National Testing Agency

Question Paper Name :	B TECH 16th March 2021 Shift 1
Subject Name :	B TECH
Creation Date :	2021-03-16 14:04:33
Duration :	180
Number of Questions :	90
Total Marks :	300
Display Marks:	Yes

B TECH

Group Number :	1
Group Id :	8643512
Group Maximum Duration :	0
Group Minimum Duration :	180
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300
Is this Group for Examiner? :	No

Physics Section A

Section Id :	8643517
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	8643517
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 86435191 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

For an electromagnetic wave travelling in free space, the relation between average energy densities due to electric (U_e) and magnetic (U_m) fields is :

Options :

864351271. $U_e = U_m$

864351272. $U_e \neq U_m$

864351273. $U_e > U_m$

864351274. $U_e < U_m$

Question Number : 2 Question Id : 86435192 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The volume V of an enclosure contains a mixture of three gases, 16 g of oxygen, 28 g of nitrogen and 44 g of carbon dioxide at absolute temperature T. Consider R as universal gas constant. The pressure of the mixture of gases is :

Options :

864351275. $\dfrac{5}{2} \dfrac{RT}{V}$

864351276. $\dfrac{3RT}{V}$

864351277. $\dfrac{4RT}{V}$

864351278. $\dfrac{88RT}{V}$

Question Number : 3 Question Id : 86435193 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

For changing the capacitance of a given parallel plate capacitor, a dielectric material of dielectric constant K is used, which has the same area as the plates of the capacitor. The thickness of the dielectric slab is $\frac{3}{4}d$, where 'd' is the separation between the plates of parallel plate capacitor. The new capacitance (C') in terms of original capacitance (C_0) is given by the following relation :
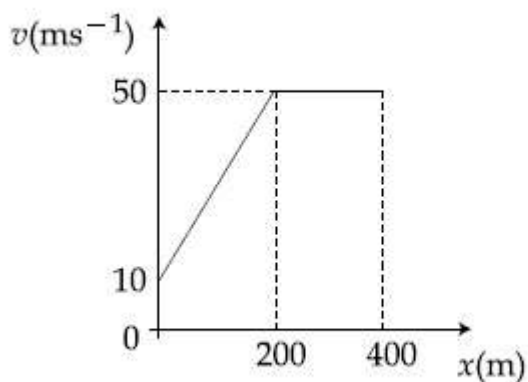
Options :

864351279. $C' = \frac{4K}{K+3}C_0$

864351280. $C' = \frac{4}{3+K}C_0$

864351281. $C' = \frac{3+K}{4K}C_0$
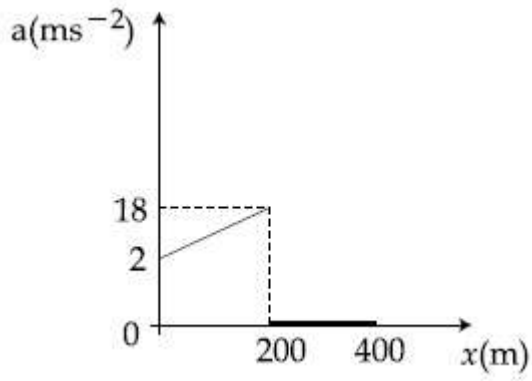
864351282. $C' = \frac{4+K}{3}C_0$

Question Number : 4 Question Id : 86435194 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

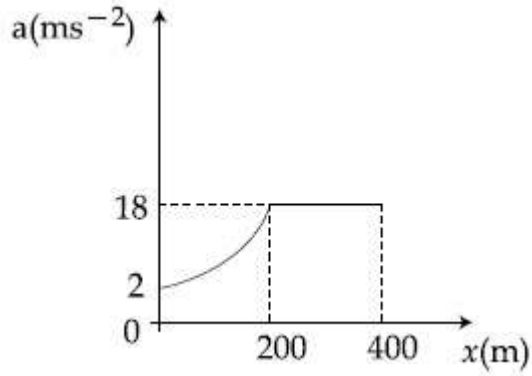The velocity-displacement graph describing the motion of a bicycle is shown in the figure.

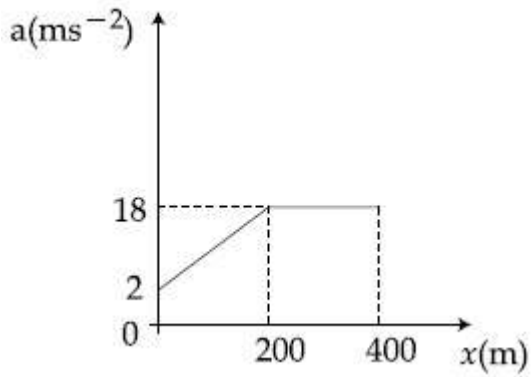The acceleration-displacement graph of the bicycle's motion is best described by :
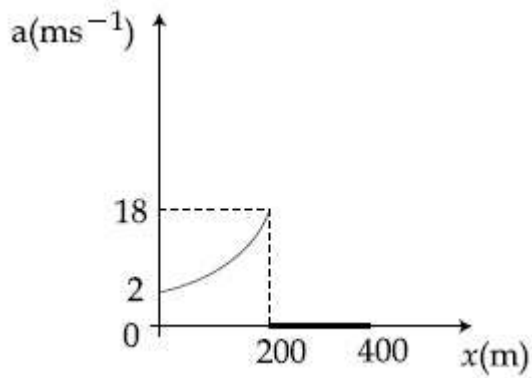
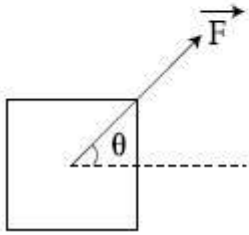Options :

864351283.

864351284.

864351285.

864351286.

Question Number : 5 Question Id : 86435195 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A block of mass m slides along a floor while a force of magnitude F is applied to it at an angle θ as shown in figure. The coefficient of kinetic friction is μ_K. Then, the block's acceleration 'a' is given by :

(g is acceleration due to gravity)

Options :

864351287.
$$-\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)$$

864351288.
$$\frac{F}{m}\cos\theta + \mu_K\left(g - \frac{F}{m}\sin\theta\right)$$

864351289.
$$\frac{F}{m}\cos\theta - \mu_K\left(g + \frac{F}{m}\sin\theta\right)$$

864351290.
$$\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)$$

Question Number : 6 Question Id : 86435196 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A bar magnet of length 14 cm is placed in the magnetic meridian with its north pole pointing towards the geographic north pole. A neutral point is obtained at a distance of 18 cm from the center of the magnet. If $B_H = 0.4$ G, the magnetic moment of the magnet is (1 G $= 10^{-4}$T)

Options :

864351291. 28.80 J T^{-1}

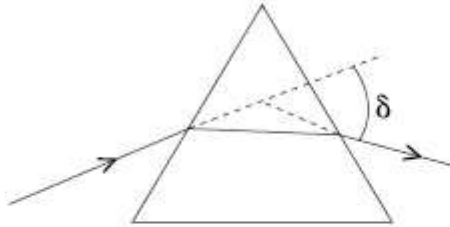864351292. 2.880×10^2 J T^{-1}

864351293. 2.880 J T^{-1}

864351294. $2.880 \times 10^3 \text{ J T}^{-1}$

Question Number : 7 Question Id : 86435197 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The angle of deviation through a prism is minimum when

(A) Incident ray and emergent ray are symmetric to the prism

(B) The refracted ray inside the prism becomes parallel to its base

(C) Angle of incidence is equal to that of the angle of emergence

(D) When angle of emergence is double the angle of incidence

Choose the correct answer from the options given below :

Options :

864351295. Only statements (A) and (B) are true

864351296. Statements (A), (B) and (C) are true

864351297. Only statement (D) is true

864351298. Statements (B) and (C) are true

Question Number : 8 Question Id : 86435198 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

An RC circuit as shown in the figure is driven by a AC source generating a square wave. The output wave pattern monitored by CRO would look close to :

Options :

864351299.

864351300.
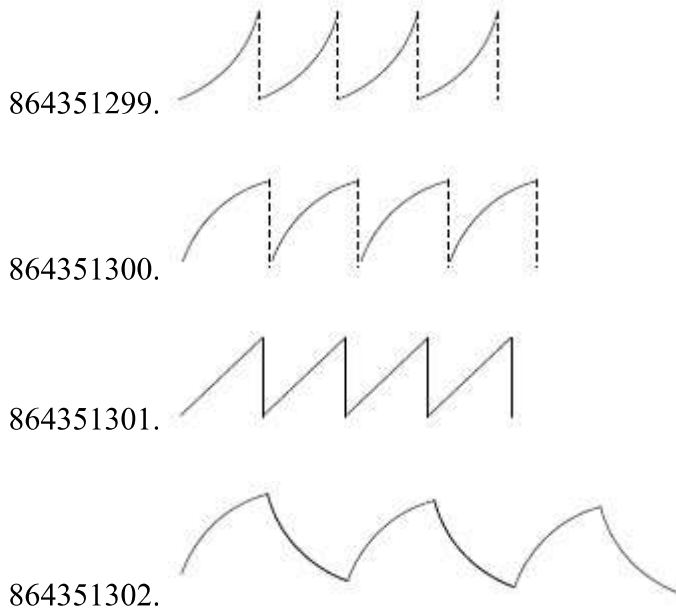
864351301.

864351302.
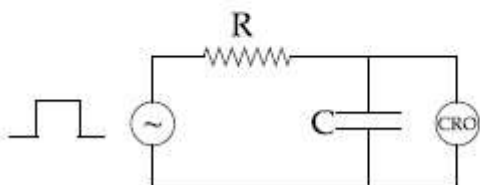
Question Number : 9 Question Id : 86435199 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A block of 200 g mass moves with a uniform speed in a horizontal circular groove, with vertical side walls of radius 20 cm. If the block takes 40 s to complete one round, the normal force by the side walls of the groove is :

Options :

864351303. 0.0314 N

864351304. 9.859×10^{-4} N

864351305. 6.28×10^{-3} N

864351306. 9.859×10^{-2} N

Question Number : 10 Question Id : 864351100 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In thermodynamics, heat and work are :

Options :

864351307. Point functions

864351308. Path functions

864351309. Intensive thermodynamic state variables

864351310. Extensive thermodynamic state variables

Question Number : 11 Question Id : 864351101 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The maximum and minimum distances of a comet from the Sun are 1.6×10^{12} m and 8.0×10^{10} m respectively. If the speed of the comet at the nearest point is 6×10^4 ms^{-1}, the speed at the farthest point is :

Options :

864351311. 1.5×10^3 m/s

864351312. 3.0×10^3 m/s
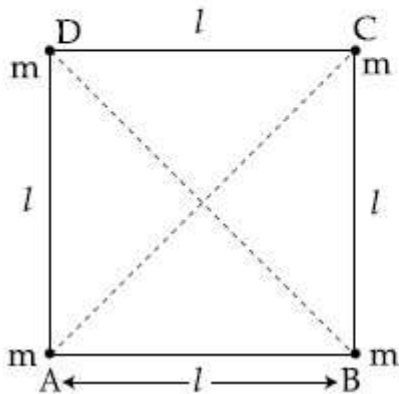
864351313. 6.0×10^3 m/s

864351314. 4.5×10^3 m/s

Question Number : 12 Question Id : 864351102 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Four equal masses, m each are placed at the corners of a square of length (l) as shown in the figure. The moment of inertia of the system about an axis passing through A and parallel to DB would be :

Options :

864351315. $2 ml^2$

864351316. $\sqrt{3} \ ml^2$

864351317. $3 \ ml^2$

864351318. ml^2

Question Number : 13 Question Id : 864351103 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A 25 m long antenna is mounted on an antenna tower. The height of the antenna tower is 75 m. The wavelength (in meter) of the signal transmitted by this antenna would be :

Options :

864351319. 200

864351320. 300

864351321. 400

864351322. 100

Question Number : 14 Question Id : 864351104 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The stopping potential in the context of photoelectric effect depends on the following property of incident electromagnetic radiation :

Options :

864351323. Frequency

864351324. Amplitude

864351325. Intensity

864351326. Phase

Question Number : 15 Question Id : 864351105 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Time period of a simple pendulum is T inside a lift when the lift is stationary. If the lift moves upwards with an acceleration g/2, the time period of pendulum will be :

Options :

864351327. $\dfrac{T}{\sqrt{3}}$

864351328. $\sqrt{3}T$

864351329. $\sqrt{\dfrac{3}{2}}\, T$

864351330. $\sqrt{\dfrac{2}{3}}\, T$

Question Number : 16 Question Id : 864351106 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A plane electromagnetic wave of frequency 500 MHz is travelling in vacuum along y-direction.

At a particular point in space and time, $\vec{B} = 8.0 \times 10^{-8}\ \hat{z}\,T$. The value of electric field at this point is :

(speed of light $= 3 \times 10^8$ ms^{-1})

$\hat{x}, \hat{y}, \hat{z}$ are unit vectors along x, y and z directions.

Options :

864351331. $-24\ \hat{x}$ V/m
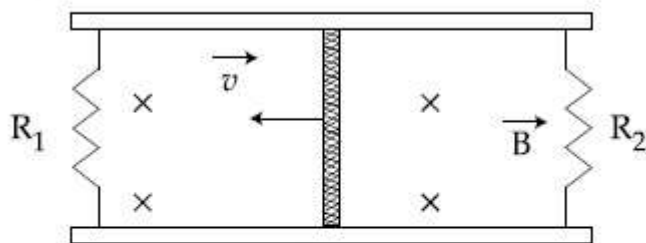
864351332. $2.6\ \hat{x}$ V/m

864351333. $24\ \hat{x}$ V/m

864351334. $-2.6\ \hat{y}$ V/m

Question Number : 17 Question Id : 864351107 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A conducting bar of length L is free to slide on two parallel conducting rails as shown in the figure

Two resistors R_1 and R_2 are connected across the ends of the rails. There is a uniform magnetic field $\vec{B}$ pointing into the page. An external agent pulls the bar to the left at a constant speed v.

The correct statement about the directions of induced currents I_1 and I_2 flowing through R_1 and R_2 respectively is :

Options :

864351335. I_1 is in anticlockwise direction and I_2 is in clockwise direction

864351336. I_1 is in clockwise direction and I_2 is in anticlockwise direction

864351337. Both I_1 and I_2 are in anticlockwise direction

864351338. Both I_1 and I_2 are in clockwise direction

Question Number : 18 Question Id : 864351108 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The pressure acting on a submarine is 3×10^5 Pa at a certain depth. If the depth is doubled, the percentage increase in the pressure acting on the submarine would be :

(Assume that atmospheric pressure is 1×10^5 Pa density of water is 10^3 kg m^{-3}, g $=10$ ms^{-2})

Options :

864351339. $\dfrac{5}{200}\%$

864351340. $\dfrac{200}{5}\%$

864351341. $\dfrac{200}{3}\%$

864351342. $\dfrac{3}{200}\%$

Question Number : 19 Question Id : 864351109 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A conducting wire of length 'l', area of cross-section A and electric resistivity ρ is connected between the terminals of a battery. A potential difference V is developed between its ends, causing an electric current.

If the length of the wire of the same material is doubled and the area of cross-section is halved, the resultant current would be :

Options :

864351343. $4\dfrac{VA}{\rho l}$

864351344. $\dfrac{1}{4}\dfrac{\rho l}{VA}$

864351345. $\dfrac{1}{4}\dfrac{VA}{\rho l}$

864351346. $\dfrac{3}{4}\dfrac{VA}{\rho l}$

Question Number : 20 Question Id : 864351110 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

One main scale division of a vernier callipers is 'a' cm and n^{th} division of the vernier scale coincide with $(n-1)^{th}$ division of the main scale. The least count of the callipers in mm is :

Options :

864351347. $\left(\dfrac{n-1}{10\,n}\right)a$

864351348. $\dfrac{10\,na}{(n-1)}$

864351349. $\dfrac{10\,a}{n}$

864351350. $\dfrac{10\,a}{(n-1)}$

Physics Section B

Section Id : 8643518

Section Number : 2

Section type : Online

Mandatory or Optional : Mandatory

Number of Questions : 10

Number of Questions to be attempted : 5

Section Marks : 20

Mark As Answered Required? : Yes

Sub-Section Number : 1

Sub-Section Id : 8643518

Question Shuffling Allowed : Yes

Question Number : 21 Question Id : 864351111 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A sinusoidal voltage of peak value 250 V is applied to a series LCR circuit, in which $R=8\ \Omega$, $L=24$ mH and $C=60\ \mu F$. The value of power dissipated at resonant condition is 'x' kW. The value of x to the nearest integer is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal
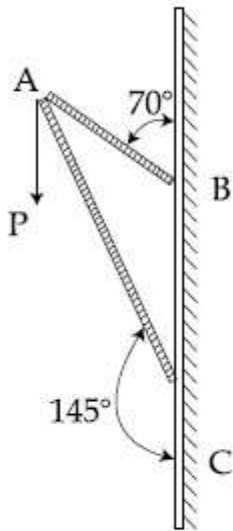
Text Areas : PlainText

Possible Answers :

100

Question Number : 22 Question Id : 864351112 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Consider a frame that is made up of two thin massless rods AB and AC as shown in the

figure. A vertical force $\vec{P}$ of magnitude 100 N is applied at point A of the frame.

Suppose the force is $\vec{P}$ resolved parallel to the arms AB and AC of the frame.

The magnitude of the resolved component along the arm AC is xN.

The value of x, to the nearest integer, is _____.

[Given : $\quad \sin(35°) = 0.573, \; \cos(35°) = 0.819$

$\qquad\qquad \sin(110°) = 0.939, \; \cos(110°) = -0.342$]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 23 Question Id : 864351113 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The first three spectral lines of H-atom in the Balmer series are given $\lambda_1, \lambda_2, \lambda_3$ considering the

Bohr atomic model, the wave lengths of first and third spectral lines $\left(\dfrac{\lambda_1}{\lambda_3}\right)$ are related by a

factor of approximately 'x' $\times 10^{-1}$.

The value of x, to the nearest integer, is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
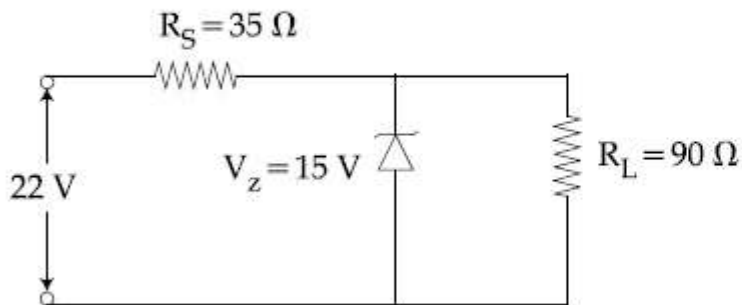Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 24 Question Id : 864351114 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The value of power dissipated across the zener diode ($V_z = 15$ V) connected in the circuit as shown in the figure is $x \times 10^{-1}$ watt.

The value of x, to the nearest integer, is _____ .

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
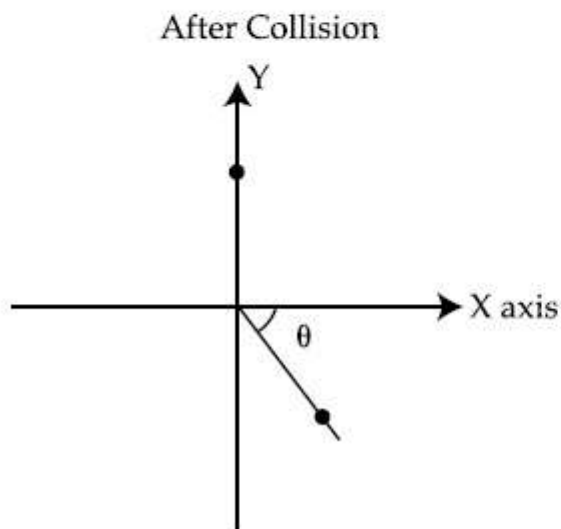Text Areas : PlainText
Possible Answers :
100

Question Number : 25 Question Id : 864351115 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A ball of mass 10 kg moving with a velocity $10\sqrt{3}$ m s^{-1} along X-axis, hits another ball of mass 20 kg which is at rest. After collision, the first ball comes to rest and the second one disintegrates into two equal pieces. One of the pieces starts moving along Y-axis at a speed of 10 m/s. The second piece starts moving at a speed of 20 m/s at an angle θ (degree) with respect to the X-axis.

The configuration of pieces after collision is shown in the figure.

The value of θ to the nearest integer is _____.

After Collision

Response Type : Numeric
Evaluation Required For SA : Yes
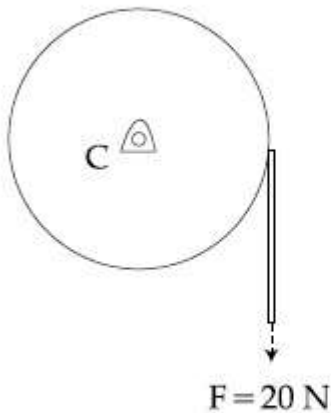Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

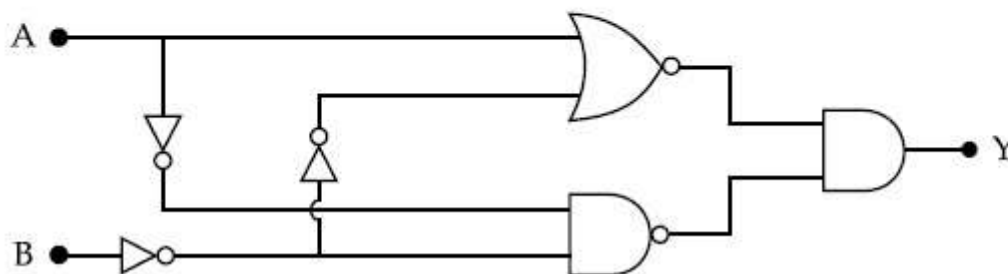Question Number : 26 Question Id : 864351116 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Consider a 20 kg uniform circular disk of radius 0.2 m. It is pin supported at its center and is at rest initially. The disk is acted upon by a constant force F = 20 N through a massless string wrapped around its periphery as shown in the figure.

F = 20 N

Suppose the disk makes n number of revolutions to attain an angular speed of 50 rad s^{-1}. The value of n, to the nearest integer, is _____.

[Given : In one complete revolution, the disk rotates by 6.28 rad]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 27 Question Id : 864351117 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

In the logic circuit shown in the figure, if input A and B are 0 to 1 respectively, the output at Y would be 'x'.

The value of x is _____.

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

Question Number : 28 Question Id : 864351118 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

In the figure given, the electric current flowing through the 5 kΩ resistor is 'x' mA.

The value of x to the nearest integer is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes
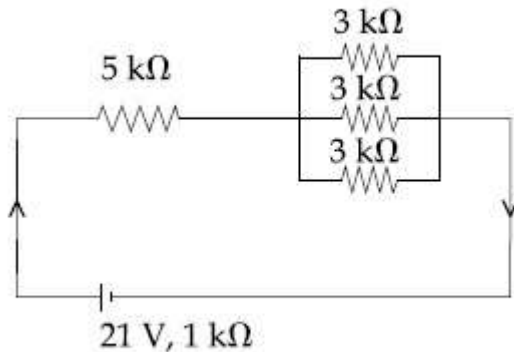
Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 29 Question Id : 864351119 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A fringe width of 6 mm was produced for two slits separated by 1 mm apart. The screen is placed 10 m away. The wavelength of light used is 'x' nm.

The value of 'x' to the nearest integer is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 30 Question Id : 864351120 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The resistance $R = \dfrac{V}{I}$, where $V = (50 \pm 2)V$ and $I = (20 \pm 0.2)A$. The percentage error in R is 'x' %.

The value of 'x' to the nearest integer is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Chemistry Section A

Question Number : 31 Question Id : 864351121 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

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

Assertion A : The H−O−H bond angle in water molecule is 104.5°.

Reason R : The lone pair - lone pair repulsion of electrons is higher than the bond pair - bond pair repulsion.

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

Options :

864351361.   Both **A** and **R** are true, and **R** is the correct explanation of **A**

864351362. Both **A** and **R** are true, but **R** is not the correct explanation of **A**

864351363. **A** is true but **R** is false

864351364. **A** is false but **R** is true

Question Number : 32 Question Id : 864351122 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match List - I with List - II :

List - I		List - II	
Industrial process		Application	
(a)	Haber's process	(i)	HNO_3 synthesis
(b)	Ostwald's process	(ii)	Aluminium extraction
(c)	Contact process	(iii)	NH_3 synthesis
(d)	Hall-Heroult process	(iv)	H_2SO_4 synthesis

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

Options :

864351365. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

864351366. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

864351367. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

864351368. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

Question Number : 33 Question Id : 864351123 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A group 15 element, which is a metal and forms a hydride with strongest reducing power among group 15 hydrides. The element is :

Options :

864351369. Bi

864351370. P

864351371. As

864351372. Sb

Question Number : 34 Question Id : 864351124 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The process that involves the removal of sulphur from the ores is :

Options :

864351373. Refining

864351374. Roasting

864351375. Smelting

864351376. Leaching

Question Number : 35 Question Id : 864351125 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Given below are two statements :

Statement I : H_2O_2 can act as both oxidising and reducing agent in basic medium.

Statement II :   In the hydrogen economy, the energy is transmitted in the form of dihydrogen.

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

Options :

864351377. Both statement I and statement II are true

864351378. Both statement I and statement II are false

864351379. Statement I is true but statement II is false

864351380. Statement I is false but statement II is true

Question Number : 36 Question Id : 864351126 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Given below are two statements :

Statement I : Both $CaCl_2 \cdot 6H_2O$ and $MgCl_2 \cdot 8H_2O$ undergo dehydration on heating.

Statement II : BeO is amphoteric whereas the oxides of other elements in the same group are acidic.

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

Options :

864351381. Both statement I and statement II are true

864351382. Both statement I and statement II are false

864351383. Statement I is true but statement II is false

864351384. Statement I is false but statement II is true

Question Number : 37 Question Id : 864351127 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match List - I with List - II :

	List - I		List - II
	Name of oxo acid		Oxidation state of 'P'
(a)	Hypophosphorous acid	(i)	+5
(b)	Orthophosphoric acid	(ii)	+4
(c)	Hypophosphoric acid	(iii)	+3
(d)	Orthophosphorous acid	(iv)	+2
		(v)	+1

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

Options :

864351385. (a)-(v), (b)-(iv), (c)-(ii), (d)-(iii)

864351386. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

864351387. (a)-(iv), (b)-(v), (c)-(ii), (d)-(iii)

864351388. (a)-(v), (b)-(i), (c)-(ii), (d)-(iii)

Question Number : 38 Question Id : 864351128 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

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

Assertion A :   Size of Bk^{3+} ion is less than Np^{3+} ion.

Reason R :   The above is a consequence of the lanthanoid contraction.

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

Options :

864351389. Both **A** and **R** are true and **R** is the correct explanation of **A**

864351390. Both **A** and **R** are true but **R** is not the correct explanation of **A**

864351391. **A** is true but **R** is false

864351392. **A** is false but **R** is true

Question Number : 39 Question Id : 864351129 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Given below are two statements :

Statement I :   The E° value for Ce^{4+}/Ce^{3+} is $+1.74$ V.

Statement II :   Ce is more stable in Ce^{4+} state than Ce^{3+} state.

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

Options :

864351393. Both statement I and statement II are correct

864351394.   Both statement I and statement II are incorrect

864351395.   Statement I is correct but statement II is incorrect

864351396.   Statement I is incorrect but statement II is correct

Question Number : 40 Question Id : 864351130 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The type of pollution that gets increased during the day time and in the presence of O_3 is :

Options :

864351397.   Reducing smog

864351398.   Oxidising smog

864351399.   Acid rain

864351400.   Global warming

Question Number : 41 Question Id : 864351131 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In chromotography technique, the purification of compound is independent of :

Options :

864351401.   Solubility of the compound

864351402.   Mobility or flow of solvent system
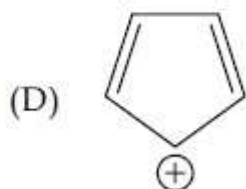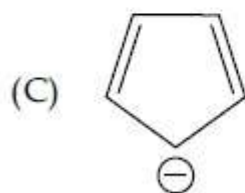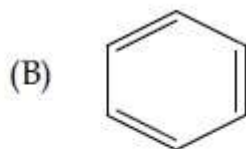
864351403.   Length of the column or TLC plate

864351404.   Physical state of the pure compound

Question Number : 42 Question Id : 864351132 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Among the following, the aromatic compounds are :

(A) =CH₂

(B)

(C)

(D)

Choose the **correct** answer from the following options :

Options :

864351405. (A) and (B) only

864351406. (A), (B) and (C) only

864351407. (B), (C) and (D) only

864351408. (B) and (C) only

Question Number : 43 Question Id : 864351133 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following is Lindlar catalyst ?
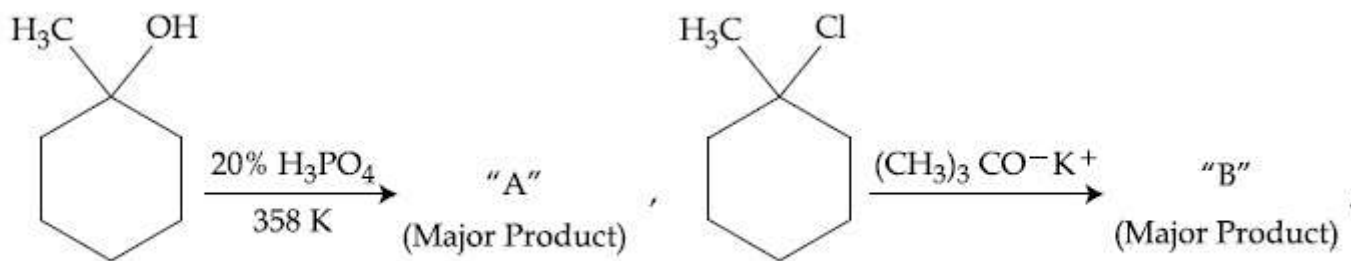
Options :

864351409. Partially deactivated palladised charcoal

864351410. Sodium and Liquid NH_3
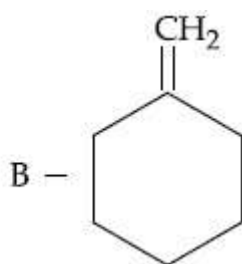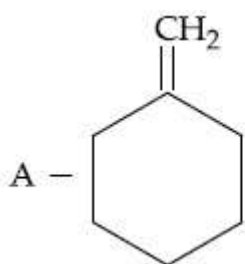
864351411. Cold dilute solution of $KMnO_4$

864351412. Zinc chloride and HCl

Question Number : 44 Question Id : 864351134 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
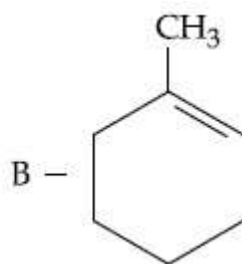
Correct Marks : 4 Wrong Marks : 1

The products "A" and "B" formed in above reactions are :

Options :

864351413.

864351414.

864351415.

864351416.

Question Number : 45 Question Id : 864351135 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

i) DIBAL-H, Toluene, −78°C
ii) H_3O^+

"P"
(Major Product)

The product "P" in the above reaction is :

Options :

864351417.

864351418.

864351419.

864351420.
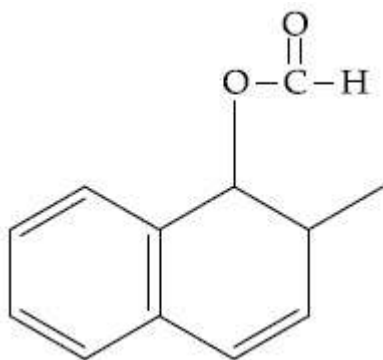
Question Number : 46 Question Id : 864351136 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No
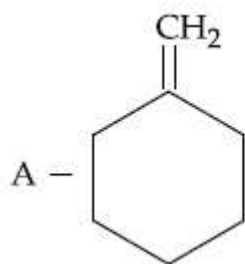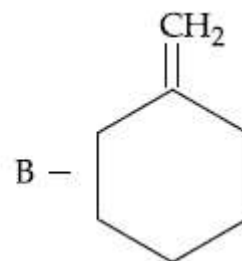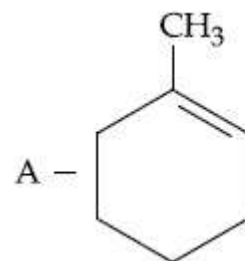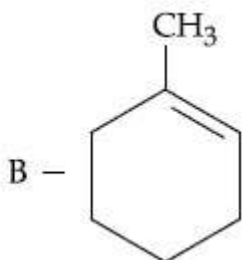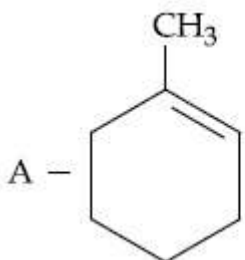**Correct Marks : 4 Wrong Marks : 1**

Assertion A : Enol form of acetone [CH₃COCH₃] exists in < 0.1% quantity. However, the enol form of acetyl acetone [CH₃COCH₂OCCH₃] exists in approximately 15% quantity.

Reason R : Enol form of acetyl acetone is stabilized by intramolecular hydrogen bonding, which is not possible in enol form of acetone.

Choose the **correct statement :**

Options :

864351421. Both **A** and **R** are true and **R** is the correct explanation of **A**

864351422. Both **A** and **R** are true but **R** is not the correct explanation of **A**

864351423. **A** is true but **R** is false

864351424. **A** is false but **R** is true

Question Number : 47 Question Id : 864351137 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
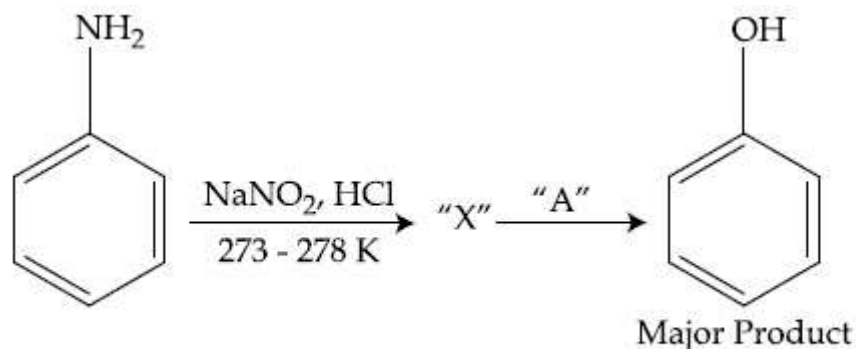
In the above chemical reaction, intermediate "X" and reagent/condition "A" are :

Options :

X - ; A - H₂O/NaOH

864351425.

864351426.

X - [benzene ring with $N_2^+Cl^-$ group] ; A - H_2O/Δ

864351427.

X - [benzene ring with $N_2^+Cl^-$ group] ; A - $H_2O/NaOH$

864351428.

X - [benzene ring with NO_2 group] ; A - H_2O/Δ
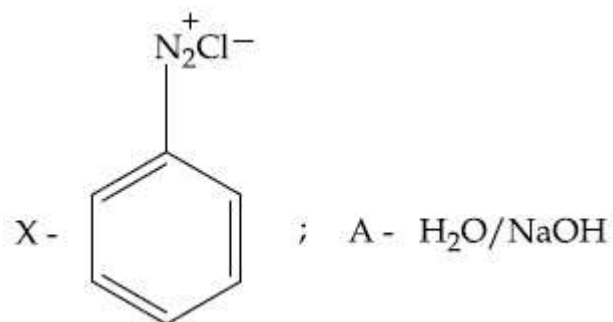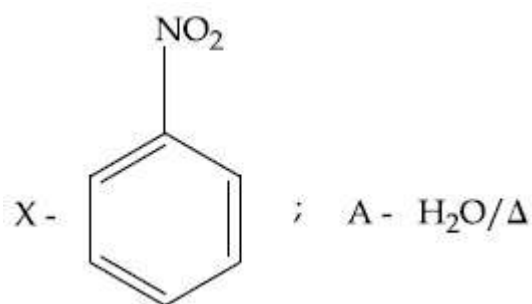
Question Number : 48 Question Id : 864351138 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following reaction DOES NOT involve Hoffmann bromamide degradation ?

Options :

864351429.

[benzene ring with $CH_2-\overset{O}{\overset{\|}{C}}-CH_3$]

i) Br_2, $NaOH/H^+$
ii) NH_3/Δ
iii) $LiAlH_4/H_2O$

→ [benzene ring with CH_2-NH_2]
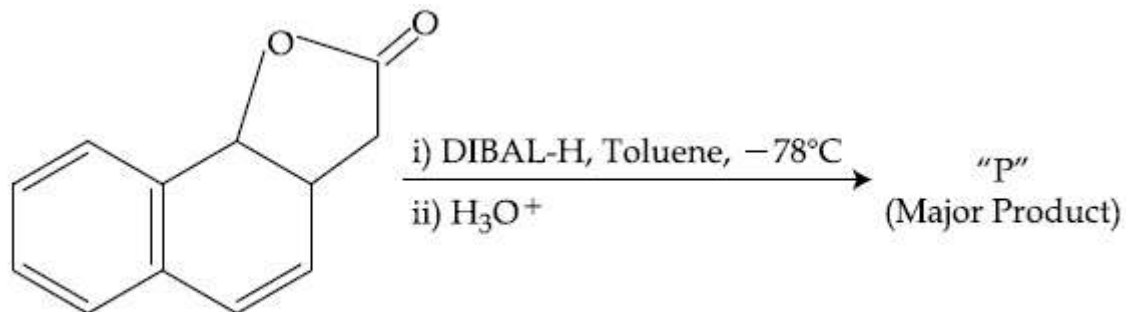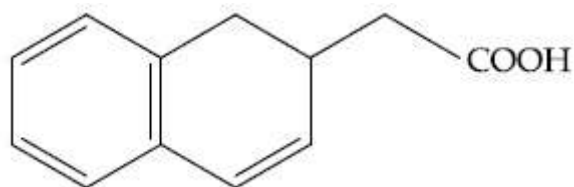
864351430.

864351431.
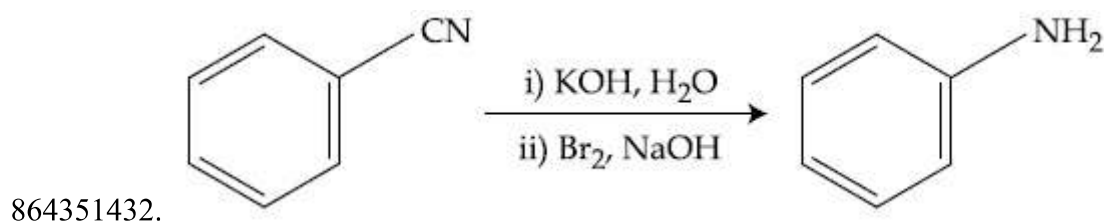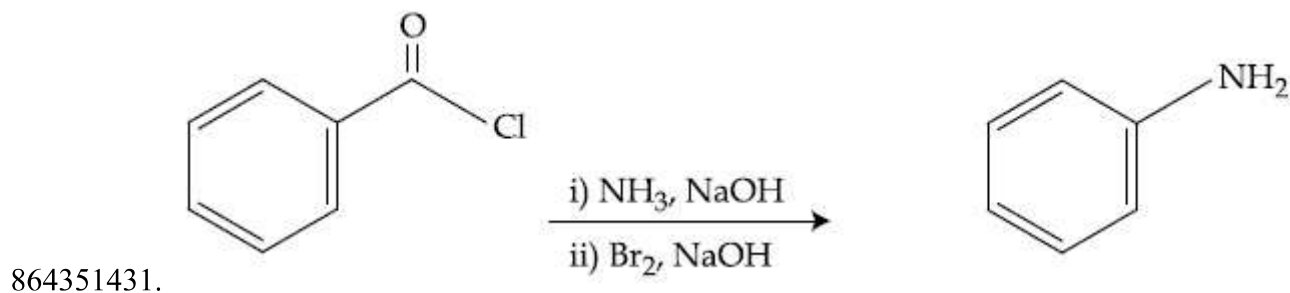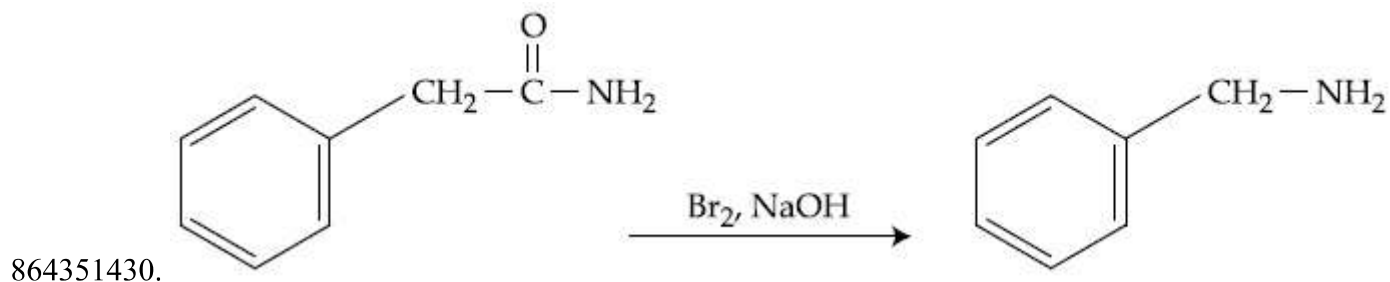
864351432.

Question Number : 49 Question Id : 864351139 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
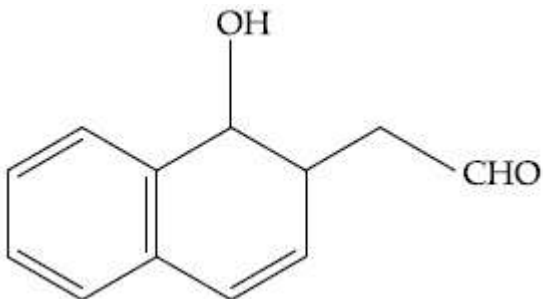
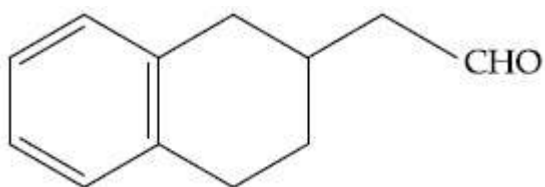**Correct Marks : 4 Wrong Marks : 1**

The functions of antihistamine are :

Options :

864351433. Antiallergic and Analgesic

864351434. Analgesic and antacid

864351435. Antacid and antiallergic

864351436. Antiallergic and antidepressant

Question Number : 50 Question Id : 864351140 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which among the following pairs of Vitamins is stored in our body relatively for longer duration ?

Options :

864351437. Thiamine and Ascorbic acid

864351438. Vitamin A and Vitamin D

864351439. Thiamine and Vitamin A

864351440. Ascorbic acid and Vitamin D

Chemistry Section B

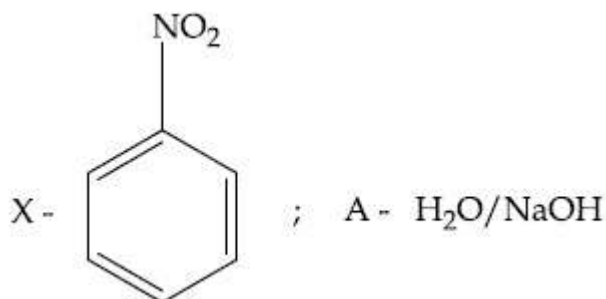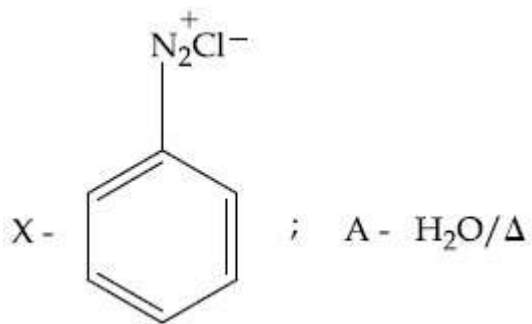|	
Section Id :	86435110
Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	86435110
Question Shuffling Allowed :	Yes

Question Number : 51 Question Id : 864351141 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A 6.50 molal solution of KOH (aq.) has a density of $1.89 \, g \, cm^{-3}$. The molarity of the solution is _____ $mol \, dm^{-3}$. (Round off to the Nearest Integer).

[Atomic masses : K : 39.0 u; O : 16.0 u; H : 1.0 u]

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

Question Number : 52 Question Id : 864351142 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A certain element crystallises in a bcc lattice of unit cell edge length 27Å. If the same element under the same conditions crystallises in the fcc lattice, the edge length of the unit cell in Å will be _____. (Round off to the Nearest Integer).

[Assume each lattice point has a single atom]

[Assume $\sqrt{3} = 1.73$, $\sqrt{2} = 1.41$]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

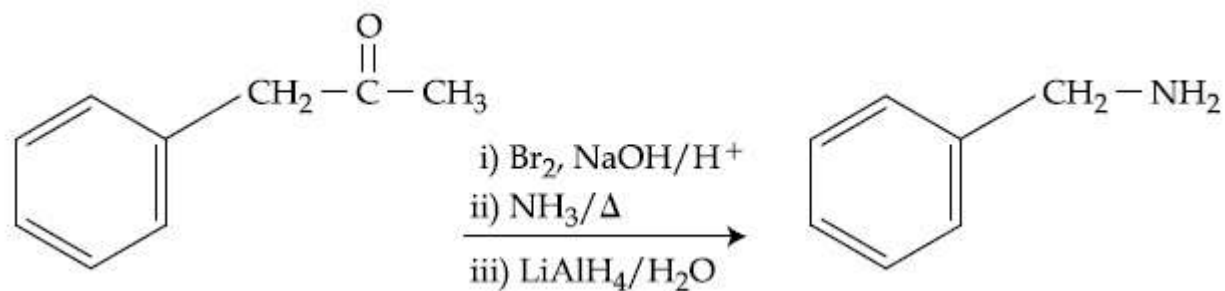**Question Number : 53 Question Id : 864351143 Question Type : SA**

Correct Marks : 4 Wrong Marks : 0

When light of wavelength 248 nm falls on a metal of threshold energy 3.0 eV, the de-Broglie wavelength of emitted electrons is _____ Å. (Round off to the Nearest Integer).

[Use : $\sqrt{3} = 1.73$, h$=6.63 \times 10^{-34}$ Js

$m_e = 9.1 \times 10^{-31}$ kg ; c$=3.0 \times 10^8$ ms^{-1} ; 1eV$=1.6 \times 10^{-19}$J]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 54 Question Id : 864351144 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

For the reaction A(g) $\rightleftharpoons$ B(g) at 495 K, $\Delta_r G^\circ = -9.478$ kJ mol^{-1}.

If we start the reaction in a closed container at 495 K with 22 millimoles of A, the amount of B in the equilibrium mixture is _____ millimoles. (Round off to the Nearest Integer).

[R$=8.314$ J mol^{-1} K^{-1} ; ln 10$=2.303$]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Question Number : 55 Question Id : 864351145 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

AB_2 is 10% dissociated in water to A^{2+} and B^-. The boiling point of a 10.0 molal aqueous solution of AB_2 is _____ °C. (Round off to the Nearest Integer).

[Given : Molal elevation constant of water $K_b = 0.5$ K kg mol^{-1} boiling point of pure water $= 100$°C]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 56 Question Id : 864351146 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Two salts A_2X and MX have the same value of solubility product of 4.0×10^{-12}. The ratio of their molar solubilities i.e. $\dfrac{S(A_2X)}{S(MX)} =$ _____. (Round off to the Nearest Integer).

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 57 Question Id : 864351147 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

$2\,MnO_4^- + b\,C_2O_4^{2-} + c\,H^+ \rightarrow x\,Mn^{2+} + y\,CO_2 + z\,H_2O$
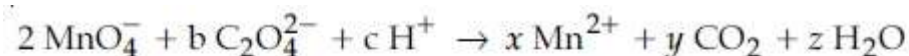
If the above equation is balanced with integer coefficients, the value of c is _____. (Round off to the Nearest Integer).

Response Type : Numeric

Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 58 Question Id : 864351148 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The decomposition of formic acid on gold surface follows first order kinetics. If the rate constant at 300 K is 1.0×10^{-3} s^{-1} and the activation energy $E_a = 11.488$ kJ mol^{-1}, the rate constant at 200 K is _____ $\times 10^{-5}$ s^{-1}. (Round off to the Nearest Integer).
(Given : R = 8.314 J mol^{-1} K^{-1})

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 59 Question Id : 864351149 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The equivalents of ethylene diamine required to replace the neutral ligands from the coordination sphere of the trans-complex of $CoCl_3 \cdot 4NH_3$ is _____. (Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 60 Question Id : 864351150 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Complete combustion of 750 g of an organic compound provides 420 g of CO_2 and 210 g of H_2O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and _____ respectively. (Round off to the Nearest Integer).

Response Type : Numeric

Mathematics Section A

Section Id :   86435111

Section Number :   5

Section type :   Online

Mandatory or Optional :   Mandatory

Number of Questions :   20

Number of Questions to be attempted :   20

Section Marks :   80

Mark As Answered Required? :   Yes

Sub-Section Number :   1

Sub-Section Id :   86435111

Question Shuffling Allowed :   Yes

Question Number : 61 Question Id : 864351151 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix}$, $i = \sqrt{-1}$. Then, the system of linear equations $A^8 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix}$ has :

Options :

864351451. No solution

864351452. A unique solution

864351453. Infinitely many solutions

864351454. Exactly two solutions

Question Number : 62 Question Id : 864351152 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let the functions $f : \mathbf{R} \to \mathbf{R}$ and $g : \mathbf{R} \to \mathbf{R}$ be defined as :

$$f(x) = \begin{cases} x + 2, & x < 0 \\ x^2, & x \geqslant 0 \end{cases} \quad \text{and} \quad g(x) = \begin{cases} x^3, & x < 1 \\ 3x - 2, & x \geqslant 1 \end{cases}$$

Then, the number of points in $\mathbf{R}$ where $(fog)(x)$ is NOT differentiable is equal to :

Options :

864351455. 0

864351456. 1

864351457. 2

864351458. 3

Question Number : 63 Question Id : 864351153 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let P be a plane $lx + my + nz = 0$ containing the line, $\dfrac{1 - x}{1} = \dfrac{y + 4}{2} = \dfrac{z + 2}{3}$. If plane P divides the line segment AB joining points $A(-3, -6, 1)$ and $B(2, 4, -3)$ in ratio $k : 1$ then the value of k is equal to :

Options :

864351459. 2

864351460. 1.5

864351461. 3

864351462. 4

Question Number : 64 Question Id : 864351154 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If for a > 0, the feet of perpendiculars from the points A(a, −2a, 3) and B(0, 4, 5) on the plane $lx + my + nz = 0$ are points C(0, −a, −1) and D respectively, then the length of line segment CD is equal to :

Options :

864351463. $\sqrt{31}$

864351464. $\sqrt{66}$

864351465. $\sqrt{41}$

864351466. $\sqrt{55}$

Question Number : 65 Question Id : 864351155 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Consider three observations a, b and c such that $b = a + c$. If the standard deviation of a + 2, b + 2, c + 2 is d, then which of the following is true ?

Options :

864351467. $b^2 = 3(a^2 + c^2) - 9d^2$

864351468. $b^2 = 3(a^2 + c^2) + 9d^2$

864351469. $b^2 = a^2 + c^2 + 3d^2$

864351470. $b^2 = 3(a^2 + c^2 + d^2)$

Question Number : 66 Question Id : 864351156 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let the position vectors of two points P and Q be $3\hat{i} - \hat{j} + 2\hat{k}$ and $\hat{i} + 2\hat{j} - 4\hat{k}$, respectively. Let R and S be two points such that the direction ratios of lines PR and QS are $(4, -1, 2)$ and $(-2, 1, -2)$, respectively. Let lines PR and QS intersect at T. If the vector $\overrightarrow{TA}$ is perpendicular to both $\overrightarrow{PR}$ and $\overrightarrow{QS}$ and the length of vector $\overrightarrow{TA}$ is $\sqrt{5}$ units, then the modulus of a position vector of A is :

Options :

864351471. $\sqrt{5}$

864351472. $\sqrt{171}$

864351473. $\sqrt{227}$

864351474. $\sqrt{482}$

Question Number : 67 Question Id : 864351157 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let a vector $\alpha\hat{i} + \beta\hat{j}$ be obtained by rotating the vector $\sqrt{3}\,\hat{i} + \hat{j}$ by an angle $45°$ about the origin in counterclockwise direction in the first quadrant. Then the area of triangle having vertices (α, β), $(0, \beta)$ and $(0, 0)$ is equal to :

Options :

864351475. $\dfrac{1}{2}$

864351476. 1

864351477. $2\sqrt{2}$

864351478. $\dfrac{1}{\sqrt{2}}$

Question Number : 68 Question Id : 864351158 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The number of roots of the equation,

$$(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$$

in the interval $[0, \pi]$ is equal to :

Options :

864351479. 2

864351480. 3

864351481. 4

864351482. 8

Question Number : 69 Question Id : 864351159 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A pack of cards has one card missing. Two cards are drawn randomly and are found to be spades. The probability that the missing card is not a spade, is :

Options :

864351483. $\dfrac{22}{425}$

864351484. $\dfrac{52}{867}$

864351485. $\dfrac{39}{50}$

864351486. $\dfrac{3}{4}$

Question Number : 70 Question Id : 864351160 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The range of a∈R for which the function

$$f(x) = (4a - 3)(x + \log_e 5) + 2(a - 7) \cot\left(\frac{x}{2}\right) \sin^2\left(\frac{x}{2}\right), \quad x \neq 2n\pi, n \in N \text{ has critical points,}$$

is :

Options :

864351487. $[1, \infty)$

864351488. $(-\infty, -1]$

864351489. $\left[-\frac{4}{3}, 2\right]$

864351490. $(-3, 1)$

Question Number : 71 Question Id : 864351161 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If n is the number of irrational terms in the expansion of $\left(3^{\frac{1}{4}} + 5^{\frac{1}{8}}\right)^{60}$, then (n − 1) is divisible

by :

Options :

864351491. 30

864351492. 8

864351493. 26

864351494. 7

Question Number : 72 Question Id : 864351162 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let $[x]$ denote greatest integer less than or equal to x. If for $n \in N$,

$$(1 - x + x^3)^n = \sum_{j=0}^{3n} a_j x^j, \text{ then}$$

$$\sum_{j=0}^{\left[\frac{3n}{2}\right]} a_{2j} + 4 \sum_{j=0}^{\left[\frac{3n-1}{2}\right]} a_{2j+1} \text{ is equal to :}$$

Options :

864351495. 2^{n-1}

864351496. n

864351497. 2

864351498. 1

Question Number : 73 Question Id : 864351163 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following Boolean expression is a tautology ?

Options :

864351499. $(p \wedge q) \vee (p \vee q)$

864351500. $(p \wedge q) \vee (p \rightarrow q)$

864351501. $(p \wedge q) \wedge (p \rightarrow q)$

864351502. $(p \wedge q) \rightarrow (p \rightarrow q)$

Question Number : 74 Question Id : 864351164 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let $S_k = \sum_{r=1}^{k} \tan^{-1}\left(\dfrac{6^r}{2^{2r+1} + 3^{2r+1}}\right)$. Then $\lim\limits_{k \to \infty} S_k$ is equal to :

Options :

864351503. $\dfrac{\pi}{2}$

864351504. $\cot^{-1}\left(\dfrac{3}{2}\right)$

864351505. $\tan^{-1}\left(\dfrac{3}{2}\right)$

864351506. $\tan^{-1}(3)$

Question Number : 75 Question Id : 864351165 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The number of elements in the set $\{x \epsilon R : (|x| - 3)\,|x + 4| = 6\}$ is equal to :

Options :

864351507. 1

864351508. 2

864351509. 3

864351510. 4

Question Number : 76 Question Id : 864351166 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If for $x \epsilon \left(0, \dfrac{\pi}{2}\right)$, $\log_{10}\sin x + \log_{10}\cos x = -1$ and $\log_{10}(\sin x + \cos x) = \dfrac{1}{2}(\log_{10} n - 1)$, $n > 0$,

then the value of n is equal to :

Options :

864351511. 9

864351512. 12

864351513. 16

864351514. 20

Question Number : 77 Question Id : 864351167 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If $y = y(x)$ is the solution of the differential equation, $\dfrac{dy}{dx} + 2y\tan x = \sin x$, $y\left(\dfrac{\pi}{3}\right) = 0$, then

the maximum value of the function $y(x)$ over **R** is equal to :

Options :

864351515. 8

864351516. $\dfrac{1}{2}$

864351517. $-\dfrac{15}{4}$

864351518. $\dfrac{1}{8}$

Question Number : 78 Question Id : 864351168 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The locus of the midpoints of the chord of the circle, $x^2 + y^2 = 25$ which is tangent to the

hyperbola, $\dfrac{x^2}{9} - \dfrac{y^2}{16} = 1$ is :

Options :

864351519. $(x^2 + y^2)^2 - 9x^2 + 144y^2 = 0$

864351520. $(x^2 + y^2)^2 - 9x^2 - 16y^2 = 0$

864351521. $(x^2 + y^2)^2 - 9x^2 + 16y^2 = 0$

864351522. $(x^2 + y^2)^2 - 16x^2 + 9y^2 = 0$

Question Number : 79 Question Id : 864351169 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If the three normals drawn to the parabola, $y^2 = 2x$ pass through the point $(a, 0)$ $a \neq 0$, then 'a' must be greater than :

Options :

864351523. 1

864351524. -1

864351525. $\dfrac{1}{2}$

864351526. $-\dfrac{1}{2}$

Question Number : 80 Question Id : 864351170 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let a complex number z, $|z| \neq 1$, satisfy $\log_{\frac{1}{\sqrt{2}}} \left(\dfrac{|z| + 11}{(|z| - 1)^2} \right) \leq 2$. Then, the largest value of

$|z|$ is equal to _____.

Options :

864351527. 5

864351528. 6

864351529. 7

864351530. 8

Mathematics Section B

Section Id : 86435112

Section Number : 6

Section type : Online

Mandatory or Optional : Mandatory

Number of Questions : 10

Number of Questions to be attempted : 5

Section Marks : 20

Mark As Answered Required? : Yes

Sub-Section Number : 1

Sub-Section Id : 86435112

Question Shuffling Allowed : Yes

Question Number : 81 Question Id : 864351171 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let z and w be two complex numbers such that $w = z\bar{z} - 2z + 2$, $\left|\dfrac{z + i}{z - 3i}\right| = 1$ and Re (w)

has minimum value. Then, the minimum value of $n \in N$ for which w^n is real, is equal to

_____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 82 Question Id : 864351172 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $f : R \to R$ be a continuous function such that $f(x) + f(x+1) = 2$, for all $x \in R$. If $I_1 = \int\limits_0^8 f(x)dx$

and $I_2 = \int\limits_{-1}^3 f(x)dx$, then the value of $I_1 + 2I_2$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 83 Question Id : 864351173 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the normal to the curve $y(x) = \int\limits_{0}^{x}(2t^2 - 15t + 10)\,dt$ at a point (a, b) is parallel to the line

$x + 3y = -5$, a > 1, then the value of $|a + 6b|$ is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 84 Question Id : 864351174 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If $\lim\limits_{x \to 0} \dfrac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$, then a + b + c is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 85 Question Id : 864351175 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Consider an arithmetic series and a geometric series having four initial terms from the set
{11, 8, 21, 16, 26, 32, 4}. If the last terms of these series are the maximum possible four digit
numbers, then the number of common terms in these two series is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

Question Number : 86 Question Id : 864351176 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $P = \begin{bmatrix} -30 & 20 & 56 \\ 90 & 140 & 112 \\ 120 & 60 & 14 \end{bmatrix}$ and $A = \begin{bmatrix} 2 & 7 & \omega^2 \\ -1 & -\omega & 1 \\ 0 & -\omega & -\omega+1 \end{bmatrix}$ where $\omega = \dfrac{-1 + i\sqrt{3}}{2}$, and I_3 be the

identity matrix of order 3. If the determinant of the matrix $(P^{-1}AP - I_3)^2$ is $\alpha\omega^2$, then the

value of α is equal to _____.

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

100

Question Number : 87 Question Id : 864351177 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $f : (0, 2) \to \mathbf{R}$ be defined as $f(x) = \log_2\left(1 + \tan\left(\dfrac{\pi x}{4}\right)\right)$.

Then, $\displaystyle\lim_{n\to\infty} \dfrac{2}{n}\left(f\left(\dfrac{1}{n}\right) + f\left(\dfrac{2}{n}\right) + \ldots + f(1)\right)$ is equal to _____.

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

100

Question Number : 88 Question Id : 864351178 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The total number of 3×3 matrices A having entries from the set $\{0, 1, 2, 3\}$ such that the sum
of all the diagonal entries of AA^T is 9, is equal to _____.

Response Type : Numeric

Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 89 Question Id : 864351179 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let ABCD be a square of side of unit length. Let a circle C_1 centered at A with unit radius is drawn. Another circle C_2 which touches C_1 and the lines AD and AB are tangent to it, is also drawn. Let a tangent line from the point C to the circle C_2 meet the side AB at E. If the length of EB is $\alpha + \sqrt{3}\,\beta$, 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
Possible Answers :
100

Question Number : 90 Question Id : 864351180 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let the curve $y = y(x)$ be the solution of the differential equation, $\dfrac{dy}{dx} = 2(x + 1)$. If the numerical value of area bounded by the curve $y = y(x)$ and x-axis is $\dfrac{4\sqrt{8}}{3}$, then the value of $y(1)$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100