4}Ma^2$$

. 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

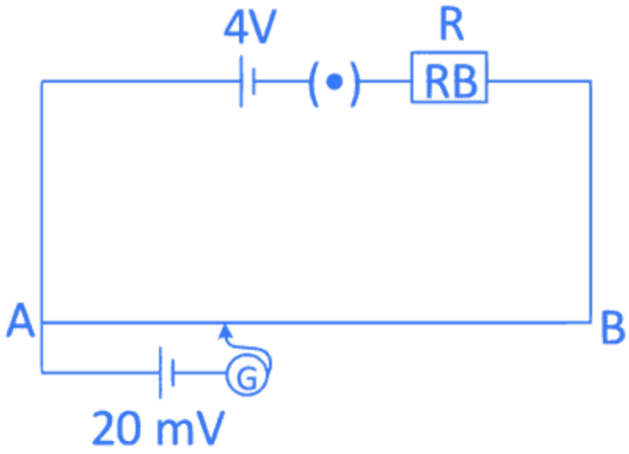
A freshly prepared radioactive source of half life 2 hours 30 minutes emits radiation which is 64 times the permissible safe level. The minimum time, after which it would be possible to work safely with source, will be _____ hours.

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

As shown in the figure, a potentiometer wire of resistance 20 Ω and length 300 cm is connected with resistance box (R.B.) and a standard cell of emf 4 V. For a resistance '*R*' of resistance box introduced into the circuit, the null point for a cell of 20 mV is found to be 60 cm. The value of '*R*' is _____ Ω.



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 frequency of echo will be _____ Hz if the train blowing a whistle of frequency 320 Hz is moving with a velocity of 36 km/h towards a hill from which an echo is heard by the train driver. Velocity of sound in air is 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

Identify the incorrect statement from the following.

Options :

A. A circular path around the nucleus in which an electron moves is proposed as Bohr's orbit.

B. An orbital is the one electron wave function (ψ) in an atom.

C. The existence of Bohr's orbits is supported by hydrogen spectrum.

D. Atomic orbital is characterised by the quantum numbers n and l only.

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

Which of the following relation is not correct?

Options :

A. $\Delta H = \Delta U - P\Delta V$

B. $\Delta U = q + W$

C. $\Delta S_{sys} + \Delta S_{surr} \geqslant 0$

D. $\Delta G = \Delta H - T\Delta S$

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

Match List - I with List - II.

	List - I		**List - II**
(A)	$Cd(s) + 2Ni(OH)_3(s) \rightarrow CdO(s) + 2Ni(OH)_2(s) + H_2O(l)$	(I)	Primary battery
(B)	$Zn(Hg) + HgO(s) \rightarrow ZnO(s) + Hg(l)$	(II)	Discharging of secondary battery
(C)	$2PbSO_4(s) + 2H_2O(l) \rightarrow Pb(s) + PbO_2(s) + 2H_2SO_4(aq)$	(III)	Fuel cell
(D)	$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$	(IV)	Charging of secondary battery

Choose the correct answer from the options given below:

Options :

A. (A) – (I), (B) – (II), (C) – (III), (D) – (IV)

B. (A) – (IV), (B) – (I), (C) – (II), (D) – (III)

C. (A) – (II), (B) – (I), (C) – (IV), (D) – (III)

D. (A) – (II), (B) – (I), (C) – (III), (D) – (IV)

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

In which of the following pairs, electron gain enthalpies of constituent elements are nearly the same or identical?

(A) Rb and Cs

(B) Na and K

(C) Ar and Kr

(D) I and At

Choose the correct answer from the options given below :

Options :

A. (A) and (B) only

B. (B) and (C) only

C. (A) and (C) only

D. (C) and (D) only

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

Match List - I with List - II, match the gas evolved during each reaction.

	List - I		**List - II**
(A)	$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$	(I)	H_2
(B)	$KMnO_4 + HCl \rightarrow$	(II)	N_2
(C)	$Al + NaOH + H_2O \rightarrow$	(III)	O_2
(D)	$NaNO_3 \xrightarrow{\Delta}$	(IV)	Cl_2

Choose the correct answer from the options given below :

Options :

A. (A) – (II), (B) – (III), (C) – (I), (D) – (IV)

B. (A) – (III), (B) – (I), (C) – (IV), (D) – (II)

C. (A) – (II), (B) – (IV), (C) – (I), (D) – (III)

D. $(A) - (III), (B) - (IV), (C) - (I), (D) - (II)$

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

Which of the following has least tendency to liberate H_2 from mineral acids?

Options :

A. Cu

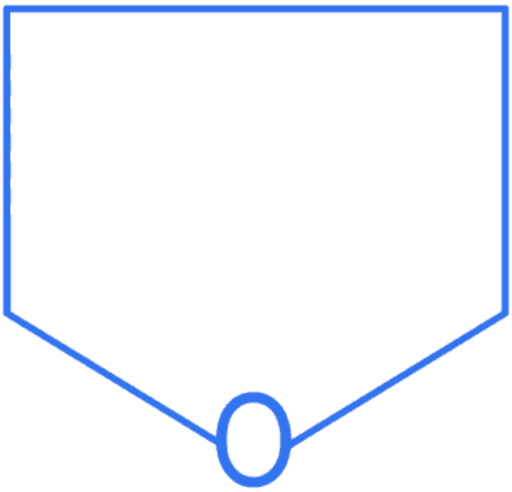
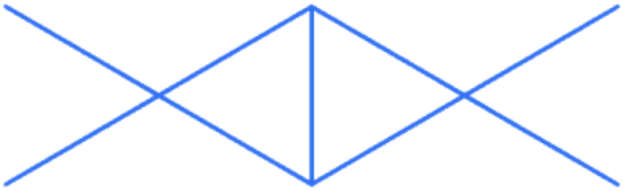
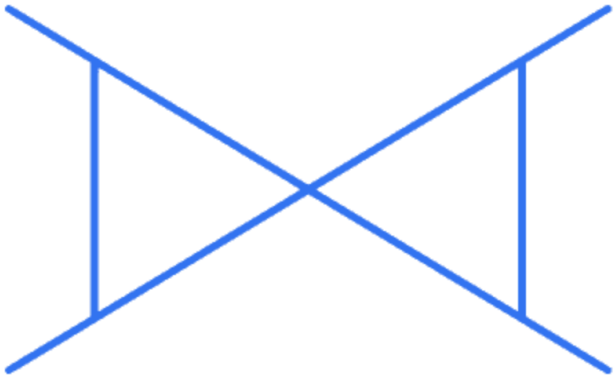
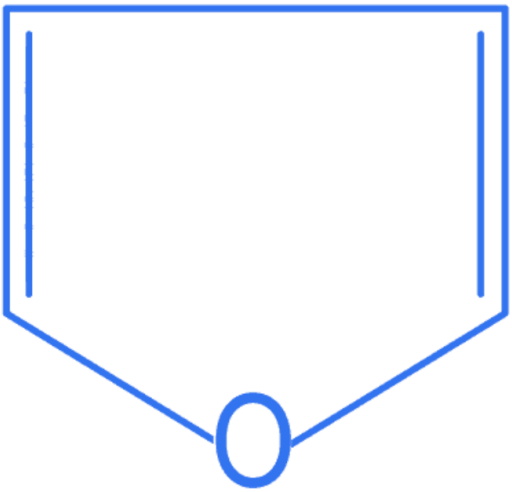
B. Mn

C. Ni

D. Zn

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		**List - II**
(A)		(I)	Spiro compound
(B)		(II)	Aromatic compound
(C)		(III)	Non-planar Heterocyclic compound
(D)		(IV)	Bicyclo compound

Choose the correct answer from the options given below :

Options :

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

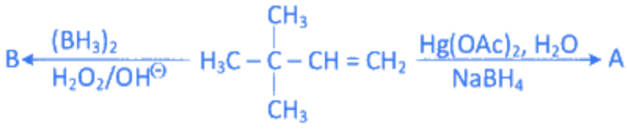
B. (A) - (IV), (B) - (III), (C) - (I), (D) - (II)

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

D. (A) - (IV), (B) - (III), (C) - (II), (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

Choose the correct option for the following reactions.



Options :

A. 'A' and 'B' are both Markovnikov addition products.

B. 'A' is Markovnikov product and 'B' is anti-Markovnikov product.

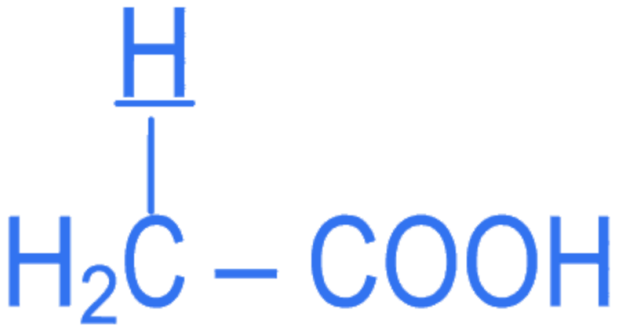
C. 'A' and 'B' are both anti-Markovnikov products.

D. 'B' is Markovnikov and 'A' is anti-Markovnikov product.

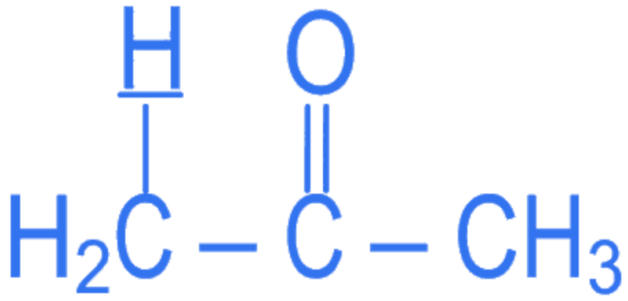
Question Number : 69 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Among the following marked proton of which compound shows lowest pK_a value?

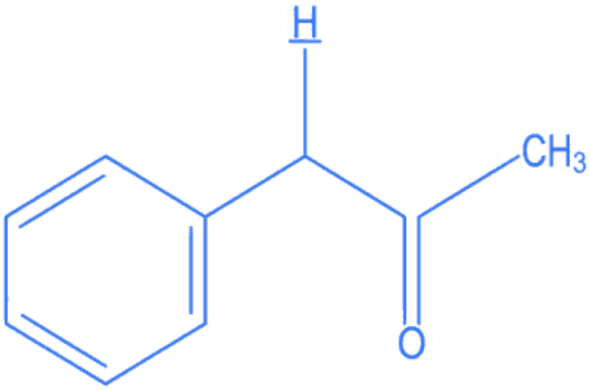
Options :

A. 

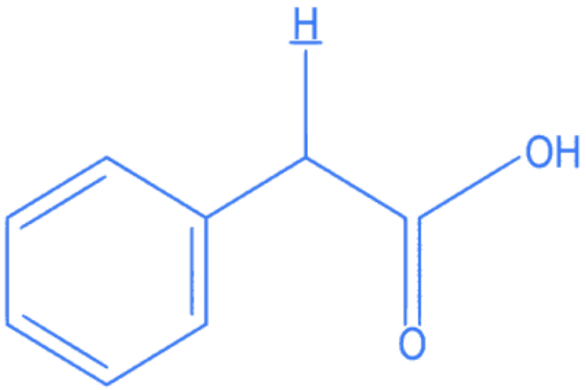
B.



C.

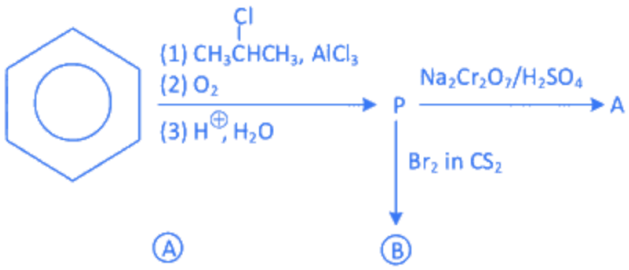


D.

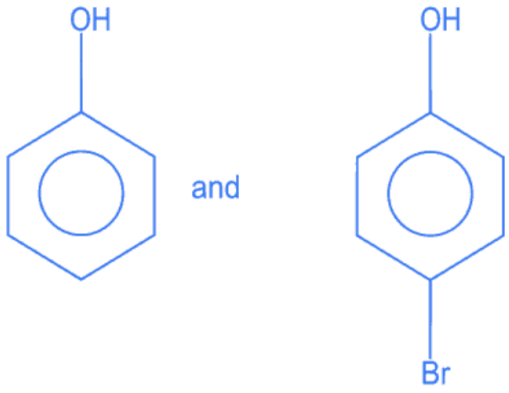


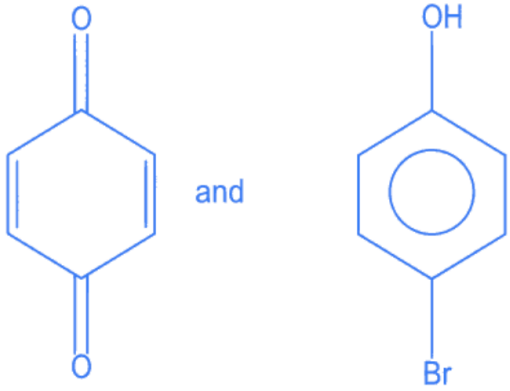
Question Number : 70 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

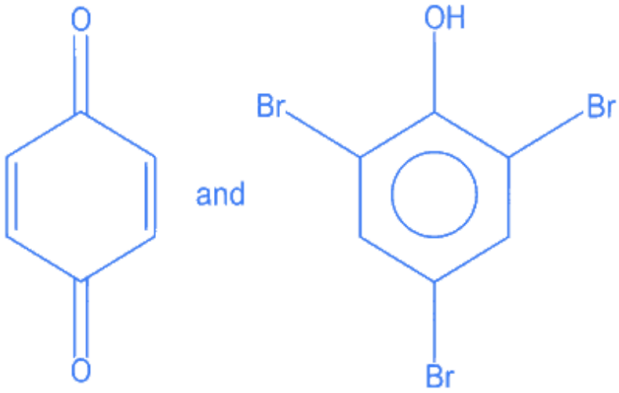
Identify the major products A and B for the below given reaction sequence.

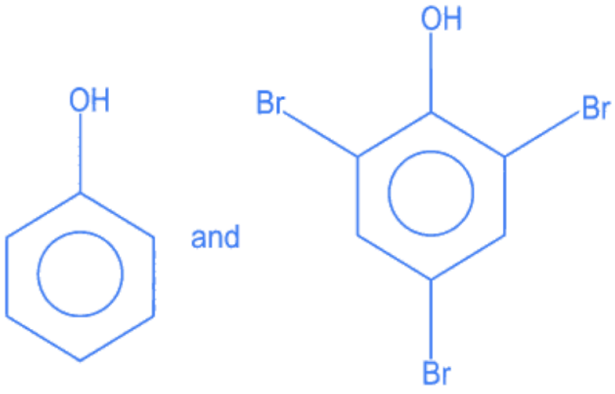


Options :

A. 

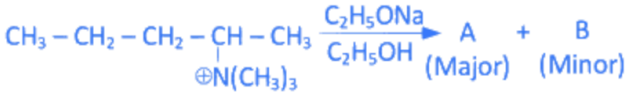
B. 

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

Identify the correct statement for the below given transformation.



Options :

A. $A - CH_3CH_2CH = CH - CH_3,\ B - CH_3CH_2CH_2CH = CH_2$, Saytzeff products

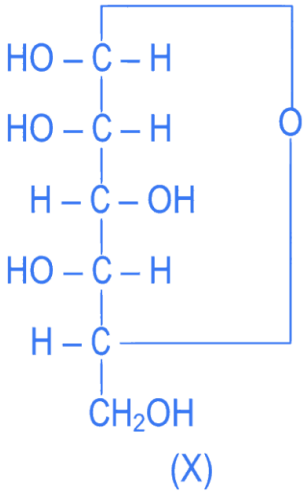
B. $A - CH_3CH_2CH = CH - CH_3$, $-CH_3CH_2CH_2CH = CH_2$, Hofmann products

C. $A - CH_3CH_2CH_2CH = CH_2,\ B - CH_3CH_2CH = CHCH_3$, Hofmann products

D. $A - CH_3CH_2CH_2CH = CH_2,\ B - CH_3CH_2CH = CHCH_3$, Saytzeff products

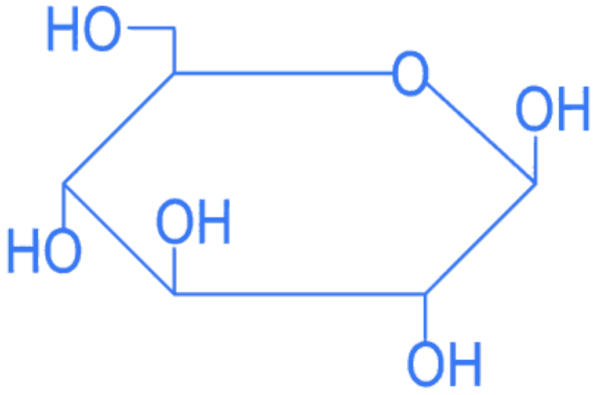
Question Number : 72 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For the below given cyclic hemiacetal (X), the correct pyranose structure is :

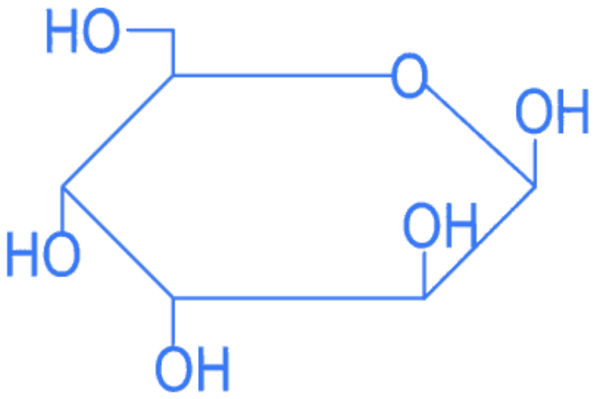


Options :

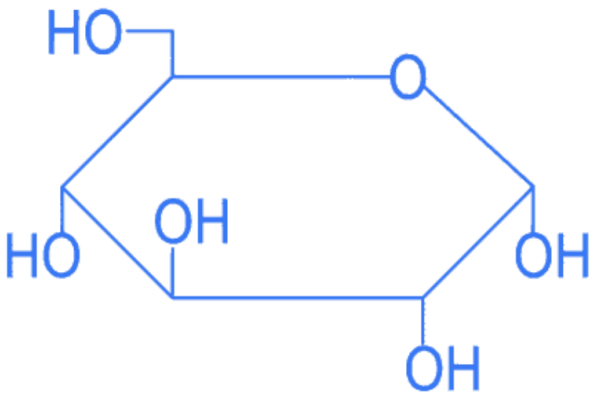
A.



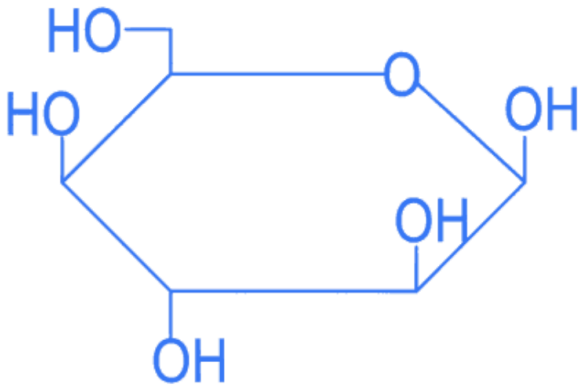
B.



C.



D.



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

For kinetic study of the reaction of iodide ion with H_2O_2 at room temperature :

(A) Always use freshly prepared starch solution.

(B) Always keep the concentration of sodium thiosulphate solution less than that of KI solution.

(C) Record the time immediately after the appearance of blue colour.

(D) Record the time immediately before the appearance of blue colour.

(E) Always keep the concentration of sodium thiosulphate solution more than that of KI solution.

Choose the correct answer from the options given below :

Options :

A. (A), (B), (C) only

B. (A), (D), (E) only

C. (D), (E) only

D. (A), (B), (E) only

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

Match List - I with List - II.

	List - I Reaction		**List - II Catalyst**
(A)	$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$	(I)	$NO(g)$
(B)	$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	(II)	$H_2SO_4(l)$
(C)	$C_{12}H_{22}O_{11}(aq) + H_2O(l) \rightarrow$ C6 H12 O6 (*Glucose*) + C6 H12 O6 (*Fructose*)	(III)	$Pt(s)$
(D)	$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(IV)	$Fe(s)$

Choose the correct answer from the options given below :

Options :

A. (A) – (II), (B) – (III), (C) – (I), (D) – (IV)

B. (A) – (III), (B) – (II), (C) – (I), (D) – (IV)

C. (A) – (III), (B) – (IV), (C) – (II), (D) – (I)

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

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

Which of the reaction is suitable for concentrating ore by leaching process ?

Options :

A. $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

B. $Fe_3O_4 + CO \rightarrow 3FeO + CO_2$

C. $Al_2O_3 + 2NaOH + 3H_2O \rightarrow 2Na\left[Al(OH)_4\right]$

D. $Al_2O_3 + 6Mg \rightarrow 6MgO + 4Al$

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 metal salts formed during softening of hardwater using Clark's method are :

Options :

A. $Ca(OH)_2$ and $Mg(OH)_2$

B. $CaCO_3$ and $Mg(OH)_2$

C. $Ca(OH)_2$ and $MgCO_3$

D. $CaCO_3$ and $MgCO_3$

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

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

Options :

A. Low solubility of LiF in water is due to its small hydration enthalpy.

B. KO_2 is paramagnetic.

C. Solution of sodium in liquid ammonia is conducting in nature.

D. Sodium metal has higher density than potassium metal.

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

Given below are two statements:

Statement I : In polluted water values of both dissolved oxygen and BOD are very low.

Statement II : Eutrophication results in decrease in the amount of dissolved oxygen.

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 true

B. Both Statement I and Statement II are false

C. Statement I is true but Statement II is false

D. Statement I is false but Statement II is true

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

Terylene polymer is obtained by condensation of :

Options :

A. Ethane-1,2-diol and Benzene-1,3 dicarboxylic acid

B. Propane-1, 2-diol and Benzene-1, 4 dicarboxylic acid

C. Ethane-1,2-diol and Benzene-1, 4 dicarboxylic acid

D. Ethane-1,2-diol and Benzene-1, 2 dicarboxylic acid

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

Statements about Enzyme Inhibitor Drugs are given below :

(A) There are Competitive and Non-competitive inhibitor drugs.

(B) These can bind at the active sites and allosteric sites.

(C) Competitive Drugs are allosteric site blocking drugs.

(D) Non-competitive Drugs are active site blocking drugs.

Choose the correct answer from the options given below:

Options :

A. (A), (D) only

B. (A), (C) only

C. (A), (B) only

D. (A), (B), (C) only

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

In the given reaction,

$$X + Y + 3Z \leftrightarrows XYZ_3$$

if one mole of each of X and Y with 0.05 mol of Z gives compound XYZ_3. (Given : Atomic masses of X, Y and Z are 10, 20 and 30 amu, respectively.) The yield of XYZ_3 is _____ g. (Nearest integer)

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 number of paramagnetic species among the following is _____.

$$B_2, Li_2, C_2, C_2^-, O_2^{2-}, O_2^+$$

and He_2^+

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

150 g of acetic acid was contaminated with 10.2 g ascorbic acid $\left(C_6H_8O_6\right)$ to lower down its freezing point by $\left(x \times 10^{-1}\right)^{\circ}$C. The value of x is _____. (Nearest integer)

[Given

$$K_f = 3.9 \text{ K kg mol}^{-1}$$

; molar mass of ascorbic acid

$$= 176 \text{ g mol}^{-1}$$

]

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

K_a for butyric acid $\left(C_3H_7COOH\right)$ is 2×10^{-5}. The pH of 0.2 M solution of butyric acid is _____ $\times 10^{-1}$. (Nearest integer)

[Given

$$\log 2 = 0.30$$

]

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

For the given first order reaction

$$A \rightarrow B$$

the half life of the reaction is 0.3010 min. The ratio of the initial concentration of reactant to the concentration of reactant at time 2.0 min will be equal to _____. (Nearest integer)

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 number of interhalogens from the following having square pyramidal structure is :

$$ClF_3, IF_7, BrF_5, BrF_3, I_2Cl_6, IF_5, ClF, ClF_5$$

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

The disproportionation of MnO_4^{2-} in acidic medium resulted in the formation of two manganese compounds A and B. If the oxidation state of Mn in B is smaller than that of A, then the spin-only magnetic moment (μ) value of B in BM is _____. (Nearest integer)

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

Total number of relatively more stable isomer(s) possible for octahedral complex $\left[Cu(en)_2(SCN)_2\right]$ will be _____.

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

On complete combustion of 0.492 g of an organic compound containing C, H and O, 0.7938 g of CO_2 and 0.4428 g of H_2O was produced. The % composition of oxygen in the compound 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

An element M crystallises in a body centred cubic unit cell with a cell edge of 300 pm. The density of the element is 6.0 g cm^{-3}. The number of atoms present in 180 g of the element is _____ $\times 10^{23}$. (Nearest integer)

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