Question Paper Name: B TECH EMA 17th March 2021 Shift 1
Subject Name: B TECH EMA
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Number of Questions: 90
Total Marks: 300
Display Marks: Yes

B TECH EMA
Group Number: 1
Group Id: 86435131
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: 864351181
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: 864351181
Question Shuffling Allowed: Yes

Question Number: 1 Question Id: 8643512701 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No Correct Marks: 4 Wrong Marks: 1
A car accelerates from rest at a constant rate \(\alpha\) for some time after which it decelerates at a constant rate \(\beta\) to come to rest. If the total time elapsed is \(t\) seconds, the total distance travelled is:

Options:

\[
\frac{2 \alpha \beta}{(\alpha + \beta)} t^2
\]
8643518101.

\[
\frac{\alpha \beta}{2(\alpha + \beta)} t^2
\]
8643518102.

\[
\frac{4 \alpha \beta}{(\alpha + \beta)} t^2
\]
8643518103.

\[
\frac{\alpha \beta}{4 (\alpha + \beta)} t^2
\]
8643518104.
A modern grand prix racing car of mass \( m \) is travelling on a flat track in a circular arc of radius \( R \) with a speed \( v \). If the coefficient of static friction between the tyres and the track is \( \mu_s \), then the magnitude of negative lift \( F_L \) acting downwards on the car is: (Assume forces on the four tyres are identical and \( g = \) acceleration due to gravity)

\[
m\left( \frac{v^2}{\mu_s R} + g \right)
\]

8643518105.

\[
m\left( g - \frac{v^2}{\mu_s R} \right)
\]

8643518106.

\[
m\left( \frac{v^2}{\mu_s R} - g \right)
\]

8643518107.

\[
- m\left( g + \frac{v^2}{\mu_s R} \right)
\]

8643518108.
A Carnot’s engine working between 400 K and 800 K has a work output of 1200 J per cycle. The amount of heat energy supplied to the engine from the source in each cycle is:

Options:

8643518109. 2400 J
Question Number : 3 Question Id : 8643512703 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The temperature of a substance is increased from 400 K to 800 K. How much work (in Joules) is done by the substance in one cycle? If the temperature difference between the hot and cold limits is 1200 K per cycle, then what is the heat energy that is absorbed in one cycle?

Options :

8643518109. 2400 J
8643518110. 1600 J
8643518111. 3200 J
8643518112. 1800 J

Question Number : 4 Question Id : 8643512704 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A solenoid of 1000 turns per metre has a core with relative permeability 500. Insulated windings of the solenoid carry an electric current of 5 A. The magnetic flux density produced by the solenoid is: (permeability of free space = \(4\pi \times 10^{-7}\) H/m)

Options :

8643518113. \(10^{-4}\pi\) T
8643518114. \(2 \times 10^{-3}\pi\) T
8643518115. \(\frac{\pi}{5}\) T
8643518116. $\pi T$

**Question Number : 4**  
**Question Id : 8643512704**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

Options:

8643518113. $10^{-4}\pi T$

8643518114. $2 \times 10^{-3}\pi T$

8643518115. $\frac{\pi}{5} T$

8643518116. $\pi T$

**Question Number : 5**  
**Question Id : 8643512705**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

A current of 10 A exists in a wire of cross-sectional area of 5 mm$^2$ with a drift velocity of $2 \times 10^{-3}$ ms$^{-1}$. The number of free electrons in each cubic meter of the wire is ________.

Options:

8643518117. $2 \times 10^6$

8643518118. $1 \times 10^{23}$

8643518119. $625 \times 10^{25}$

8643518120. $2 \times 10^{25}$
A mass M hangs on a massless rod of length l which rotates at a constant angular frequency. The mass M moves with steady speed in a circular path of constant radius. Assume that the system is in steady circular motion with constant angular velocity ω. The angular momentum of M about point A is \( L_A \) which lies in the positive z direction and the angular momentum of M about point B is \( L_B \). The correct statement for this system is:

\( L_A \) and \( L_B \) are both constant in magnitude and direction.
LA is constant, both in magnitude and direction

LB is constant, both in magnitude and direction

LB is constant in direction with varying magnitude

Question Number: 6  Question Id: 8643512706  Question Type: MCQ  Option Shuffling: Yes  Is Question Mandatory: No
Correct Marks: 4  Wrong Marks: 1

Options:
8643518121. LA ≠ LB ≠ constant (massless) or their moment of inertia is constant.
8643518122. LA ≠ LB ≠ constant (angular frequency) but their moment of inertia is constant.
8643518123. LA ≠ LB ≠ constant (angular momentum) both but LA ≠ LB ≠ constant (angular frequency)
8643518124. LA ≠ LB ≠ constant (angular momentum) both but LA ≠ constant (angular frequency)

8643518125. LA = LB = constant (massless) or their moment of inertia is constant.
8643518126. LA = LB = constant (angular frequency) but their moment of inertia is constant.
8643518127. LA = LB = constant (angular momentum) both but LA = LB = constant (angular frequency)
8643518128. LA = constant (massless) or their moment of inertia is constant but LB ≠ constant (angular frequency)
8643518129. LA = constant (massless) or their moment of inertia is constant but LB ≠ constant (angular momentum)
An AC current is given by \( I = I_1 \sin \omega t + I_2 \cos \omega t \). A hot wire ammeter will give a reading:

Options:

\[
\frac{I_1 + I_2}{\sqrt{2}}
\]

8643518125.

\[
\frac{I_1 + I_2}{2\sqrt{2}}
\]

8643518126.

\[
\frac{\sqrt{I_1^2 + I_2^2}}{2}
\]

8643518127.

\[
\frac{\sqrt{I_1^2 - I_2^2}}{2}
\]

8643518128.
A polyatomic ideal gas has 24 vibrational modes. What is the value of $\gamma$?

Options:

8643518129. 10.3
8643518130. 1.30
8643518131. 1.03
8643518132. 1.37

When two soap bubbles of radii $a$ and $b$ ($b > a$) coalesce, the radius of curvature of common surface is:

Options:

8643518133. $\frac{ab}{b-a}$
\[
\frac{ab}{a + b}
\]

8643518134.

\[
\frac{b-a}{ab}
\]

8643518135.

\[
\frac{a+b}{ab}
\]

8643518136.

Question Number : 9 Question Id : 8643512709 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options:

\[
\frac{ab}{b-a}
\]

8643518133.

\[
\frac{ab}{a+b}
\]

8643518134.

\[
\frac{b-a}{ab}
\]

8643518135.

\[
\frac{a+b}{ab}
\]

8643518136.

Question Number : 10 Question Id : 8643512710 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
A triangular plate is shown. A force \( \vec{F} = 4 \hat{i} - 3 \hat{j} \) is applied at point P. The torque at point P with respect to point ‘O’ and ‘Q’ are:

![Diagram of a triangular plate with forces](image)

**Options:**

8643518137. \(-15 - 20\sqrt{3}, 15 - 20\sqrt{3}\)

8643518138. \(15 + 20\sqrt{3}, 15 - 20\sqrt{3}\)

8643518139. \(15 - 20\sqrt{3}, 15 + 20\sqrt{3}\)

8643518140. \(-15 + 20\sqrt{3}, 15 + 20\sqrt{3}\)
Two identical metal wires of thermal conductivities $K_1$ and $K_2$ respectively are connected in series. The effective thermal conductivity of the combination is:

Options:

$$\frac{K_1 K_2}{K_1 + K_2}$$

8643518141.

$$\frac{2K_1 K_2}{K_1 + K_2}$$

8643518142.
Question Number : 11 Question Id : 8643512711 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A boy is rolling a 0.5 kg ball on the frictionless floor with the speed of 20 ms\(^{-1}\). The ball gets deflected by an obstacle on the way. After deflection it moves with 5% of its initial kinetic energy. What is the speed of the ball now?

Options :
8643518145.  1.00 ms\(^{-1}\)
8643518146.  4.47 ms\(^{-1}\)
8643518147. 14.41 ms\(^{-1}\)

8643518148. 19.0 ms\(^{-1}\)

Question Number : 12 Question Id : 8643512712 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Hany 0.5 kg kalariyam kang vartam thirumalay 20 ms\(^{-1}\) adai
vinaan thigir. Thirandu vellam pottavil 20 20 variyar parnam. Thirandu
thiru vakkulavaiyiru 5% pulasu varğ amkam thirandu vakkulavaiy
vandai thiru vakkulavai?

Options :
8643518145. 1.00 ms\(^{-1}\)
8643518146. 4.47 ms\(^{-1}\)
8643518147. 14.41 ms\(^{-1}\)
8643518148. 19.0 ms\(^{-1}\)

Question Number : 13 Question Id : 8643512713 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The thickness at the centre of a plano convex lens is 3 mm and the diameter is 6 cm. If the
speed of light in the material of the lens is 2 \times 10^8\text{ ms}^{-1}. The focal length of the lens is

Options :
8643518149. 30 cm
8643518150. 15 cm
8643518151. 1.5 cm
8643518152. 0.30 cm
Question Number : 13

Question Id : 8643512713

Question Type : MCQ

Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

8643518149. 30 cm
8643518150. 15 cm
8643518151. 1.5 cm
8643518152. 0.30 cm

Question Number : 14

Question Id : 8643512714

Question Type : MCQ

Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which level of the single ionized carbon has the same energy as the ground state energy of hydrogen atom?

Options :

8643518153. 1
8643518154. 4
8643518155. 6
8643518156. 8

Question Number : 14

Question Id : 8643512714

Question Type : MCQ

Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

8643518157. (single ionized level)
Two ideal polyatomic gases at temperatures $T_1$ and $T_2$ are mixed so that there is no loss of energy. If $F_1$ and $F_2$, $m_1$ and $m_2$, $n_1$ and $n_2$ be the degrees of freedom, masses, number of molecules of the first and second gas respectively, the temperature of mixture of these two gases is:

Options:

\[
\frac{n_1 F_1 T_1 + n_2 F_2 T_2}{n_1 + n_2}
\]

8643518157.

\[
\frac{n_1 F_1 T_1 + n_2 F_2 T_2}{F_1 + F_2}
\]

8643518158.

\[
\frac{n_1 F_1 T_1 + n_2 F_2 T_2}{n_1 F_1 + n_2 F_2}
\]

8643518159.

\[
\frac{n_1 T_1 + n_2 T_2}{n_1 + n_2}
\]

8643518160.
For what value of displacement the kinetic energy and potential energy of a simple harmonic oscillation become equal?

Options:

1. \[ x = \pm A \]
2. \[ x = 0 \]
3. \[ x = \pm \frac{A}{\sqrt{2}} \]
4. \[ x = \frac{A}{2} \]
Question Number : 17  Question Id : 8643512717  Question Type : MCQ  Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The output of the given combination gates represents:

Options:
8643518165. AND Gate
8643518166. NOR Gate
8643518167. NAND Gate
8643518168. XOR Gate
An electron of mass \( m \) and a photon have same energy \( E \). The ratio of wavelength of electron to that of photon is: (c being the velocity of light)

Options:

8643518169. \( \frac{E}{2m} \)

8643518170. \( c \left(2mE\right)^{1/2} \)

8643518171. \( \frac{1}{c} \left(\frac{2m}{E}\right)^{1/2} \)

8643518172. \( \frac{1}{c} \left(\frac{E}{2m}\right)^{1/2} \)
Question Number : 19 Question Id : 8643512719 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The vernier scale used for measurement has a positive zero error of 0.2 mm. If while taking a measurement it was noted that '0' on the vernier scale lies between 8.5 cm and 8.6 cm, vernier coincidence is 6, then the correct value of measurement is ________ cm. (least count = 0.01 cm)
Options :
8643518173. 8.58 cm
8643518174. 8.56 cm
8643518175. 8.54 cm
8643518176. 8.36 cm

Question Number : 19 Question Id : 8643512719 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Question Number : 20  Question Id : 8643512720  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No
Correct Marks : 4  Wrong Marks : 1
If an electron is moving in the n\textsuperscript{th} orbit of the hydrogen atom, then its velocity (v\textsubscript{n}) for the n\textsuperscript{th} orbit is given as:

Options :

\begin{align*}
8643518177. & \quad v\textsubscript{n} \propto n^2 \\
8643518178. & \quad v\textsubscript{n} \propto n \\
8643518179. & \quad v\textsubscript{n} \propto \frac{1}{n^2} \\
8643518180. & \quad v\textsubscript{n} \propto \frac{1}{n}
\end{align*}
Physics Section B

Section Id : 864351182
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 : 864351182
Question Shuffling Allowed : Yes

Question Number : 21 Question Id : 8643512721 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

For VHF signal broadcasting, ________ km\(^2\) of maximum service area will be covered by an antenna tower of height 30 m, if the receiving antenna is placed at ground. Let radius of the earth be 6400 km. (Round off to the Nearest Integer) (Take \(\pi\) as 3.14)

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

Question Number : 21 Question Id : 8643512721 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

VHF ഭീമം താഴെപ്പിന്നെത്തിൽ എത്ര കി.മി. നിരക്ക് വരെ നിന്നും 30 മീ. മുകളിലേക്ക് (height) ചെന്ന കോൺവെക്ഷണിൽ വിധിക്കപ്പെടുന്നു. അന്‍‍്തരേയും കേന്ദ്രീകരണം നടക്കുന്നതോടെ അനവധികിരീടിന്റെ മുകളിൽ ഏതാണ് 6400 കി.വി. സേക്ക്.
(സാമ്പത്തിക പ്രവൃത്തിയുകരം മാറ്റം)

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 : 8643512722 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If $2.5 \times 10^{-6}$ N average force is exerted by a light wave on a non - reflecting surface of 30 cm$^2$ area during 40 minutes of time span, the energy flux of light just before it falls on the surface is _________ W/cm$^2$. (Round off to the Nearest Integer)

(Assume complete absorption and normal incidence conditions are there)

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 : 8643512722 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
$2.5 \times 10^{-6}$ N is a force in the problem. The energy flux in the problem is $30 \text{ cm}^2$ and $40 \text{ W/cm}^2$. Find the energy flux in the problem. (The energy flux) __________ W/cm$^2$. (The energy flux in the problem is equal to the energy flux in the problem.)

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: 8643512723  
Question Type: SA  
Correct Marks: 4  
Wrong Marks: 0

Four identical rectangular plates with length, $l = 2$ cm and breadth, $b = \frac{3}{2}$ cm are arranged as shown in figure. The equivalent capacitance between A and C is $\frac{x \varepsilon_0}{d}$. The value of $x$ 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 : 23 Question Id : 8643512723 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The equivalent resistance of series combination of two resistors is ‘s’. When they are connected in parallel, the equivalent resistance is ‘p’. If \( s = np \), then the minimum value for \( n \) is \( \frac{x0}{d} \). (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 : 24 Question Id : 8643512724 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The equivalent resistance of series combination of two resistors is ‘s’. When they are connected in parallel, the equivalent resistance is ‘p’. If \( s = np \), then the minimum value for \( n \) is \( \frac{x0}{d} \). (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 : 24 Question Id : 8643512724 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
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 : 8643512725  
Question Type : SA  
Correct Marks : 4  
Wrong Marks : 0

A parallel plate capacitor whose capacitance C is 14 pF is charged by a battery to a potential difference V = 12 V between its plates. The charging battery is now disconnected and a porcelain plate with k = 7 is inserted between the plates, then the plate would oscillate back and forth between the plates with a constant mechanical energy of ________ pJ.

(Assume no friction)

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 : 8643512725  
Question Type : SA  
Correct Marks : 4  
Wrong Marks : 0

The parallel plate capacitor with capacitance C is 14 pF is charged by a battery to a potential difference V = 12 V between its plates. The battery is now disconnected and a porcelain plate with k = 7 is inserted between the plates, then the plate would oscillate back and forth between the plates with a constant mechanical energy of ________ pJ.

(Assume no friction)

Response Type : Numeric  
Evaluation Required For SA : Yes  
Show Word Count : Yes
The radius in kilometer to which the present radius of earth ($R = 6400$ km) to be compressed so that the escape velocity is increased 10 times is ________.

Question Number : 26
Question Id : 8643512726
Question Type : SA
Correct Marks : 4
Wrong Marks : 0

The angular speed of truck wheel is increased from 900 rpm to 2460 rpm in 26 seconds. The number of revolutions by the truck engine during this time is ________.

(Assuming the acceleration to be uniform).

Question Number : 27
Question Id : 8643512727
Question Type : SA
Correct Marks : 4
Wrong Marks : 0
26. ഒരു കാറ്റിന്റെ വിതരണ സാമഗ്രിയുടെ ശക്തി വേഗത്തിൽ 900 rpm നിയമിച്ചാൽ 2460 rpm വേഗത്തിന്റെ അതിക്രമമാണ്. എങ്കിലും ഈ വിവിധ അവസ്ഥയെ ആശ്രയിക്കാൻ എത്ര സാശ്വാത്തുകാരായോ? (തിയ്യതി പ്രാധാന്യം നൽകാൻ മാറ്റം)

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

Question Number: 28 Question Id: 8643512728 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
Consider two identical springs each of spring constant $k$ and negligible mass compared to the mass $M$ as shown. Fig. 1 shows one of them and Fig. 2 shows their series combination.

The ratios of time period of oscillation of the two SHM is $\frac{T_b}{T_a} = \sqrt{x}$, where value of $x$ 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** : 28  
**Question Id** : 8643512728  
**Question Type** : SA  
**Correct Marks** : 4  
**Wrong Marks** : 0
The question deals with a spring of constant $k$ and mass $M$. The spring is attached to a rigid wall and subjected to a force of $F$ newtons. The spring constant is $k$. The question asks for the extension of the spring $x$ such that the force applied equals the spring's natural frequency. The given equation is $\frac{T_b}{T_a} = \sqrt{x}$, where $T_b$ and $T_a$ are the tensions in the spring before and after the force is applied. The question requires showing the word count and has 100 possible answers.

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: 8643512729 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
The following bodies,

(1) a ring
(2) a disc
(3) a solid cylinder
(4) a solid sphere,

of same mass ‘m’ and radius ‘R’ are allowed to roll down without slipping simultaneously from the top of the inclined plane. The body which will reach first at the bottom of the inclined plane is __________.

[Mark the body as per their respective numbering given in the question]
(1) പൊള്ള (Ring)
(2) പിന്തുണ (Disc)
(3) ശ്രീ സംസ്ഥിതി കൃത്യ ഗിരിക്കാൻ (Solid cylinder)
(4) ശ്രീ സംസ്ഥിതി കൃത്യ ഗോളം (solid sphere)

മുപ്പിന്റെ വെല്ല് മേളം (mass) 'm' എന്നും റിൽ 'R' എന്നും. മുപ്പിന്റെ മേളം ഏറ്റു അടിക്കുന്ന ചേരിയുടെ തൂക്കിനു സമീപം അടിയുടെ നിലയിൽ വരും റിൽ തൂക്കിനു അടിയുടെ ഉയരത്തിലെ _______. (മുപ്പിന്റെ
ബുല്ലം ബുല്ലം ബുല്ലം ബുല്ലം ബുല്ലം)

[ഇപ്പോഴും അവാന്തരിക്കാൻ വിവിധവിധം മേളം കൂടുതലായി അടിയുടെ
നിലയില്ലാത്തമാണ്.]
Two blocks (m = 0.5 kg and M = 4.5 kg) are arranged on a horizontal frictionless table as shown in figure. The coefficient of static friction between the two blocks is $\frac{3}{7}$. Then the maximum horizontal force that can be applied on the larger block so that the blocks move together is ________ N. (Round off to the Nearest Integer) [Take g as 9.8 ms$^{-2}$]
Chemistry Section A

Section Id : 864351183
Section Number : 3
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 : 864351183
Question Shuffling Allowed : Yes

Question Number : 31 Question Id : 8643512731 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
A central atom in a molecule has two lone pairs of electrons and forms three single bonds. The shape of this molecule is :
Options :
planar triangular
T-shaped
see-saw
trigonal pyramidal

Question Number : 31 Question Id : 8643512731 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
A central atom in a molecule has two lone pairs of electrons and forms three single bonds. The shape of this molecule is :
Options :
planar triangular
T-shaped
see-saw
trigonal pyramidal
Question Number : 32 Question Id : 8643512732 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
A colloid system consisting of a gas dispersed in a solid is called a/an:
Options:
8643518195. aerosol
8643518196. solid sol
8643518197. foam
8643518198. gel

Question Number : 33 Question Id : 8643512733 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The absolute value of the electron gain enthalpy of halogens satisfies:

Question Number : 32 Question Id : 8643512732 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
A colloid system consisting of a gas dispersed in a solid is called a/an:
Options:
8643518195. aerosol
8643518196. solid sol
8643518197. foam
8643518198. gel

Question Number : 33 Question Id : 8643512733 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The absolute value of the electron gain enthalpy of halogens satisfies:
Question Number: 33  Question Id: 8643512733  Question Type: MCQ  Option Shuffling: Yes  Is Question Mandatory: No  Correct Marks: 4  Wrong Marks: 1

Options:
8643518199.  F > Cl > Br > I
8643518200.  Cl > F > Br > I
8643518201.  Cl > Br > F > I
8643518202.  I > Br > Cl > F

Question Number: 34  Question Id: 8643512734  Question Type: MCQ  Option Shuffling: Yes  Is Question Mandatory: No  Correct Marks: 4  Wrong Marks: 1

Options:
8643518199.  F > Cl > Br > I
8643518200.  Cl > F > Br > I
8643518201.  Cl > Br > F > I
8643518202.  I > Br > Cl > F
The point of intersection and sudden increase in the slope, in the diagram given below, respectively, indicates:

Options:

8643518203. $\Delta G < 0$ and decomposition of the metal oxide

8643518204. $\Delta G > 0$ and decomposition of the metal oxide

8643518205. $\Delta G = 0$ and melting or boiling point of the metal oxide

8643518206. $\Delta G = 0$ and reduction of the metal oxide
Options:
8643518203. \( \Delta G < 0 \) αυτό εξαπλώνει τακτικήτα διακοπτή πυρηνοκεραίου

8643518204. \( \Delta G > 0 \) αυτό εξαπλώνει τακτικήτα διακοπτή πυρηνοκεραίου

8643518205. \( \Delta G = 0 \) αυτό εξαπλώνει τακτικήτα διακοπτή πυρηνοκεραίου καθώς και τον διαλογισμό των διακοπτή πυρηνοκεραίου

8643518206. \( \Delta G = 0 \) αυτό εξαπλώνει τακτικήτα διακοπτή πυρηνοκεραίου γενικάπερης διακοπτή πυρηνοκεραίου

Question Number : 35 Question Id : 8643512735 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
The INCORRECT statement(s) about heavy water is (are)
(A) used as a moderator in nuclear reactor
(B) obtained as a by-product in fertilizer industry
(C) used for the study of reaction mechanism
(D) has a higher dielectric constant than water
Choose the correct answer from the options given below:

Options:

8643518207. (C) only
8643518208. (B) only
8643518209. (D) only
8643518210. (B) and (D) only

Question Number : 35 Question Id : 8643512735 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Question Number : 36 Question Id : 8643512736 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The correct order of conductivity of ions in water is :
Options :
8643518211. $Cs^+ > Rb^+ > K^+ > Na^+$
8643518212. $Na^+ > K^+ > Rb^+ > Cs^+$
8643518213. $K^+ > Na^+ > Cs^+ > Rb^+$
8643518214. $Rb^+ > Na^+ > K^+ > Li^+$

Question Number : 36 Question Id : 8643512736 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Questions in Malayalam:

Question Number : 37 Question Id : 8643512737 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following compound CANNOT act as a Lewis base?
Options :
8643518215. $ClF_3$
8643518216. $PCl_5$
8643518217. $NF_3$
8643518218. $SF_4$
Question Number : 37  Question Id : 8643512737  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

What is the spin-only magnetic moment value (BM) of a divalent metal ion with atomic number 25, in its aqueous solution?

Options :
8643518219. 5.0
8643518220. 5.26
8643518221. 5.92
8643518222. zero
Question Number : 39 Question Id : 8643512739 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Given below are two statements:
Statement I: Potassium permanganate on heating at 573 K forms potassium manganate.
Statement II: Both potassium permanganate and potassium manganate are tetrahedral and paramagnetic in nature.
In the light of the above statements, choose the most appropriate answer from the options given below:
Options:
8643518223. Both statement I and statement II are false
8643518224. Both statement I and statement II are true
8643518225. Statement I is true but statement II is false
8643518226. Statement I is false but statement II is true
Question Number : 40 Question Id : 8643512740 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Reducing smog is a mixture of :
Options :
8643518227.  Smoke, fog and O₃
8643518228.  Smoke, fog and SO₂
8643518229.  Smoke, fog and N₂O₃
8643518230.  Smoke, fog and CH₂=CH–CHO
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Question Number : 41 Question Id : 8643512741 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Given below are two statements:

Statement I : Retardation factor (Rf) can be measured in meter/centimeter.
Statement II : Rf value of a compound remains constant in all solvents.

Choose the most appropriate answer from the options given below:

Options :

8643518231. Both statement I and statement II are true
8643518232. Both statement I and statement II are false
8643518233. Statement I is true but statement II is false
8643518234. Statement I is false but statement II is true

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45/92
Question Number : 42 Question Id : 8643512742 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Which of the following is an aromatic compound?

Options:
Question Number : 43  
Question Id : 8643512743  
Question Type : MCQ  
Option Shuffling : Yes  
Is Question Mandatory : No  
Correct Marks : 4  
Wrong Marks : 1  

Product “A” in the above chemical reaction is:

Options:

8643518239.
Question Number : 43 Question Id : 8643512743 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

8643518239.

8643518240.

Options :
The above reaction requires which of the following reaction conditions?

Options:

8643518243. 623 K, Cu, 300 atm

8643518244. 573 K, Cu, 300 atm

8643518245. 623 K, 300 atm

8643518246. 573 K, 300 atm
Question Number : 45  Question Id : 8643512745  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

Mesityl oxide is a common name of:

Options:

8643518247. 4-Methyl pent-3-en-2-one
8643518248. 2,4-Dimethyl pentan-3-one
8643518249. 2-Methyl cyclohexanone
8643518250. 3-Methyl cyclohexane carbaldehyde
Hoffmann bromomide degradation of benzamide gives product A, which upon heating with CHCl₃ and NaOH gives product B.

The structures of A and B are:

**Options:**

**A** - ![Structure A](image1)

**B** - ![Structure B](image2)

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**Question Number : 46  Question Id : 8643512746  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1**

8643518249.

8643518250.

8643518251.

8643518252.

8643518253.

8643518254.
Question Number : 46 Question Id : 8643512746 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options:

A - Br

B - Br

A - NH₂

B - NC

A - Br

B - CHO

A - NH₂

B - NH₂ CHO

Question Number : 47 Question Id : 8643512747 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
The product “A” in the above reaction is:

Options:

8643518255.

8643518256.

8643518257.

8643518258.
Which of the following reaction is an example of ammonolysis?

Options:

\[ C_6H_5COCl + C_6H_5NH_2 \rightarrow C_6H_5CONHC_6H_5 \]

\[ C_6H_5CH_2CN \overset{[H]}\rightarrow C_6H_5CH_2CH_2NH_2 \]

\[ C_6H_5CH_2Cl + NH_3 \rightarrow C_6H_5CH_2NH_2 \]

\[ C_6H_5NH_2 + HCl \rightarrow C_6H_5NH_3^+ \cdot Cl^- \]
Question Mandatory: No  
Correct Marks: 4 Wrong Marks: 1  
With respect to drug-enzyme interaction, identify the wrong statement.

Options:
8643518259. $\text{C}_6\text{H}_5\text{COCl} + \text{C}_6\text{H}_5\text{NH}_2 \rightarrow \text{C}_6\text{H}_5\text{CONHC}_6\text{H}_5$
8643518260. $\text{C}_6\text{H}_5\text{CH}_2\text{CN} \xrightarrow{[\text{H}]} \text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{NH}_2$
8643518261. $\text{C}_6\text{H}_5\text{CH}_2\text{Cl} + \text{NH}_3 \rightarrow \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
8643518262. $\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow{\text{HCl}} \text{C}_6\text{H}_5\text{NH}_3\text{Cl}^-$

Question Number: 49  Question Id: 8643512749  Question Type: MCQ  Option Shuffling: Yes  Is Question Mandatory: No  
Correct Marks: 4 Wrong Marks: 1

Options:
8643518263. Competitive inhibitor binds to the enzyme’s active site
8643518264. Allosteric inhibitor changes the enzyme’s active site
8643518265. Allosteric inhibitor competes with the enzyme’s active site
8643518266. Non-Competitive inhibitor binds to the allosteric site
Which of the following is correct structure of tyrosine?

Options:

1. ![Structure 1](image1)
2. ![Structure 2](image2)
3. ![Structure 3](image3)
4. ![Structure 4](image4)
Question Number : 50  Question Id : 8643512750  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

Options:

8643518267.

8643518268.

8643518269.

8643518270.

Chemistry Section B

Section Id : 864351184
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 : 864351184
Question Shuffling Allowed : Yes

Question Number : 51 Question Id : 8643512751 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The mole fraction of a solute in a 100 molal aqueous solution is \( \frac{\text{\# moles of solute}}{\text{\# moles of solvent}} \times 10^{-2} \).
(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 : 51 Question Id : 8643512751 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
100 മെലുള മെലൂലശോഭാർണകം തന്നെ പിടിഞ്ഞാറായ മെലുള മെലൂലശോഭാർണകം \( \frac{\text{\# moles of solute}}{\text{\# moles of solvent}} \times 10^{-2} \)
ആക്രമണ (മൂർജ്ജന പ്രവൃത്തികാലവുകൾ)
(ഓക്സിജന മെലുള : H : 1.0 u, O : 16.0 u)
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 52 Question Id : 8643512752 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The pressure exerted by a non-reactive gaseous mixture of 6.4 g of methane and 8.8 g of carbon dioxide in a 10 L vessel at 27°C is _________ kPa. (Round off to the Nearest Integer).

[Assume gases are ideal, R = 8.314 J mol⁻¹ K⁻¹
Atomic masses : C : 12.0 u, H : 1.0 u, O : 16.0 u]

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 : 8643512753 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
n = 4, m_L = -3 ക്കാണും പ്രായത്തിൽ എന്തായിരുന്നു ചിലക്കിലായി അത്യാതി
__________ കലർത്തി. (തിരുവിതാംകൂർ മലയാളം)
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 : 8643512754 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The standard enthalpies of formation of Al_2O_3 and CaO are -1675 kJ mol^{-1} and
-635 kJ mol^{-1} respectively.
For the reaction
3CaO + 2Al → 3Ca + Al_2O_3 the standard reaction enthalpy Δ_rH^0= __________ kJ.
(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 : 54 Question Id : 8643512754 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
Al_2O_3, CaO അടയാളങ്ങളുടെ അടയാളരാശി അതിന്റെ ചെയ്താലികളിൽ മിക്കുകൊണ്ടാണ്
-1675 kJ mol^{-1}, -635 kJ mol^{-1}ആയിരുന്നതെങ്കിൽ.
3CaO + 2Al → 3Ca + Al_2O_3 അന്താംശങ്ങളിൽ അന്താംശങ്ങൾ ഉണ്ടാകുന്ന ആറാക്കാറും
Δ_rH^0= __________ kJ മിതി. (തിരുവിതാംകൂർ മലയാളം)
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
The oxygen dissolved in water exerts a partial pressure of 20 kPa in the vapour above water. The molar solubility of oxygen in water is \( _____ \times 10^{-5} \) mol dm\(^{-3}\). (Round off to the nearest integer).

[Given: Henry's law constant \( K_H = 8.0 \times 10^4 \) kPa for O\(_2\).
Density of water with dissolved oxygen = 1.0 kg dm\(^{-3}\)]

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 : 8643512756 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
0.1 M HCl kg 1.0 250 മല്ലിക, HA ജന്‍ക പാലിക്ക കാണാം (K_a = 2.0 \times 10^{-6}) 0.01 മല്ലിക അഭിവൃദ്ധിയുള്ളിലെ. HA ജന്‍ക പാലിക്ക പാലിക്ക അനുപാതം അംഗില്‍ 10^{-5} കാണാം. (ഉദ്ദേശിച്ച പ്രായസാധിക്കുന്നു)
(HA ജന്‍ക പാലിക്ക അഭിവൃദ്ധിയുള്ള അംഗില്‍ അംഗില്‍ അംഗില്‍. പാലിക്ക ജന്‍ക
പാലിക്ക അംഗില്‍ <1 ജന്‍ക പാലിക്ക

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 : 8643512757 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
15 mL of aqueous solution of Fe^{2+} in acidic medium completely reacted with 20 mL of
0.03 M aqueous Cr_2O_7^{2-}. The molarity of the Fe^{2+} solution is _________ \times 10^{-2} M. (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
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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: 8643512758  Question Type: SA
Correct Marks: 4  Wrong Marks: 0

For a certain first order reaction 32% of the reactant is left after 570 s. The rate constant of this reaction is \( _______ \times 10^{-3} \text{ s}^{-1} \). (Round off to the Nearest Integer).

[Given: \( \log_{10}2 = 0.301 \), \( \ln10 = 2.303 \)]

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: 8643512758  Question Type: SA
Correct Marks: 4  Wrong Marks: 0

570 s നാണ് രാസം അംഗുളി അവശേഷിച്ച് (അഭിജനകയുടെ 32% ഏകദേശം ശേഖരിക്കുന്നു). ഇതേ പ്രശ്നങ്ങളിൽ രാസ അവശേഷിച്ച് \( _______ \times 10^{-3} \text{ s}^{-1} \) എത്തുന്നു ആണ്

(അഭിജനകത്തിനുള്ള രീതിയിലാണ്)

\( \log_{10}2 = 0.301 \), \( \ln10 = 2.303 \)

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 : 8643512759  Question Type : SA
Correct Marks : 4  Wrong Marks : 0
The reaction of white phosphorus on boiling with alkali in inert atmosphere resulted in the formation of product ‘A’. The reaction of 1 mol of ‘A’ with excess of AgNO₃ in aqueous medium gives ________ mol(s) of Ag. (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 : 8643512760  Question Type : SA
Correct Marks : 4  Wrong Marks : 0

\[
\text{C} + \text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{NO}_2
\]

In the above reaction, 3.9 g of benzene on nitration gives 4.92 g of nitrobenzene. The percentage yield of nitrobenzene in the above reaction is ________%. (Round off to the Nearest Integer).
(Given atomic mass : C : 12.0 u, H : 1.0 u, O : 16.0 u, N : 14.0 u)

Response Type : Numeric
Evaluation Required For SA : Yes
Question Number : 60 Question Id : 8643512760 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\[
\begin{array}{c}
\text{C}_6\text{H}_6 + \text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \\
\text{C}_6\text{H}_4\text{NO}_2
\end{array}
\]


\[\text{Мол. масса} \quad \text{C}_6\text{H}_6 = 78 \quad \text{M}) \quad \text{C}_6\text{H}_4\text{NO}_2 \quad 142 \quad \text{M}\]

\[\text{Мол. масса C} = 12.0 \quad \text{M} \quad \text{H} = 1.0 \quad \text{M} \quad \text{O} = 16.0 \quad \text{M} \quad \text{N} = 14.0 \quad \text{M}\]

\[\text{Соотношение вводимыми} \quad \text{M}_{\text{C}_6\text{H}_6} : \text{M}_{\text{C}_6\text{H}_4\text{NO}_2} = 3.9 : 4.92 \quad \text{или} \quad 39 : 49.2\]

\[\text{Тогда соотношение вводимыми} \quad \text{M}_{\text{C}_6\text{H}_6} : 4.92 = 39 \quad \text{или} \quad 39 : 49.2\]

\[\text{Ответ:} \quad \text{равно} \quad \frac{39}{49.2} \times 100 \quad \% \quad \text{и получаем} \quad (\text{вторую волнуভূমিকা})\]

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

Mathematics Section A

Section Id : 864351185
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 : 864351185
Question Shuffling Allowed : Yes

Question Number : 61 Question Id : 8643512761 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
In a school, there are three types of games to be played. Some of the students play two types of games, but none play all the three games. Which Venn diagrams can justify the above statement?

Options:
8643518281. P and Q
8643518282. P and R
8643518283. Q and R
8643518284. None of these

Question Number : 61 Question Id : 8643512761 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options:
8643518281. P ∩ Q ∩ R
8643518282. P ∩ R

Question Number : 62  Question Id : 8643512762  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4 Wrong Marks : 1

The area of the triangle with vertices A(z), B(iz) and C(z + iz) is:

Options:

\[ \frac{1}{2} |z + iz|^2 \]

8643518285.

\[ \frac{1}{2} |z|^2 \]

8643518286.

\[ \frac{1}{2} \]

8643518287.

\[ 1 \]

8643518288.

---

Question Number : 62  Question Id : 8643512762  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4 Wrong Marks : 1

A(z), B(iz), C(z + iz) അവ വിന്യസിക്കാന്‍ പഴയമായിരുന്ന പദാവലി പ്രയാണം നൽകാം:

Options:

\[ \frac{1}{2} |z + iz|^2 \]

8643518285.

\[ \frac{1}{2} |z|^2 \]

8643518286.

\[ \frac{1}{2} \]

8643518287.

\[ 1 \]

8643518288.
If $A = \begin{pmatrix} 0 & \sin \alpha \\ \sin \alpha & 0 \end{pmatrix}$ and $\det \left( A^2 - \frac{1}{2}I \right) = 0$, then a possible value of $\alpha$ is:

Options:

\[
\frac{\pi}{4}, 8643518289.
\]
\[
\frac{\pi}{3}, 8643518290.
\]
\[
\frac{\pi}{6}, 8643518291.
\]
\[
\frac{\pi}{2}, 8643518292.
\]
Question Number : 64  Question Id : 8643512764  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1  
The system of equations $kx + y + z = 1$, $x + ky + z = k$ and $x + y + zk = k^2$ has no solution if $k$ is equal to :  
Options :
8643518293. 0
8643518294. 1
8643518295. −1
8643518296. −2

Question Number : 65  Question Id : 8643512765  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1  
Team ‘A’ consists of 7 boys and $n$ girls and Team ‘B’ has 4 boys and 6 girls. If a total of 52 single matches can be arranged between these two teams when a boy plays against a boy and a girl plays against a girl, then $n$ is equal to :  
Options :
8643518297. 2
Question Number : 65 Question Id : 8643512765 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If the fourth term in the expansion of \((x + x^{\log_2 x})^7\) is 4480, then the value of \(x\) where \(x \in \mathbb{N}\) is equal to :

Options :

8643518297. 2
8643518298. 4
8643518299. 5
8643518300. 6

Question Number : 66 Question Id : 8643512766 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If the fourth term in the expansion of \((x + x^{\log_2 x})^7\) is 4480, then the value of \(x\) where \(x \in \mathbb{N}\) is equal to :

Options :

8643518301. 1
8643518302. 2
8643518303. 3
Question Number : 66 Question Id : 8643512766 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\((x + x^{\log_2 x})^7\) ஆர்வடையும் பல்பல்லிரும்பு மாற்றக்கூடை முதல் 4480 சற்று பேச்சு, \(x \in N\) ஆர்வடையும், \(x\) அல்லது அன்றிய உண்மை:

Options :

8643518301. 1
8643518302. 2
8643518303. 3
8643518304. 4

Question Number : 67 Question Id : 8643512767 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The value of \(4 + \frac{1}{5 + \frac{1}{4 + \frac{1}{5 + \frac{1}{4 + \ddots}}}}\) is :

Options :

8643518305. \(2 + \frac{2}{5}\sqrt{30}\)
8643518306. \(2 + \frac{4}{5}\sqrt{30}\)
8643518307. \(5 + \frac{2}{5}\sqrt{30}\)
8643518308. \(4 + \frac{4}{5}\sqrt{30}\)
Question Number : 67 Question Id : 8643512767 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[
\frac{4}{5} + \frac{1}{4 + \frac{1}{5 + \frac{1}{4 + \frac{1}{1 + \ldots \infty}}}}
\]

Options :

1. \[2 + \frac{2}{5} \sqrt{30}\]
2. \[2 + \frac{4}{5} \sqrt{30}\]
3. \[5 + \frac{2}{5} \sqrt{30}\]
4. \[4 + \frac{4}{5} \sqrt{30}\]

Question Number : 68 Question Id : 8643512768 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If \(\cot^{-1}(\alpha) = \cot^{-1}2 + \cot^{-1}8 + \cot^{-1}18 + \cot^{-1}132 + \ldots \text{ upto } 100 \text{ terms}, \) then \(\alpha\) is :

Options :

1. \(8643518309.1.00\)
2. \(8643518310.1.01\)
3. \(8643518311.1.02\)
4. \(8643518312.1.03\)

Question Number : 68 Question Id : 8643512768 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
\[ \cot^{-1}(\alpha) = \cot^{-1}2 + \cot^{-1}8 + \cot^{-1}18 + \cot^{-1}32 + \ldots \]

Options:
8643518309. 1.00
8643518310. 1.01
8643518311. 1.02
8643518312. 1.03

Question Number : 69 Question Id : 8643512769 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The inverse of \( y = 5^{\log x} \) is:
Options:
\[ x = \frac{1}{\log y} \]
8643518313.
\[ x = y^{\log 5} \]
8643518314.
\[ x = 5^{\log y} \]
8643518315.
\[ x = y^{\log 5} \]
8643518316.

Question Number : 69 Question Id : 8643512769 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
\( y = 5^{\log x} \) എന്നതിന് അതിന്റെ അപയോഗം:
Options:
\[ x = \frac{1}{\log y} \]
8643518313.
\[ x = y^{\frac{1}{\log 5}} \]

\[ x = 5^{\log y} \]

\[ x = y^{\log 5} \]

**Question Number : 70**  
**Question Id : 8643512770**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

The value of \[ \lim_{x \to 0^+} \frac{\cos^{-1}(x - [x]^2) \cdot \sin^{-1}(x - [x]^2)}{x - x^3} \], where \([x]\) denotes the greatest integer \(\leq x\) is:

**Options :**

\[ \frac{\pi}{4} \]

8643518317.

8643518318. 0

\[ \frac{\pi}{2} \]

8643518319.

8643518320. \(\pi\)

**Question Number : 70**  
**Question Id : 8643512770**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

\[ \lim_{x \to 0^+} \frac{\cos^{-1}(x - [x]^2) \cdot \sin^{-1}(x - [x]^2)}{x - x^3} \], \(\text{where} \ [x] \text{ denotes the greatest integer} \ \leq x \text{ and for any integer } m \)

\(\text{let} \ \cos \theta = x - [x]^2 \text{ and } \sin \theta = x - [x]^2 \)

**Options :**

\[ \frac{\pi}{4} \]

8643518317.
Question Number : 71 Question Id : 8643512771 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following statements is incorrect for the function \( g(\alpha) \) for \( \alpha \in \mathbb{R} \) such that

\[
g(\alpha) = \int_{\pi/6}^{\pi/3} \frac{\sin^\alpha x}{\cos^\alpha x + \sin^\alpha x} \, dx
\]

Options :

8643518321. \( g(\alpha) \) is a strictly increasing function

8643518322. \( g(\alpha) \) is a strictly decreasing function

8643518323. \( g(\alpha) \) has an inflection point at \( \alpha = -\frac{1}{2} \)

8643518324. \( g(\alpha) \) is an even function

---

Question Number : 71 Question Id : 8643512771 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[
g(\alpha) = \int_{\pi/6}^{\pi/3} \frac{\sin^\alpha x}{\cos^\alpha x + \sin^\alpha x} \, dx
\]

Translate the question into Malayalam, and provide the options.

Options :

8643518321. \( g(\alpha) \) അത്യഗ്രഹനായി വരണ്ടത്തേയാണ്‌ അത്യക്തമായത്?
Question Number : 72 Question Id : 8643512772 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which of the following is true for \( y(x) \) that satisfies the differential equation

\[
\frac{dy}{dx} = xy - 1 + x - y ; y(0) = 0
\]

Options :

\[
y(1) = e^{-\frac{1}{2}} - 1
\]

8643518325.

\[
y(1) = e^{\frac{1}{2}} - 1
\]

8643518326.

\[
y(1) = e^{\frac{1}{2}} - e^{-\frac{1}{2}}
\]

8643518327.

\[
y(1) = 1
\]

8643518328.

Question Number : 72 Question Id : 8643512772 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[
\frac{dy}{dx} = xy - 1 + x - y ; y(0) = 0
\]

Options :

\[
y(1) = e^{-\frac{1}{2}} - 1
\]

8643518325.
\[ y(1) = e^{\frac{1}{2}} - 1 \]

\[ y(1) = e^{\frac{1}{2}} - e^{-\frac{1}{2}} \]

\[ y(1) = 1 \]

**Question Number : 73  Question Id : 8643512773  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No**

Correct Marks : 4 Wrong Marks : 1

In a triangle PQR, the co-ordinates of the points P and Q are \((-2, 4)\) and \((4, -2)\) respectively. If the equation of the perpendicular bisector of PR is \(2x - y + 2 = 0\), then the centre of the circumcircle of the \(\Delta PQR\) is:

**Options :**

8643518329. \((1, 4)\)

8643518330. \((0, 2)\)

8643518331. \((-1, 0)\)

8643518332. \((-2, -2)\)
8643518332. \((-2, -2)\)

Question Number : 74 Question Id : 8643512774 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The line \(2x - y + 1 = 0\) is a tangent to the circle at the point \((2, 5)\) and the centre of the circle lies on \(x - 2y = 4\). Then, the radius of the circle is:
Options :
8643518333. \(5\sqrt{3}\)
8643518334. \(5\sqrt{4}\)
8643518335. \(4\sqrt{5}\)
8643518336. \(3\sqrt{5}\)

Question Number : 74 Question Id : 8643512774 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
\((2, 5)\) ന്റെ തെളിവിൽ പുറത്താക്കിയ തീയതിയോടൊപ്പുള്ള രണ്ടാം പദം എന്നാൽ \(2x - y + 1 = 0\) അതായത്. പുറത്താക്കിയൊരു വനിതയും പുറത്താക്കിയൊരു വനിതയും, പുറത്താക്കിയൊരു വനിതയും:
Options :
8643518333. \(5\sqrt{3}\)
8643518334. \(5\sqrt{4}\)
8643518335. \(4\sqrt{5}\)
8643518336. \(3\sqrt{5}\)

Question Number : 75 Question Id : 8643512775 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Choose the incorrect statement about the two circles whose equations are given below:
\[ x^2 + y^2 - 10x - 10y + 41 = 0 \text{ and} \]
\[ x^2 + y^2 - 16x - 10y + 80 = 0 \]
Options:
8643518337. Circles have two intersection points.
8643518338. Both circles pass through the centre of each other.
8643518339. Both circles’ centres lie inside region of one another.
8643518340. Distance between two centres is the average of radii of both the circles.

Question Number : 75 Question Id : 8643512775 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
 totalement എല്ലാ അറിവുകളും പരിപാലനമേളയ്ക്കാണിക്കുന്ന സ്ഥാനമാണ് ഇത് പറയാവുന്നത് ?
\[ x^2 + y^2 - 10x - 10y + 41 = 0 \]
\[ x^2 + y^2 - 16x - 10y + 80 = 0 \]
Options:
8643518337. പൂത്താക്കുന്ന കാണിക്കുന്ന തരം നിരക്കുകളും എന്നിട്ടു.
8643518338. എന്ന പുതിയത്തടുത്ത് പുതിയത്തടുത്ത് പുതിയാത്മക കാഴ്ചപ്പാടുകളും.
8643518339. എന്ന പുതിയത്തടുത്ത് കൂടെക്കാണിക്കുന്ന പുതിയത്തടുത്ത് കാഴ്ചപ്പാടുകളും.
8643518340. എന്ന പുതിയത്തടുത്ത് മാത്രമാണ് എങ്ങനെ പലത്തെ പ്രകാരമായി പ്രശ്നം സൃഷ്ടിക്കുന്നു.

Question Number : 76 Question Id : 8643512776 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The equation of the plane which contains the y-axis and passes through the point (1, 2, 3) is:
Options:

8643518341. $3x + z = 6$

8643518342. $x + 3z = 10$

8643518343. $x + 3z = 0$

8643518344. $3x - z = 0$

---

Question Number : 76 Question Id : 8643512776 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

(1, 2, 3) ஆக்க விபர்பிதைகள் காலமாக்குவதை $y$-க்கு விளக்குவதாகவும் தொகுதிகள் பயன்படுத்தவோ?

Options:

8643518341. $3x + z = 6$

8643518342. $x + 3z = 10$

8643518343. $x + 3z = 0$

8643518344. $3x - z = 0$

---

Question Number : 77 Question Id : 8643512777 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If the Boolean expression $(p \Rightarrow q) \Leftrightarrow (q \ast (\neg p))$ is a tautology, then the Boolean expression $p \ast (\neg q)$ is equivalent to:

Options:

8643518345. $p \Rightarrow q$

8643518346. $p \Rightarrow \neg q$

8643518347. $q \Rightarrow p$

8643518348. $\neg q \Rightarrow p$
Question Number : 77  Question Id : 8643512777  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

\( (p \Rightarrow q) \iff (q \ast (\neg p)) \) எனில் பெருமளவு வலயம் என வரையறுக்கப்பட்டுள்ளது, \( p \ast (\neg q) \) எனில் பெருமளவு பொறுப்பு வலயம் என வரையறுக்கப்பட்டுள்ளது:

Options :

\[ p \Rightarrow q \]
8643518345.

\[ p \Rightarrow \neg q \]
8643518346.

\[ q \Rightarrow p \]
8643518347.

\[ \neg q \Rightarrow p \]
8643518348.

Question Number : 78  Question Id : 8643512778  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

Let \( \vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k} \) and \( \vec{b} = 7\hat{i} + \hat{j} - 6\hat{k} \).

If \( \vec{r} \times \vec{a} = \vec{r} \times \vec{b}, \) \( \vec{r} \cdot (\hat{i} + 2\hat{j} + \hat{k}) = -3, \) then \( \vec{r} \cdot (2\hat{i} - 3\hat{j} + \hat{k}) \) is equal to :

Options :

8643518349. 8

8643518350. 10

8643518351. 12

8643518352. 13

Question Number : 78  Question Id : 8643512778  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1
\[ \vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k} \quad \vec{b} = 7\hat{i} + \hat{j} - 6\hat{k} \]

\[ \vec{r} \times \vec{a} = \vec{r} \times \vec{b}, \quad \vec{r} \cdot (\hat{i} + 2\hat{j} + \hat{k}) = -3 \] 

Two dices are rolled. If both dices have six faces numbered 1, 2, 3, 5, 7 and 11, then the probability that the sum of the numbers on the top faces is less than or equal to 8 is:

Options:

\[ \frac{5}{12} \]

\[ \frac{4}{9} \]

\[ \frac{17}{36} \]

\[ \frac{1}{2} \]
The sum of possible values of $x$ for \( \tan^{-1}(x + 1) + \cot^{-1}\left(\frac{1}{x - 1}\right) = \tan^{-1}\left(\frac{8}{31}\right) \) is:

Options:

\[
\begin{align*}
\frac{33}{4} \\
\frac{32}{4} \\
\frac{31}{4} \\
\frac{30}{4}
\end{align*}
\]
\[
\tan^{-1}(x+1) + \cot^{-1}\left(\frac{1}{x-1}\right) = \tan^{-1}\left(\frac{8}{31}\right)
\]

\[
\text{അതുപോലെ } x \text{-ൽ } x > 0 \text{ എന്നാൽ } \tan^{-1} (x + 1) + \cot^{-1}\left(\frac{1}{x-1}\right)
\]

Options :

\[
\frac{33}{4}
\]
8643518357.

\[
\frac{32}{4}
\]
8643518358.

\[
\frac{31}{4}
\]
8643518359.

\[
\frac{30}{4}
\]
8643518360.

Mathematics Section B

Section Id : 864351186
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 : 864351186
Question Shuffling Allowed : Yes

Question Number : 81 Question Id : 8643512781 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The maximum value of \(z\) in the following equation \(z = 6xy + y^2\), where \(3x + 4y \leq 100\) and \(4x + 3y \leq 75\) for \(x \geq 0\) and \(y \geq 0\) is \__________.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Question Number : 81 Question Id : 8643512781 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
\[ z = 6xy + y^2 \text{ अथवा } \frac{6x}{2y} + \frac{y}{y} = z - m \text{ विवर्तनात्मक भविष्यवाणी मुळ्य में अंतर} \]
\[ \text{क्षेत्र} \leq 3x+4y \leq 100 \text{ और } 4x+3y \leq 75 \] तथ्यात. \( x \geq 0, y \geq 0 \)
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 : 8643512782 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
\[ A = \begin{bmatrix} 2 & 3 \\ 0 & -1 \end{bmatrix}, \text{then the value of } \det(A^4) + \det\left(A^{10}-(\text{Adj}(2A))^{10}\right) \text{ is equal to } \]
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 : 8643512782 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
\[ A = \begin{bmatrix} 2 & 3 \\ 0 & -1 \end{bmatrix} \text{केसे, } \det(A^4) + \det\left(A^{10}-(\text{Adj}(2A))^{10}\right) \text{ के अधिकतम संख्या } \]
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
Question Number : 83 Question Id : 8643512783 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If \((2021)^{3762}\) is divided by 17, then the remainder is \_______.

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 : 8643512783 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\((2021)^{3762}\) ആരോഗ്യത്തിൽ 17 വരേയ വരെ ആണ്, തേക്കാ രാമു രാമിത.

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 : 8643512784 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the function \(f(x) = \frac{\cos(\sin x) - \cos x}{x^4}\) is continuous at each point in its domain and

\[ f(0) = \frac{1}{k}, \text{ then } k \text{ is} \______. \]

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 : 8643512784 Question Type : SA
\[ f(x) = \frac{\cos(\sin x) - \cos x}{x^4} \] is the greatest integer function, then the value of

\[ \int_{\sqrt{\frac{k}{2}}}^{\sqrt{\frac{k}{2}}} \left[ [x^2] - \cos x \right] \, dx \] is \[ \frac{1}{k} \] so \( k \) must be \[ \frac{1}{k} \text{ must be an integer.} \]

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: 8643512785 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

If \( [\cdot] \) represents the greatest integer function, then the value of

\[ \int_{0}^{\sqrt{\frac{k}{2}}} \left[ [x^2] - \cos x \right] \, dx \] is \[ \frac{1}{k} \text{ must be an integer.} \]

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

[\cdot] = \text{the greatest integer function, maps all real numbers to integers,} \]

\[ \int_{0}^{\sqrt{\frac{k}{2}}} \left[ [x^2] - \cos x \right] \, dx \] \( \text{must be an integer.} \)

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
The minimum distance between any two points $P_1$ and $P_2$ while considering point $P_1$ on one circle and point $P_2$ on the other circle for the given circles' equations:

$x^2 + y^2 - 10x - 10y + 41 = 0$

$x^2 + y^2 - 24x - 10y + 160 = 0$ is \[\text{___________} \].

If the equation of the plane passing through the line of intersection of the planes $2x - 7y + 4z - 3 = 0$, $3x - 5y + 4z + 11 = 0$ and the point $(-2, 1, 3)$ is $ax + by + cz - 7 = 0$, then the value of $2a + b + c - 7$ is \[\text{___________} \].
Question Number : 87 Question Id : 8643512787 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\((-2, 1, 3)\) \(\quad\text{and}\quad\) \(\begin{cases} 2x - 7y + 4z - 3 = 0, \\ 3x - 5y + 4z + 11 = 0 \end{cases}\) \(\text{and}\) \(\begin{cases} ax + by + cz - 7 = 0 \quad\text{and}\quad\end{cases}\) \(\text{are the solutions of the following system of equations.}\)

\(2a + b + c - 7 = 0\) \(\text{and}\) \(2a - 3b = 7\). \(\text{What is the value of}\) \(\Box\) \(\text{?}\)

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 : 8643512788 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let there be three independent events \(E_1, E_2\) and \(E_3\). The probability that only \(E_1\) occurs is \(\alpha\), only \(E_2\) occurs is \(\beta\) and only \(E_3\) occurs is \(\gamma\). Let \(p\) denote the probability of none of events occurs that satisfies the equations \((\alpha - 2\beta)p = \alpha\beta\) and \((\beta - 3\gamma)p = 2\beta\gamma\). All the given probabilities are assumed to lie in the interval \((0, 1)\).

\[
\frac{\text{Probability of occurrence of } E_1}{\text{Probability of occurrence of } E_3} = \Box
\]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers : 
100
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: 8643512789 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

If \( f(x) = \sin\left(\cos^{-1}\left(\frac{1 - 2^x}{1 + 2^x}\right)\right) \) and its first derivative with respect to \( x \) is \( -\frac{b}{a} \log_e 2 \) when \( x = 1 \), where \( a \) and \( b \) are integers, then the minimum value of \( |a^2 - b^2| \) is \( \underline{\phantom{0}} \).

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: 8643512789 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
\[ f(x) = \sin \left( \cos^{-1} \left( \frac{1 - 2^{2x}}{1 + 2^{2x}} \right) \right) \]

\[ x = 1 - \frac{b}{a} \log_{e} 2 \]

\( |a^2 - b^2| \) is required.

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: 8643512790  Question Type: SA
Correct Marks: 4  Wrong Marks: 0
If \( \vec{a} = \alpha \hat{i} + \beta \hat{j} + 3 \hat{k} \),

\[ \vec{b} = -\beta \hat{i} - \alpha \hat{j} - \hat{k} \] and

\[ \vec{c} = \hat{i} - 2 \hat{j} - \hat{k} \]

such that \( \vec{a} \cdot \vec{b} = 1 \) and \( \vec{b} \cdot \vec{c} = -3 \), then \( \frac{1}{3} \left( (\vec{a} \times \vec{b}) \cdot \vec{c} \right) \) 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: 90  Question Id: 8643512790  Question Type: SA
Correct Marks: 4  Wrong Marks: 0
\[ \vec{a} = \alpha \hat{i} + \beta \hat{j} + 3\hat{k}, \quad \vec{b} = -\beta \hat{i} - \alpha \hat{j} - \hat{k}, \quad \vec{c} = \hat{i} - 2\hat{j} - \hat{k} \]

\[ \vec{a} \cdot \vec{b} = 1, \]

\[ \vec{b} \cdot \vec{c} = -3, \quad \frac{1}{3} \left( (\vec{a} \times \vec{b}) \cdot \vec{c} \right) \]

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