National Testing Agency

Question Paper Name :	B Tech 27 Jul 2022 Shift 2
Subject Name :	B. Tech
Duration :	180
Total Marks :	300
Display Marks:	Yes

B. Tech

Group Number :	1
Group Maximum Duration :	0
Group Minimum Duration :	180
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300

Mathematics Section A

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

Question Number : 1 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The domain of the function

$$f(x) = \sin^{-1}\left[2x^2 - 3\right] + \log_2\left(\log_{\frac{1}{2}}\left(x^2 - 5x + 5\right)\right)$$

, where [t] is the greatest integer function, is :

Options :

A. $\left(-\sqrt{\frac{5}{2}}, \frac{5-\sqrt{5}}{2}\right)$

B. $\left(\frac{5-\sqrt{5}}{2}, \frac{5+\sqrt{5}}{2}\right)$

C. $\left(1, \frac{5-\sqrt{5}}{2}\right)$

D. $\left[1, \frac{5+\sqrt{5}}{2}\right)$

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

Let S be the set of all

$$(\alpha, \beta), \pi < \alpha, \beta < 2\pi$$

, for which the complex number

$$\frac{1 - i\sin\alpha}{1 + 2i\sin\alpha}$$

is purely imaginary and

$$\frac{1 + i\cos\beta}{1 - 2i\cos\beta}$$

is purely real. Let

$$Z_{\alpha\beta} = \sin 2\alpha + i\cos 2\beta, (\alpha, \beta) \in S$$

. Then

$$\sum_{(\alpha,\beta) \in S} \left(iZ_{\alpha\beta} + \frac{1}{i\bar{Z}_{\alpha\beta}}\right)$$

is equal to :

Options :

A. 3

B. 3 i

C. 1

D. $2 - i$

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

If α, β are the roots of the equation

$$x^2 - \left(5 + 3^{\sqrt{\log_3 5}} - 5^{\sqrt{\log_5 3}}\right)x + 3\left(3^{(\log_3 5)^{\frac{1}{3}}} - 5^{(\log_5 3)^{\frac{2}{3}}} - 1\right) = 0$$

,

then the equation, whose roots are

$$\alpha + \frac{1}{\beta}$$

and

$$\beta + \frac{1}{\alpha}$$

, is :

Options :

A. $3x^2 - 20x - 12 = 0$

B. $3x^2 - 10x - 4 = 0$

C. $3x^2 - 10x + 2 = 0$

D. $3x^2 - 20x + 16 = 0$

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

If for $p \neq q \neq 0$, the function

$$f(x) = \frac{\sqrt[7]{p(729+x)} - 3}{\sqrt[3]{729+qx} - 9}$$

is continuous at $x = 0$, then :

Options :

A. $7pq\, f(0) - 1 = 0$

B. $63q\, f(0) - p^2 = 0$

C. $21q\, f(0) - p^2 = 0$

D. $7pq\, f(0) - 9 = 0$

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

$$f(x) = 2 + |x| - |x-1| + |x+1|, x \in \mathbf{R}$$

.

Consider

$$(S1): f'\left(-\frac{3}{2}\right) + f'\left(-\frac{1}{2}\right) + f'\left(\frac{1}{2}\right) + f'\left(\frac{3}{2}\right) = 2$$

$$(S2): \int_{-2}^{2} f(x)dx = 12$$

Then,

Options :

A. both (S1) and (S2) are correct

B. both (S1) and (S2) are wrong

C. only (S1) is correct

D. only (S2) is correct

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 the sum of an infinite G.P., whose first term is a and the common ratio is r, be 5 . Let the sum of its first five terms be $\frac{98}{25}$. Then the sum of the first 21 terms of an AP, whose first term is 10ar, n^{th} term is a_n and the common difference is $10ar^2$, is equal to :

Options :

A. $21\, a_{11}$

B. $22\, a_{11}$

C. $15\, a_{16}$

D. $14\, a_{16}$

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

The area of the region enclosed by $y \leq 4x^2, x^2 \leq 9y$ and $y \leq 4$, is equal to :

Options :

A. $\frac{40}{3}$

B. $\frac{56}{3}$

C. $\frac{112}{3}$

D. $\frac{80}{3}$

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

$$\int_0^2 \left(|2x^2 - 3x| + \left[x - \frac{1}{2} \right] \right) dx$$

, where [t] is the greatest integer function, is equal to :

Options :

A. $\frac{7}{6}$

B. $\frac{19}{12}$

C. $\frac{31}{12}$

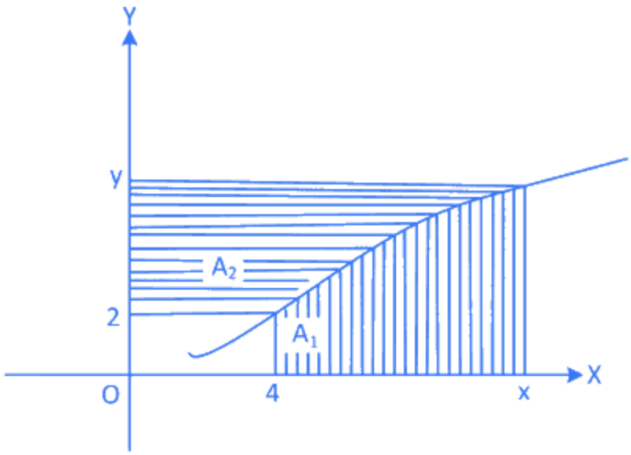
D. $\frac{3}{2}$

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

Consider a curve

$$y = y(x)$$

in the first quadrant as shown in the figure. Let the area A_1 is twice the area A_2. Then the normal to the curve perpendicular to the line $2x - 12y = 15$ does NOT pass through the point.



Options :

A. $(6, 21)$

B. $(8, 9)$

C. $(10, -4)$

D. $(12, -15)$

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

The equations of the sides AB, BC and CA of a triangle ABC are

$$2x + y = 0, x + py = 39$$

and $x - y = 3$ respectively and P(2,3) is its circumcentre. Then which of the following is NOT true?

Options :

A. $(AC)^2 = 9p$

B. $(AC)^2 + p^2 = 136$

C. $32 < \text{area } (\Delta ABC) < 36$

D. $34 < \text{area } (\triangle ABC) < 38$

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

If the length of the perpendicular drawn from the point $P(a, 4, 2)$, a > 0 on the line

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

is $2\sqrt{6}$ units and $Q(\alpha_1, \alpha_2, \alpha_3)$ is the image of the point P in this line, then

$$a + \sum_{i=1}^{3} \alpha_i$$

is equal to :

Options :

A. 7

B. 8

C. 12

D. 14

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

A six faced die is biased such that

$3 \times P(\text{a prime number}) = 6 \times P(\text{a composite number}) = 2 \times P(1)$

.

Let X be a random variable that counts the number of times one gets a perfect square on some throws of this die. If the die is thrown twice, then the mean of X is :

Options :

A. $\frac{3}{11}$

B. $\frac{5}{11}$

C. $\frac{7}{11}$

D. $\frac{8}{11}$

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

Let

$$A = \begin{pmatrix} 4 & -2 \\ \alpha & \beta \end{pmatrix}$$

.

If

$$A^2 + \gamma A + 18I = O$$

, then det(A) is equal to _____.

Options :

A. -18

B. 18

C. -50

D. 50

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

A circle C_1 passes through the origin O and has diameter 4 on the positive x-axis. The line $y = 2x$ gives a chord OA of circle C_1. Let C_2 be the circle with OA as a diameter. If the tangent to C_2 at the point A meets the x-axis at P and y-axis at Q, then QA : AP is equal to :

Options :

A. $1 : 4$

B. $1 : 5$

C. $2 : 5$

D. $1 : 3$

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

If the length of the latus rectum of a parabola, whose focus is (a, a) and the tangent at its vertex is $x + y = a$, is 16, then $|a|$ is equal to :

Options :

A. $2\sqrt{2}$

B. $2\sqrt{3}$

C. $4\sqrt{2}$

D. 4

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 line of intersection of the planes $ax + by = 3$ and $ax + by + cz = 0$, a > 0 makes an angle 30° with the plane $y - z + 2 = 0$, then the direction cosines of the line are :

Options :

A. $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0$

B. $\frac{1}{\sqrt{2}}, \pm\frac{1}{\sqrt{2}}, 0$

C. $\frac{1}{\sqrt{5}}, -\frac{2}{\sqrt{5}}, 0$

D. $\frac{1}{2}, -\frac{\sqrt{3}}{2}, 0$

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 X have a binomial distribution B(n, p) such that the sum and the product of the mean and variance of X are 24 and 128 respectively. If

$$P(X > n - 3) = \frac{k}{2^n}$$

, then k is equal to :

Options :

A. 528

B. 529

C. 629

D. 630

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

The angle of elevation of the top P of a vertical tower PQ of height 10 from a point A on the horizontal ground is 45°. Let R be a point on AQ and from a point B, vertically above R, the angle of elevation of P is 60°. If

$$\angle BAQ = 30°, AB = d$$

and the area of the trapezium PQRB is α, then the ordered pair (d, α) is :

Options :

A. $(10(\sqrt{3} - 1), 25)$

B. $\left(10(\sqrt{3} - 1), \frac{25}{2}\right)$

C. $(10(\sqrt{3} + 1), 25)$

D. $\left(10(\sqrt{3} + 1), \frac{25}{2}\right)$

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

Let

$$S = \left\{\theta \in \left(0, \frac{\pi}{2}\right) : \sum_{m=1}^{9} \sec\left(\theta + (m-1)\frac{\pi}{6}\right) \sec\left(\theta + \frac{m\pi}{6}\right) = -\frac{8}{\sqrt{3}}\right\}$$

. Then

Options :

A. $S = \left\{\frac{\pi}{12}\right\}$

B. $S = \left\{\frac{2\pi}{3}\right\}$

C. $\sum_{\theta \in S} \theta = \frac{\pi}{2}$

D. $\sum_{\theta \in S} \theta = \frac{3\pi}{4}$

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 the truth value of the statement $(P \wedge (\sim R)) \rightarrow ((\sim R) \wedge Q)$ is F, then the truth value of which of the following is F ?

Options :

A. $P \vee Q \rightarrow \sim R$

B. $R \vee Q \rightarrow \sim P$

C. $\sim(P \vee Q) \rightarrow \sim R$

D. $\sim(R \vee Q) \rightarrow \sim P$

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

The number of functions f, from the set

$$A = \{x \in \mathbf{N} : x^2 - 10x + 9 \leq 0\}$$

to the set

$$B = \{n^2 : n \in \mathbf{N}\}$$

such that $f(x) \leq (x-3)^2 + 1$, for every $x \in A$, is _____.

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 for the 9^{th} term in the binomial expansion of $(3 + 6x)^n$, in the increasing powers of $6x$, to be the greatest for

$$x = \frac{3}{2}$$

, the least value of n is n_0. If k is the ratio of the coefficient of x^6 to the coefficient of x^3, then $k + n_0$ 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

A water tank has the shape of a right circular cone with axis vertical and vertex downwards. Its semi-vertical angle is

$$\tan^{-1}\frac{3}{4}$$

. Water is poured in it at a constant rate of 6 cubic meter per hour. The rate (in square meter per hour), at which the wet curved surface area of the tank is increasing, when the depth of water in the tank is 4 meters, 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

For the curve

$$C: \left(x^2+y^2-3\right)+\left(x^2-y^2-1\right)^5=0$$

, the value of $3y'-y^3y''$, at the point (α,α), $\alpha>0$, on C, is equal to _____.

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

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

Let

$$f(x)=\min\{[x-1],[x-2],\ \ldots\ ,[x-10]\}$$

where [t] denotes the greatest integer $\leq$ t. Then

$$\int_0^{10} f(x)\mathrm{d}x+\int_0^{10}(f(x))^2\,\mathrm{d}x+\int_0^{10}|f(x)|\mathrm{d}x$$

is equal to _____.

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

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

Let f be a differentiable function satisfying

$$f(x) = \frac{2}{\sqrt{3}} \int_0^{\sqrt{3}} f\left(\frac{\lambda^2 x}{3}\right) d\lambda, x > 0$$

and

$$f(1) = \sqrt{3}$$

. If

$$y = f(x)$$

passes through the point $(\alpha, 6)$, 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 : 27 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be three non-coplanar vectors such that $\vec{a} \times \vec{b} = 4\vec{c}$, $\vec{b} \times \vec{c} = 9\vec{a}$ and $\vec{c} \times \vec{a} = \alpha \vec{b}$, $\alpha >$ 0. If

$$\left|\vec{a}\right| + \left|\vec{b}\right| + \left|\vec{c}\right| = \frac{1}{36}$$

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

Consider a matrix

$$A = \begin{bmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta+\gamma & \gamma+\alpha & \alpha+\beta \end{bmatrix}$$

, where α, β, γ are three distinct natural numbers.

If

$$\frac{\det(\text{adj}(\text{adj}(\text{adj}(\text{adj}\, A))))}{(\alpha-\beta)^{16}(\beta-\gamma)^{16}(\gamma-\alpha)^{16}} = 2^{32} \times 3^{16}$$

, then the number of such 3 - tuples (α, β, γ) is _____.

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

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

$$\frac{2^3-1^3}{1\times 7}+\frac{4^3-3^3+2^3-1^3}{2\times 11}+\frac{6^3-5^3+4^3-3^3+2^3-1^3}{3\times 15}+\cdots+\frac{30^3-29^3+28^3-27^3+\ \ldots\ +2^3-1^3}{15\times 63}$$

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

A common tangent T to the curves

$$C_1 : \frac{x^2}{4}+\frac{y^2}{9}=1$$

and

$$C_2 : \frac{x^2}{42}-\frac{y^2}{143}=1$$

does not pass through the fourth quadrant. If T touches C_1 at $\left(x_1, y_1\right)$ and C_2 at $\left(x_2, y_2\right)$, then $\left|2x_1+x_2\right|$ 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

An expression of energy density is given by

$$u=\frac{\alpha}{\beta}\sin\left(\frac{\alpha x}{kt}\right)$$

, where α, β are constants, x is displacement, k is Boltzmann constant and t is the temperature. The dimensions of β will be :

Options :

A. $\left[\mathrm{ML^2\,T^{-2}\theta^{-1}}\right]$

B. $\left[\mathrm{M^0\,L^2\,T^{-2}}\right]$

C. $\left[M^0\ L^0\ T^0\right]$

D. $\left[M^0\ L^2\ T^0\right]$

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 body of mass 10 kg is projected at an angle of 45° with the horizontal. The trajectory of the body is observed to pass through a point (20,10). If T is the time of flight, then its momentum vector, at time

$$t = \frac{T}{\sqrt{2}}$$

, is _____.

[Take

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

]

Options :

A. $100\hat{i} + (100\sqrt{2} - 200)\hat{j}$

B. $100\sqrt{2}\ \hat{i} + (100 - 200\sqrt{2}\ )\hat{j}$

C. $100\hat{i} + (100 - 200\sqrt{2}\ )\hat{j}$

D. $100\sqrt{2}\ \hat{i} + (100\sqrt{2} - 200)\hat{j}$

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

A block of mass M slides down on a rough inclined plane with constant velocity. The angle made by the incline plane with horizontal is θ. The magnitude of the contact force will be :

Options :

A. Mg

B. $Mg\cos\theta$

C. $\sqrt{Mg\sin\theta + Mg\cos\theta}$

D. $Mg\sin\theta\sqrt{1+\mu}$

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 block 'A' takes 2 s to slide down a frictionless incline of 30° and length 'l', kept inside a lift going up with uniform velocity 'v'. If the incline is changed to 45°, the time taken by the block, to slide down the incline, will be approximately :

Options :

A. 2.66 s

B. 0.83 s

C. 1.68 s

D. 0.70 s

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

The velocity of the bullet becomes one third after it penetrates 4 cm in a wooden block. Assuming that bullet is facing a constant resistance during its motion in the block. The bullet stops completely after travelling at (4 + x) cm inside the block. The value of x is :

Options :

A. 2.0

B. 1.0

C. 0.5

D. 1.5

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 body of mass m is projected with velocity λv_e in vertically upward direction from the surface of the earth into space. It is given that v_e is escape velocity and $\lambda < 1$. If air resistance is considered to be negligible, then the maximum height from the centre of earth, to which the body can go, will be :

(R : radius of earth)

Options :

A. $\frac{R}{1+\lambda^2}$

B. $\frac{R}{1-\lambda^2}$

C. $\frac{R}{1-\lambda}$

D. $\frac{\lambda^2 R}{1-\lambda^2}$

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 steel wire of length

$$3.2\ \text{m}\left(Y_s = 2.0 \times 10^{11}\ \text{Nm}^{-2}\right)$$

and a copper wire of length

$$4.4\ \text{m}\left(Y_c = 1.1 \times 10^{11}\ \text{Nm}^{-2}\right)$$

, both of radius 1.4 mm are connected end to end. When stretched by a load, the net elongation is found to be 1.4 mm. The load applied, in Newton, will be:

(

Given

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

)

Options :

A. 360

B. 180

C. 1080

D. 154

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

Which statements are correct about degrees of freedom ?

(A) A molecule with n degrees of freedom has n^2 different ways of storing energy.

(B) Each degree of freedom is associated with $\frac{1}{2}$ RT average energy per mole.

(C) A monatomic gas molecule has 1 rotational degree of freedom where as diatomic molecule has 2 rotational degrees of freedom.

(D) CH_4 has a total of 6 degrees of freedom.

Choose the correct answer from the options given below :

Options :

A. (B) and (C) only

B. (B) and (D) only

C. (A) and (B) only

D. (C) and (D) only

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

A charge of $4\,\mu C$ is to be divided into two. The distance between the two divided charges is constant. The magnitude of the divided charges so that the force between them is maximum, will be :

Options :

A. $1\,\mu C$ and $3\,\mu C$

B. $2\,\mu C$ and $2\,\mu C$

C. 0 and $4\,\mu C$

D. $1.5\,\mu C$ and $2.5\,\mu C$

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) The drift velocity of electrons decreases with the increase in the temperature of conductor.

(B) The drift velocity is inversely proportional to the area of cross-section of given conductor.

(C) The drift velocity does not depend on the applied potential difference to the conductor.

(D) The drift velocity of electron is inversely proportional to the length of the conductor.

(E) The drift velocity increases with the increase in the temperature of conductor.

Choose the correct answer from the options given below :

Options :

A. (A) and (B) only

B. (A) and (D) only

C. (B) and (E) only

D. (B) and (C) only

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 cyclotron is used to accelerate protons. If the operating magnetic field is 1.0 T and the radius of the cyclotron 'dees' is 60 cm, the kinetic energy of the accelerated protons in MeV will be :

$$[\text{use } m_p = 1.6 \times 10^{-27}\ \text{kg}, e = 1.6 \times 10^{-19}\ \text{C}$$

]

Options :

A. 12

B. 18

C. 16

D. 32

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 series LCR circuit has

$$L = 0.01\ H, R = 10\ \Omega$$

and

$$C = 1\mu F$$

and it is connected to ac voltage of amplitude (V_m) 50 V. At frequency 60% lower than resonant frequency, the amplitude of current will be approximately :

Options :

A. 466 mA

B. 312 mA

C. 238 mA

D. 196 mA

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

Identify the correct statements from the following descriptions of various properties of electromagnetic waves.

(A) In a plane electromagnetic wave electric field and magnetic field must be perpendicular to each other and direction of propagation of wave should be along electric field or magnetic field.

(B) The energy in electromagnetic wave is divided equally between electric and magnetic fields.

(C) Both electric field and magnetic field are parallel to each other and perpendicular to the direction of propagation of wave.

(D) The electric field, magnetic field and direction of propagation of wave must be perpendicular to each other.

(E) The ratio of amplitude of magnetic field to the amplitude of electric field is equal to speed of light.

Choose the most appropriate answer from the options given below :

Options :

A. (D) only

B. (B) and (D) only

C. (B), (C) and (E) only

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

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 coherent sources of light interfere. The intensity ratio of two sources is 1 : 4. For this interference pattern if the value of

$$\frac{I_{\max} + I_{\min}}{I_{\max} - I_{\min}}$$

is equal to

$$\frac{2\alpha + 1}{\beta + 3}$$

, then $\frac{\alpha}{\beta}$ will be :

Options :

A. 1.5

B. 2

C. 0.5

D. 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

With reference to the observations in photo-electric effect, identify the correct statements from below :

(A) The square of maximum velocity of photoelectrons varies linearly with frequency of incident light.

(B) The value of saturation current increases on moving the source of light away from the metal surface.

(C) The maximum kinetic energy of photo-electrons decreases on decreasing the power of LED (light emitting diode) source of light.

(D) The immediate emission of photo-electrons out of metal surface can not be explained by particle nature of light/electromagnetic waves.

(E) Existence of threshold wavelength can not be explained by wave nature of light/ electromagnetic waves.

Choose the correct answer from the options given below :

Options :

A. (A) and (B) only

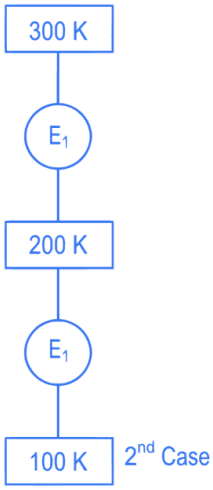
B. (A) and (E) only

C. (C) and (E) only

D. (D) and (E) only

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

In 1^{st} case, Carnot engine operates between temperatures 300 K and 100 K. In 2^{nd} case, as shown in the figure, a combination of two engines is used. The efficiency of this combination (in 2^{nd} case) will be :



Options :

A. same as the 1^{st} case.

B. always greater than the 1^{st} case.

C. always less than the 1^{st} case.

D. may increase or decrease with respect to the 1^{st} case.

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

A compass needle of oscillation magnetometer oscillates 20 times per minute at a place P of dip 30°. The number of oscillations per minute become 10 at another place Q of 60° dip. The ratio of the total magnetic field at the two places $\left(B_Q : B_P\right)$ is :

Options :

A. $\sqrt{3} : 4$

B. $4 : \sqrt{3}$

C. $\sqrt{3} : 2$

D. $2 : \sqrt{3}$

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 activity of a radioactive material is 6.4×10^{-4} curie. Its half life is 5 days. The activity will become 5×10^{-6} curie after :

Options :

A. 7 days

B. 15 days

C. 25 days

D. 35 days

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 constant collector-emitter voltage of 8 V, the collector current of a transistor reached to the value of 6 mA from 4 mA, whereas base current changed from 20 μA to 25 μA value. If transistor is in active state, small signal current gain (current amplification factor) will be :

Options :

A. 240

B. 400

C. 0.0025

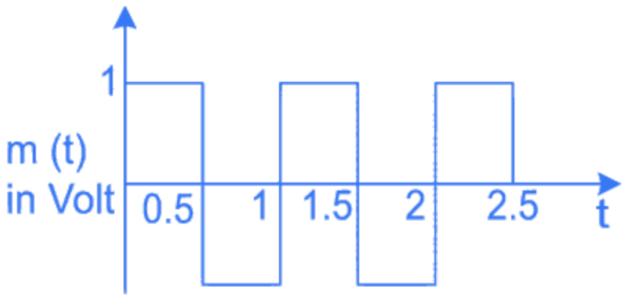
D. 200

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

A square wave of the modulating signal is shown in the figure. The carrier wave is given by

$$C(t) = 5\sin(8\pi t)$$

Volt. The modulation index is :



Options :

A. 0.2

B. 0.1

C. 0.3

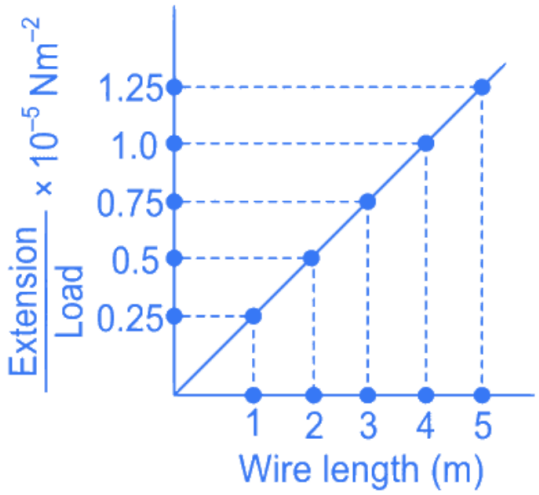
D. 0.4

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

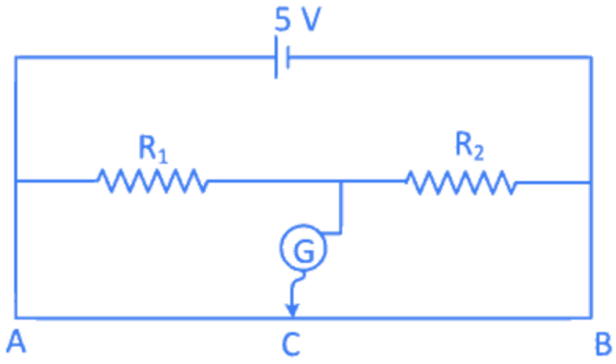
In an experiment to determine the Young's modulus, steel wires of five different lengths (1,2,3,4, and 5 m) but of same cross section $\left(2\ \text{mm}^2\right)$ were taken and curves between extension and load were obtained. The slope (extension/load) of the curves were plotted with the wire length and the following graph is obtained. If the Young's modulus of given steel wires is $x \times 10^{11}\ \text{Nm}^{-2}$, then 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 : 52 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In the given figure of meter bridge experiment, the balancing length AC corresponding to null deflection of the galvanometer is 40 cm. The balancing length, if the radius of the wire AB is doubled, will be _____ cm.



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

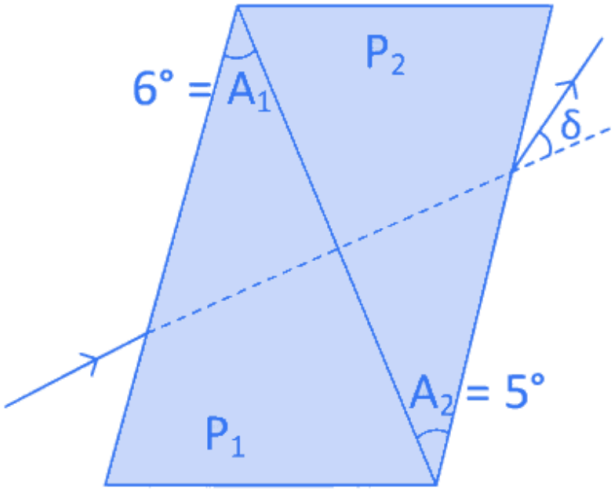
A thin prism of angle 6° and refractive index for yellow light $(n_Y)1.5$ is combined with another prism of angle 5° and

$$n_Y = 1.55$$

. The combination produces no dispersion. The net average deviation (δ) produced by the combination is

$$\left(\frac{1}{x}\right)^{\circ}$$

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

A conducting circular loop is placed in $X-Y$ plane in presence of magnetic field

$$\vec{B} = \left(3t^3\,\hat{j} + 3t^2\,\hat{k}\right)$$

in SI unit. If the radius of the loop is 1 m, the induced emf in the loop, at time,

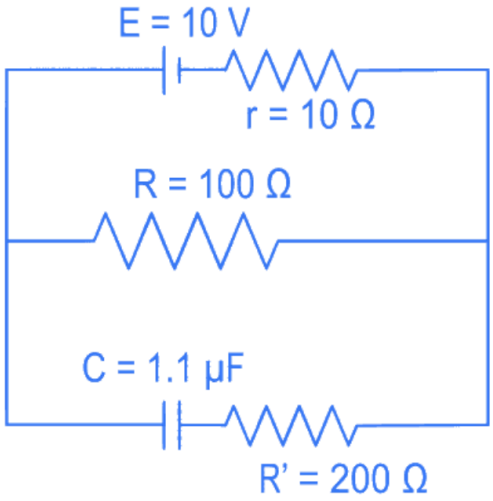
$$t = 2\ s$$

is $n\pi$ V. The value of n 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

As show in the figure, in steady state, the charge stored in the capacitor is _____ $\times\ 10^{-6}$ C.



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

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

A parallel plate capacitor with width 4 cm, length 8 cm and separation between the plates of 4 mm is connected to a battery of 20 V. A dielectric slab of dielectric constant 5 having length 1 cm, width 4 cm and thickness 4 mm is inserted between the plates of parallel plate capacitor. The electrostatic energy of this system will be _____ ϵ_0 J. (Where ϵ_0 is the permittivity of free space)

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

A wire of length 30 cm, stretched between rigid supports, has it's n^{th} and $(n+1)^{th}$ harmonics at 400 Hz and 450 Hz, respectively. If tension in the string is 2700 N, it's linear mass density is _____ kg/m.

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

Answers Type : Equal
Text Areas : PlainText

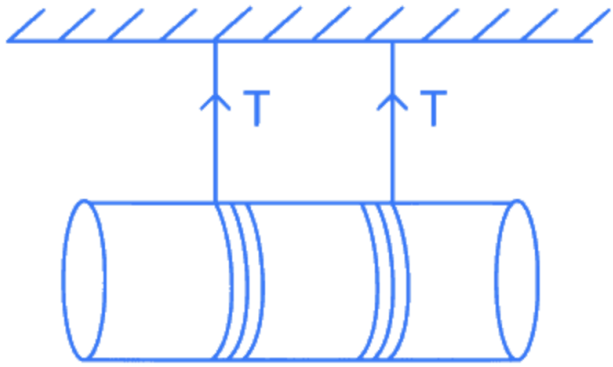
Question Number : 58 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A spherical soap bubble of radius 3 cm is formed inside another spherical soap bubble of radius 6 cm. If the internal pressure of the smaller bubble of radius 3 cm in the above system is equal to the internal pressure of the another single soap bubble of radius r cm. The value of r is _____.

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

A solid cylinder length is suspended symmetrically through two massless strings, as shown in the figure. The distance from the initial rest position, the cylinder should be unbinding the strings to achieve a speed of $4\ ms^{-1}$, is _____ cm. (take $g = 10\ ms^{-2}$)



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

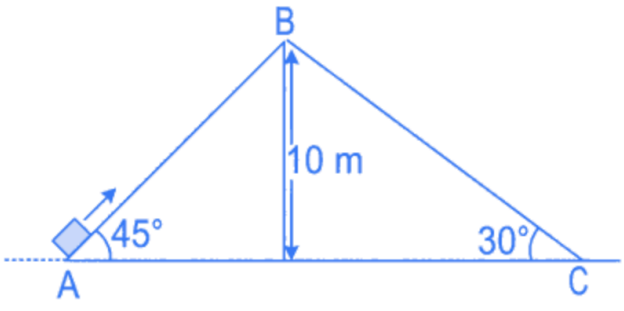
Question Number : 60 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Two inclined planes are placed as shown in figure. A block is projected from the Point A of inclined plane AB along its surface with a velocity just sufficient to carry it to the top Point B at a height 10 m. After reaching the Point B the block slides down on inclined plane BC. Time it takes to reach to the point C from point A is $t(\sqrt{2}+1)$ s. The value of t is _____.

(use

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

)



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

The correct decreasing order of energy for the orbitals having, following set of quantum numbers :

(A) $n = 3, l = 0, m = 0$

(B) $n = 4, l = 0, m = 0$

(C) $n = 3, l = 1, m = 0$

(D) $n = 3, l = 2, m = 1$

is :

Options :

A. (D) > (B) > (C) > (A)

B. (B) > (D) > (C) > (A)

C. (C) > (B) > (D) > (A)

D. (B) > (C) > (D) > (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

Match List - I with List - II.

	List - I		**List - II**
(A)	$\psi_{MO} = \psi_A - \psi_B$	(I)	Dipole moment
(B)	$\mu = Q \times r$	(II)	Bonding molecular orbital
(C)	$\frac{N_b - N_a}{2}$	(III)	Anti-bonding molecular orbital
(D)	$\psi_{MO} = \psi_A + \psi_B$	(IV)	Bond order

Choose the correct answer from the options given below :

Options :

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

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

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

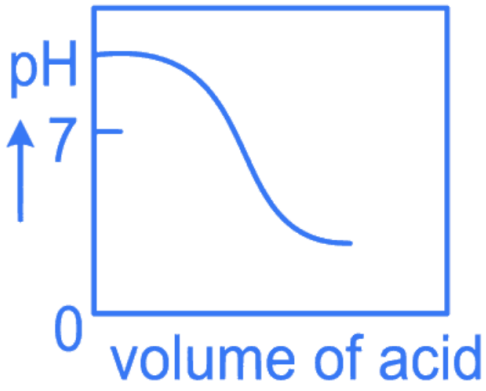
D. (A) – (III), (B) – (IV), (C) – (II), (D) – (I)

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

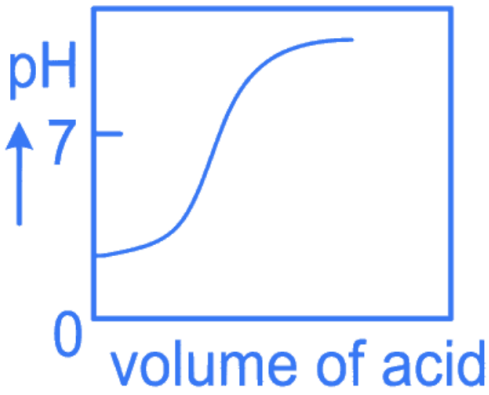
The plot of pH-metric titration of weak base NH_4OH vs strong acid HCl looks like :

Options :

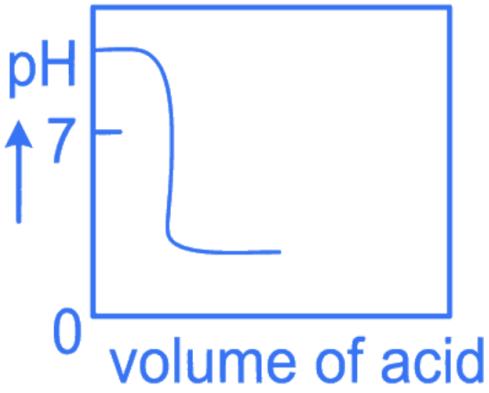
A.



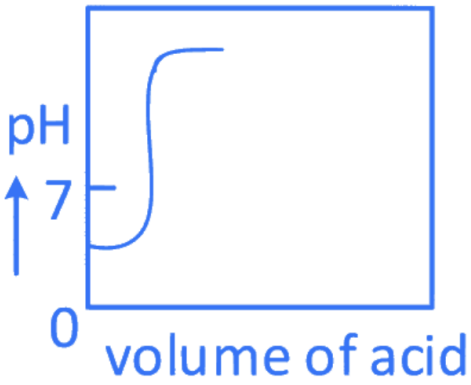
B.



C.



D.



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

Given below are two statements :

Statement I : For KI, molar conductivity increases steeply with dilution

Statement II : For carbonic acid, molar conductivity increases slowly with dilution

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

Outermost electronic configurations of four elements A, B, C, D are given below :

(A) $3s^2$

(B) $3s^2 3p^1$

(C) $3s^2 3p^3$

(D) $3s^2 3p^4$

The correct order of first ionization enthalpy for them is :

Options :

A. (A) < (B) < (C) < (D)

B. (B) < (A) < (D) < (C)

C. (B) < (D) < (A) < (C)

D. (B) < (A) < (C) < (D)

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

In neutral or alkaline solution, MnO_4^- oxidises thiosulphate to :

Options :

A. $S_2O_7^{2-}$

B. $S_2O_8^{2-}$

C. SO_3^{2-}

D. SO_4^{2-}

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

Low oxidation state of metals in their complexes are common when ligands :

Options :

A. have good π-accepting character

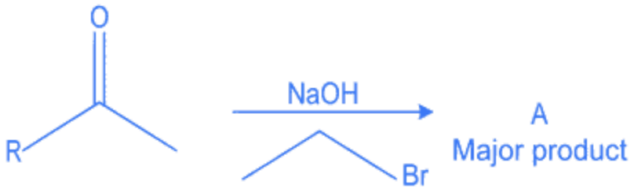
B. have good σ-donor character

C. are having good π-donating ability

D. are having poor σ-donating ability

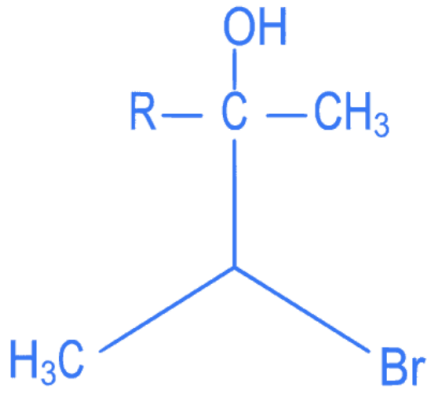
Question Number : 68 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The structure of A in the given reaction is :

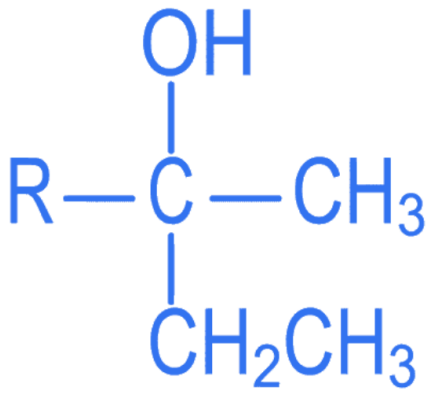


Options :

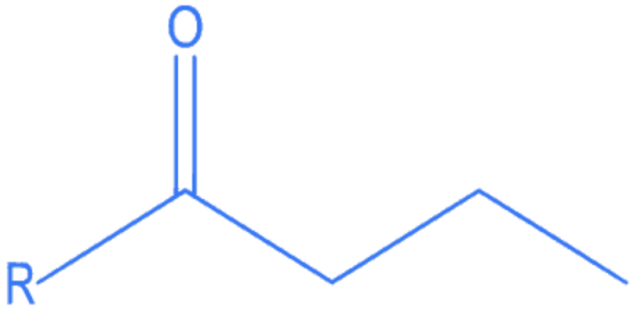
A.



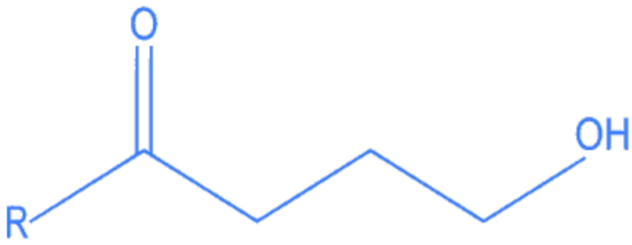
B.



C.

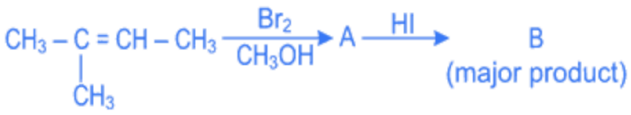


D.



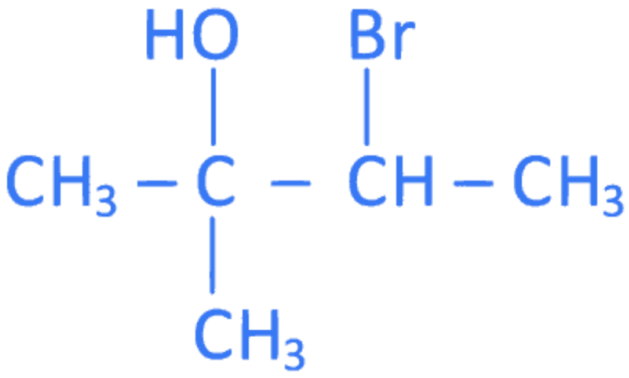
Question Number : 69 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Major product 'B' of the following reaction sequence is :

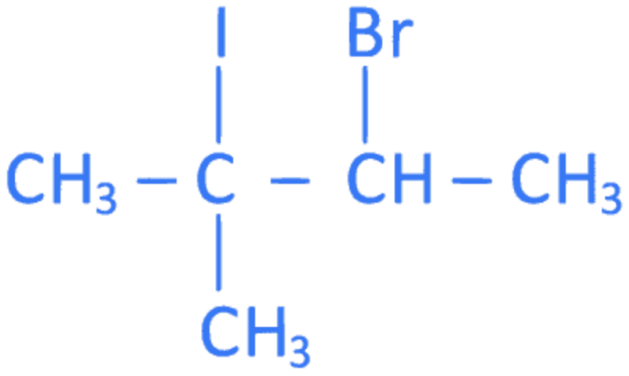


Options :

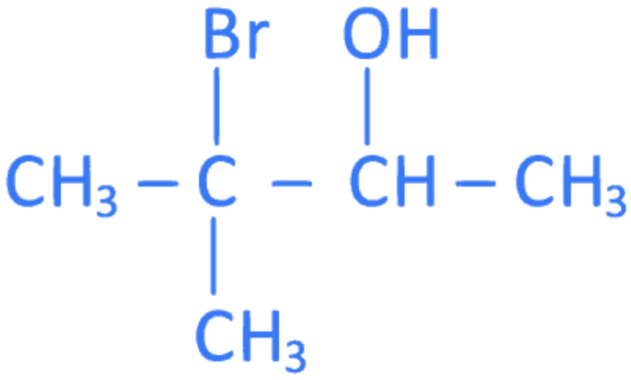
A.



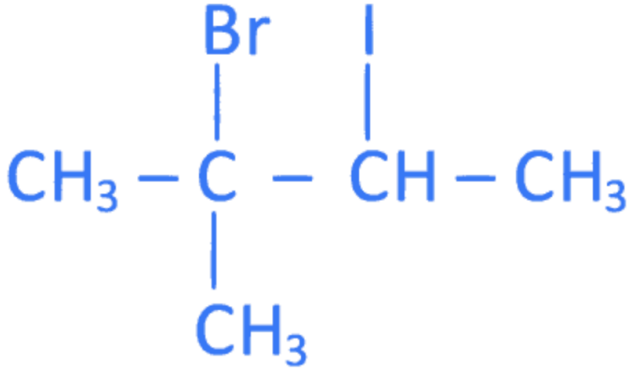
B.



C.

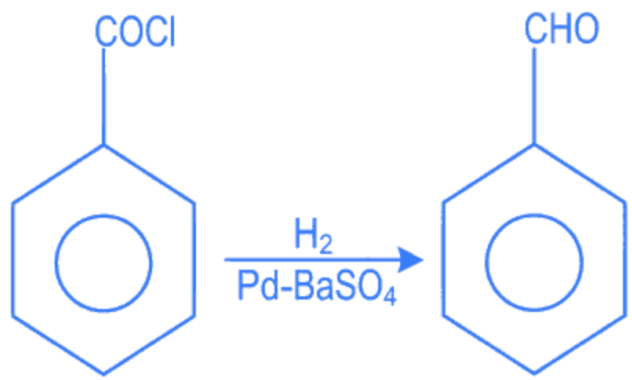
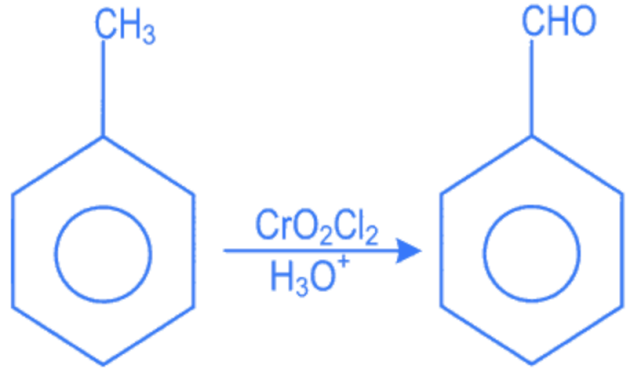
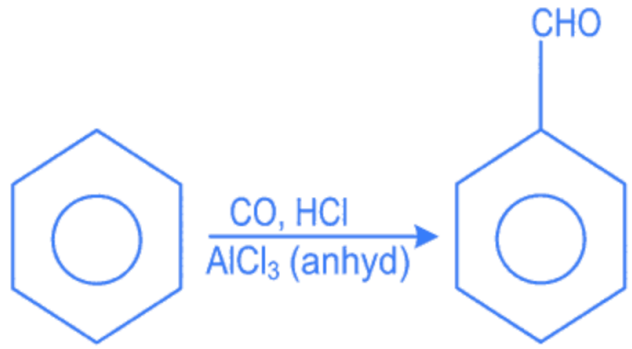


D.



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		**List - II**
(A)		(I)	Gatterman Koch reaction
(B)	$CH_3 - CN \xrightarrow[H_3O^+]{SnCl_2/HCl} CH_3 - CHO$	(II)	Etard reaction
(C)		(III)	Stephen reaction
(D)		(IV)	Rosenmund reaction

Choose the correct answer from the options given below :

Options :

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

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

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

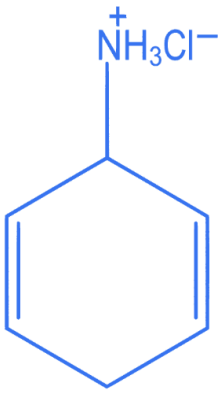
D. (A) – (III), (B) – (II), (C) – (I), (D) – (IV)

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

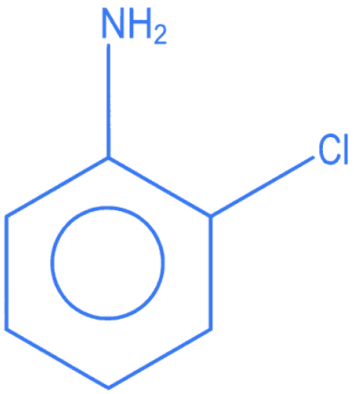
An organic compound 'A' contains nitrogen and chlorine. It dissolves readily in water to give a solution that turns litmus red. Titration of compound 'A' with standard base indicates that the molecular weight of 'A' is 131 ± 2. When a sample of 'A' is treated with aq. NaOH, a liquid separates which contains N but not Cl. Treatment of the obtained liquid with nitrous acid followed by phenol gives orange precipitate. The compound 'A' is :

Options :

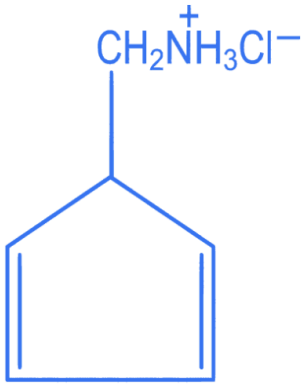
A.



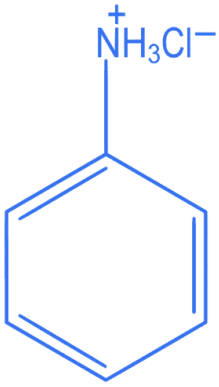
B.



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

Match List - I with Match List - II.

	List - I		**List - II**
(A)	Glucose + HI	(I)	Gluconic acid
(B)	Glucose + Br_2 water	(II)	Glucose pentacetate
(C)	Glucose + acetic anhydride	(III)	Saccharic acid
(D)	Glucose + HNO_3	(IV)	Hexane

Choose the correct answer from the options given below:

Options :

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

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

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

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

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 (Mixture)		**List - II (Purification Process)**
(A)	Chloroform & Aniline	(I)	Steam distillation
(B)	Benzoic acid & Napthalene	(II)	Sublimation
(C)	Water & Aniline	(III)	Distillation
(D)	Napthalene & Sodium chloride	(IV)	Crystallisation

Choose the correct answer from the options given below :

Options :

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

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

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

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

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

Fe^{3+} cation gives a prussian blue precipitate on addition of potassium ferrocyanide solution due to the formation of :

Options :

A. $\left[Fe\left(H_2O\right)_6\right]_2\left[Fe(CN)_6\right]$

B. $Fe_2\left[Fe(CN)_6\right]_2$

C. $Fe_3\left[Fe(OH)_2(CN)_4\right]_2$

D. $Fe_4\left[Fe(CN)_6\right]_3$

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

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

Assertion (A) : Dissolved substances can be removed from a colloidal solution by diffusion through a parchment paper.

Reason (R) : Particles in a true solution cannot pass through parchment paper but the colloidal particles can pass through the parchment paper.

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. Both (A) and (R) are correct but (R) is not the correct explanation of (A)

C. (A) is correct but (R) is not correct

D. (A) is not correct but (R) is correct

Question Number : 76 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An element A of group 1 shows similarity to an element B belonging to group 2. If A has maximum hydration enthalpy in group 1 then B is :

Options :

A. Mg

B. Be

C. Ca

D. Sr

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) : Boron is unable to form BF_6^{3-}.

Reason (R) : Size of B is very small.

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. Both (A) and (R) are true but (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

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 : The non bio-degradable fly ash and slag from steel industry can be used by cement industry.

Statement II : The fuel obtained from plastic waste is lead free.

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

Options :

A. Both Statement I and Statement II are correct

B. Both Statement I and Statement II are incorrect

C. Statement I is correct but Statement II is incorrect

D. Statement I is incorrect but Statement II is correct

Question Number : 79 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 (Polymer)		**List - II (Monomer)**
(A)	Neoprene	(I)	Acrylonitrile
(B)	Teflon	(II)	Chloroprene
(C)	Acrilan	(III)	Tetrafluoroethene
(D)	Natural rubber	(IV)	Isoprene

Choose the correct answer from the options given below :

Options :

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

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

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

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

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

Which of the following enhances the lathering property of soap?

Options :

A. Sodium stearate

B. Sodium carbonate

C. Sodium rosinate

D. Trisodium phosphate

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

The normality of H_2SO_4 in the solution obtained on mixing 100 mL of 0.1 M H_2SO_4 with 50 mL of 0.1 M NaOH is _____ $\times 10^{-1}$ N. (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

A gas (Molar mass = 280 g mol^{-1}) was burnt in excess O_2 in a constant volume calorimeter and during combustion the temperature of calorimeter increased from 298.0 K to 298.45 K. If the heat capacity of calorimeter is 2.5 kJ K^{-1} and enthalpy of combustion of gas is 9 kJ mol^{-1} then amount of gas burnt is _____ g. (Nearest Integer)

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

When a certain amount of solid A is dissolved in 100 g of water at 25°C to make a dilute solution, the vapour pressure of the solution is reduced to one-half of that of pure water. The vapour pressure of pure water is 23.76 mmHg. The number of moles of solute A added is _____. (Nearest Integer)

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

$$\underset{\text{Reactant}}{[A]} \rightarrow \underset{\text{Product}}{[B]}$$

If formation of compound [B] follows the first order of kinetics and after 70 minutes the concentration of [A] was found to be half of its initial concentration. Then the rate constant of the reaction is $x \times 10^{-6}$ s^{-1}. The value of x is _____. (Nearest Integer)

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

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

The number of molecule(s) or ion(s) from the following having non-planar structure is _____.

$$NO_3^-, H_2O_2, BF_3, PCl_3, XeF_4, SF_4, XeO_3, PH_4^+, SO_3, \left[Al(OH)_4\right]^-$$

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

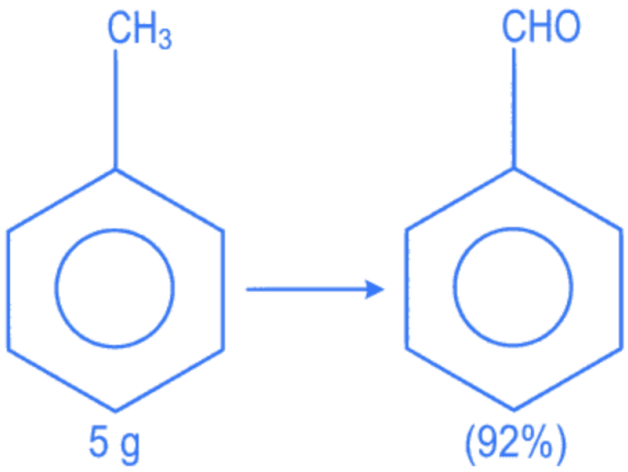
Answers Type : Equal
Text Areas : PlainText

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

The spin only magnetic moment of the complex present in Fehling's reagent is _____ B.M. (Nearest integer).

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

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



In the above reaction, 5 g of toluene is converted into benzaldehyde with 92% yield. The amount of benzaldehyde produced is _____ $\times 10^{-2}$ g. (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

For a real gas at 25°C temperature and high pressure (99 bar) the value of compressibility factor is 2, so the value of Vander Waal's constant 'b' should be _____ $\times 10^{-2}$ L mol^{-1} (Nearest integer)

(Given

$$R = 0.083 \text{ L}$$

bar K^{-1} mol^{-1})

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

Among the following ores Bauxite, Siderite, Cuprite, Calamine, Haematite, Kaolinite, Malachite, Magnetite, Sphalerite, Limonite, Cryolite, the number of principal ores if iron 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

The oxidation state of manganese in the product obtained in a reaction of potassium permanganate and hydrogen peroxide in basic medium is _____.

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