National Testing Agency

Question Paper Name : B TECH ETE 16th March 2021 Shift 2
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Total Marks : 300
Display Marks : Yes

B TECH ETE

Group Number : 1
Group Id : 86435123
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 : 864351133
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 : 864351133
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 8643511981 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Two identical antennas mounted on identical towers are separated from each other by a distance of 45 km. What should nearly be the minimum height of receiving antenna to receive the signals in line of sight?

(Assume radius of earth is 6400 km)

Options:
8643515941. 79.1 m
8643515942. 39.55 m
8643515943. 158.2 m
8643515944. 19.77 m

Question Number : 1 Question Id : 8643511981 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The de-Broglie wavelength associated with an electron and a proton were calculated by accelerating them through same potential of 100 V. What should nearly be the ratio of their wavelengths?

\( m_p = 1.00727u \quad m_e = 0.00055u \)

Options:
Question Number : 2  Question Id : 8643511982  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1  

100 V शक्ति प्रदाता तथा इलेक्ट्रॉन ने आपूर्ति में घुमी और आपूर्ति में घुमी तरीके से है? \( m_p = 1.00727 \mu m \) \( m_e = 0.00055 \mu m \)  

Options :  
8643515945. 43 : 1  
8643515946. 1860 : 1  
8643515947. 41.4 : 1  
8643515948. \((1860)^2 : 1\)

---

Question Number : 3  Question Id : 8643511983  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1  

The refractive index of a converging lens is 1.4. What will be the focal length of this lens if it is placed in a medium of same refractive index? Assume the radii of curvature of the faces of lens are \( R_1 \) and \( R_2 \) respectively.  

Options :  
8643515949. Zero  
8643515950. 1  
8643515951. Infinite
\[
\frac{R_1 R_2}{R_1 - R_2}
\]

Question Number : 3 Question Id : 8643511983 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options :

8643515949.

8643515950. 1

8643515951.

\[
\frac{R_1 R_2}{R_1 - R_2}
\]

8643515952.

Question Number : 4 Question Id : 8643511984 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Red light differs from blue light as they have :

Options :

8643515953. Same frequencies and same wavelengths

8643515954. Different frequencies and different wavelengths

8643515955. Same frequencies and different wavelengths

8643515956. Different frequencies and same wavelengths
The magnetic field in a region is given by \( \mathbf{B} = B_0 \left( \frac{x}{a} \right) \mathbf{k} \). A square loop of side \( d \) is placed with its edges along the \( x \) and \( y \) axes. The loop is moved with a constant velocity \( \mathbf{v} = v_0 \mathbf{i} \).

The emf induced in the loop is:

\[
\mathbf{B} \cdot \mathbf{v} = \frac{B_0 v_0 d}{2a}
\]
\[
\frac{B_0 v_o^2 d}{2a}
\]

8643515959.

\[
\frac{B_0 v_o d^2}{2a}
\]

8643515960.

**Question Number : 5**  **Question Id :** 8643511985  **Question Type :** MCQ  **Option Shuffling :** Yes  **Is Question Mandatory :** No  **Correct Marks :** 4  **Wrong Marks :** 1

The magnetic field \( \mathbf{B} \) is given by \( \mathbf{B} = B_0 \left( \frac{x}{a} \right)^k \mathbf{\hat{k}} \) for \( 0 \leq x \leq a \). The conductor moves in the \( x \) direction at velocity \( v = v_o \mathbf{\hat{i}} \). Calculate the induced emf.

\[ \text{Options:} \]

\[
\frac{B_0 v_o d}{2a}
\]

8643515957.

\[
\frac{B_0 v_o d^2}{2a}
\]

8643515958.

\[
\frac{B_0 v_o^2 d}{2a}
\]

8643515959.

\[
\frac{B_0 v_o d^2}{2a}
\]

8643515960.
Amplitude of a mass-spring system, which is executing simple harmonic motion decreases with time. If mass = 500g, Decay constant = 20 g/s then how much time is required for the amplitude of the system to drop to half of its initial value?

\( \ln 2 = 0.693 \)

Options:

8643515961. 34.65 s
8643515962. 15.01 s
8643515963. 0.034 s
8643515964. 17.32 s

Question Number : 7 Question Id : 8643511987 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
Calculate the value of mean free path (\( \lambda \)) for oxygen molecules at temperature 27°C and pressure \( 1.01 \times 10^5 \) Pa. Assume the molecular diameter 0.3 nm and the gas is ideal. \( (k = 1.38 \times 10^{-23} \text{ JK}^{-1}) \)

Options:
- 32 nm
- 58 nm
- 86 nm
- 102 nm

Question Number : 7 Question Id : 8643511987 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

27°C లో అంటా 1.01 \times 10^5 \) Pa ట్రాఫిక కు ఆంకితి విశేషాంశ మేధావు మాత్రమే (\( \lambda \)) ఖాళ్లించబడితే. \( (k = 1.38 \times 10^{-23} \text{ JK}^{-1}) \)

Options:
- 32 nm
- 58 nm
- 86 nm
- 102 nm

Question Number : 8 Question Id : 8643511988 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

What will be the nature of flow of water from a circular tap, when its flow rate increased from 0.18 L/min to 0.48 L/min? The radius of the tap and viscosity of water are 0.5 cm and \( 10^{-3} \) Pa s, respectively.

(Density of water : \( 10^3 \) kg/m\(^3\))
Question Number : 8 Question Id : 8643511988 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

8643515969. Steady flow to unsteady flow
8643515970. Unsteady to steady flow
8643515971. Remains steady flow
8643515972. Remains turbulent flow

Question Number : 9 Question Id : 8643511989 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A charge Q is moving dl distance in the magnetic field B. Find the value of work done by B.

Options :
8643515973. 1
8643515974. Zero
8643515975. Infinite

8643515976. −1

Question Number : 9 Question Id : 8643511989 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options :
8643515973. 1

8643515974. 2

8643515975. 3

8643515976. −1

Question Number : 10 Question Id : 8643511990 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Calculate the time interval between 33% decay and 67% decay if half-life of a substance is 20 minutes.

Options :
8643515977. 20 minutes

8643515978. 40 minutes

8643515979. 60 minutes

8643515980. 13 minutes
Question Number : 10 Question Id : 8643511990 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options :
8643515977. 20 विलीनित
8643515978. 40 विलीनित
8643515979. 60 विलीनित
8643515980. 13 विलीनित

Question Number : 11 Question Id : 8643511991 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

For the given circuit, comment on the type of transformer used.

Options :
8643515981. Step - up transformer
8643515982. Step down transformer
8643515983. Auto transformer
8643515984. Auxilliary transformer
Question Number : 12  Question Id : 8643511992  Question Type : MCQ  Option Shuffling : Yes Is  Question Mandatory : No  Correct Marks : 4 Wrong Marks : 1
The half-life of Au\(^{198}\) is 2.7 days. The activity of 1.50 mg of Au\(^{198}\) if its atomic weight is 198 g mol\(^{-1}\) is, \((N_A = 6 \times 10^{23}/\text{mol})\).
Options :

8643515985.  240 Ci

8643515986.  357 Ci

8643515987.  252 Ci

8643515988.  535 Ci
\( \text{Au}^{198} \) చ్యాంగు అంప్యుగుట సంఖ్య 2.7 మింగి. మీనతో నిత్యార్థం 198 g mol\(^{-1}\) అంటే నైయికే 1.50 mg స్పష్టంగా \( \text{Au}^{198} \) చ్యాంగు మీనతో \_\_\_\_\_. (\( N_A = 6 \times 10^{23}/\text{mol} \)).

Options:
8643515985. 240 Ci
8643515986. 357 Ci
8643515987. 252 Ci
8643515988. 535 Ci

A bimetallic strip consists of metals A and B. It is mounted rigidly as shown. The metal A has higher coefficient of expansion compared to that of metal B. When the bimetallic strip is placed in a cold bath, it will:

\[ A \quad B \]

Options:
8643515989. Bend towards the right
8643515990. Bend towards the left
8643515991. Not bend but shrink
8643515992. Neither bend nor shrink
A large block of wood of mass $M = 5.99$ kg is hanging from two long massless cords. A bullet of mass $m = 10$ g is fired into the block and gets embedded in it. The (block + bullet) then swing upwards, their centre of mass rising a vertical distance $h = 9.8$ cm before the (block+bullet) pendulum comes momentarily to rest at the end of its arc. The speed of the bullet just before collision is:

(take $g = 9.8$ ms$^{-2}$)

Options:

811.4 m/s
Question Number : 14 Question Id : 8643511994 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[ M = 5.99 \text{ kg} \quad m = 10 \text{ g} \quad \text{and} \quad A = \text{constant} \quad \text{(given)} \] 

\[ h = 9.8 \text{ cm} \quad \text{and} \quad \text{g} = 9.8 \text{ ms}^{-2} \]

Options :
- 8643515993. 811.4 m/s
- 8643515994. 821.4 m/s
- 8643515995. 831.4 m/s
- 8643515996. 841.4 m/s
Question Number : 15 Question Id : 8643511995 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No 
Correct Marks : 4 Wrong Marks : 1

Statement I :  A cyclist is moving on an unbanked road with a speed of 7 kmh\(^{-1}\) and takes a sharp circular turn along a path of radius of 2m without reducing the speed. The static friction coefficient is 0.2. The cyclist will not slip and pass the curve. \((g=9.8 \text{ m/s}^2)\)

Statement II : If the road is banked at an angle of 45°, cyclist can cross the curve of 2m radius with the speed of 18.5 kmh\(^{-1}\) without slipping.

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

Options :
8643515997. Both statement I and statement II are true
8643515998. Both statement I and statement II are false
8643515999. Statement I is correct and statement II is incorrect
8643516000. Statement I is incorrect and statement II is correct

Question Number : 15 Question Id : 8643511995 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No 
Correct Marks : 4 Wrong Marks : 1

అమాలు I : 7 kmh\(^{-1}\) సేచ్చు వేగంతో వెలుగు సేచ్చు వేగంతో 2 m రాడియాస్ పత్రికలో వెలుగు సేచ్చు వేగంతో వెళ్ళుకోవడం కోసం సప్తాంశ నాటికి వెళ్ళడం. సప్తాంశ నాటికి అంతే సాధారణంగా సప్తాంశ నాటికి అంతే సాధారణంగా నాటికి అంతే సాధారణంగా నాటికి అంతే సాధారణంగా నాటికి అంతే సాధారణంగా నాటికి అంతే (g=9.8 \text{ m/s}^2)

అమాలు II : 45° విధానంతో వెలుగు సేచ్చు వేగంతో 2 m రాడియాస్ పత్రికలో వెలుగు సేచ్చు వేగంతో 18.5 kmh\(^{-1}\) సేచ్చు వేగంతో వెళ్ళడం కోసం సప్తాంశ నాటికి అంతే సాధారణంగా నాటికి అంతే సాధారణంగా నాటికి అంతే సాధారణంగా నాటికి అంతే సాధారణంగా నాటికి అంతే

అమాలు I వేరు అమాలు II వేరు అమాలు I వేరు అమాలు II వేరు

Options :
8643515997. 
8643515998.
A mosquito is moving with a velocity \( \vec{v} = 0.5 \, t^2 \, \hat{i} + 3t \, \hat{j} + 9 \, \hat{k} \, \text{m/s} \) and accelerating in uniform conditions. What will be the direction of mosquito after 2 s?

Options:

\[
tan^{-1}\left(\frac{5}{2}\right) \text{ from x-axis}
\]

8643516001.

\[
tan^{-1}\left(\frac{5}{2}\right) \text{ from y-axis}
\]

8643516002.

\[
tan^{-1}\left(\frac{2}{3}\right) \text{ from x-axis}
\]

8643516003.

\[
tan^{-1}\left(\frac{2}{3}\right) \text{ from y-axis}
\]

8643516004.
In order to determine the Young’s Modulus of a wire of radius 0.2 cm (measured using a scale of least count = 0.001 cm) and length 1m (measured using a scale of least count = 1 mm), a weight of mass 1 kg (measured using a scale of least count = 1 g) was hanged to get the elongation of 0.5 cm (measured using a scale of least count 0.001 cm). What will be the fractional error in the value of Young’s Modulus determined by this experiment?

Options:

1. 1.4 %
2. 0.9 %
3. 0.14 %
4. 9 %
A resistor develops 500 J of thermal energy in 20 s when a current of 1.5 A is passed through it. If the current is increased from 1.5 A to 3 A, what will be the energy developed in 20 s.

Options:

8643516009. 500 J
8643516010. 1000 J
8643516011. 1500 J
8643516012. 2000 J

1.5 A విద్యుత్ సాధనాలు 20 సంవత్సరాల ప్రయోగం చేసే తోలు 500 J ప్రతి సంవత్సరం ఉంది. అయితే 1.5 A నుండి 3 A వరకు విద్యుత్ సాధనాలు ప్రయోగం చేసే తోలు 20 సంవత్సరాలు ఉంటాయి.

Options:

8643516009. 500 J
8643516010. 1000 J
8643516011. 1500 J
Find out the surface charge density at the intersection of point $x = 3$ m plane and $x$-axis, in the region of uniform line charge of 8 nC/m lying along the $z$-axis in free space.

Options:

- $47.88$ C/m
- $0.07$ nC m$^{-2}$
- $0.424$ nC m$^{-2}$
- $4.0$ nC m$^{-2}$
The following logic gate is equivalent to:

![Logic Gate Diagram]

Options:
- 8643516017. AND Gate
- 8643516018. NAND Gate
- 8643516019. OR Gate
- 8643516020. NOR Gate

Question Number: 20 Question Id: 8643512000 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No Correct Marks: 4 Wrong Marks: 1

And ఈ త్రికి పోయి చిన్ని విషయాలను తెలిపండి:

![Logic Gate Diagram]

Options:
- 8643516017. AND రేట్
- 8643516018. NAND రేట్
- 8643516019. OR రేట్
Physics Section B

Section Id: 864351134
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: 864351134
Question Shuffling Allowed: Yes

Question Number: 21 Question Id: 8643512001 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

If one wants to remove all the mass of the earth to infinity in order to break it up completely.

The amount of energy that needs to be supplied will be \( \frac{x}{5} \frac{GM^2}{R} \) where \( x \) is \_____\.

(Round off to the Nearest Integer)

(M is the mass of earth, R is the radius of earth, G is the gravitational constant)

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: 8643512001 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
\[ \frac{x}{5} \frac{GM^2}{R} \text{ ఎంచుకుంది, } x = \underline{\phantom{0000}}. \]

(యా గణాన్ రాశిపుష్పి రాశిపుష్పి)

(మహోన చదువు M, చదువు రెండు R విలిడ గణనాం గణనాం G)

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: 8643512002 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
A swimmer can swim with velocity of 12 km/h in still water. Water flowing in a river has velocity 6 km/h. The direction with respect to the direction of flow of river water he should swim in order to reach the point on the other bank just opposite to his starting point is \underline{\phantom{0000}}°. (Round off to the Nearest Integer)
(Find the angle in degrees)

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: 8643512002 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
6 km/h నుండి 6 km/h నుండి చదివడానికి వాతావరణం అయిన స్థితిలో స్నానం కంటే 12 km/h నుండి 6 km/h చదివడానికి స్థితిలో స్నానం కంటే కనిపించడానికి \underline{\phantom{0000}}°.
(ఆ గణాన్ రాశిపుష్పి రాశిపుష్పి రాశిపుష్పి రాశిపుష్పి)

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
A body of mass 2 kg moves under a force of \(\left(2 \hat{i} + 3 \hat{j} + 5 \hat{k}\right) \text{N}\). It starts from rest and was at the origin initially. After 4 s, its new coordinates are (8, b, 20). The value of b is \(\square\). (Round off to the Nearest Integer)

Question Number: 24 Question Id: 8643512004 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

2 kg నిపుణుడు నిపుణుడు \(\left(2 \hat{i} + 3 \hat{j} + 5 \hat{k}\right) \text{N}\) మీద నిపుణుడు నిపుణుడు నిపుణుడు నిపుణుడు నిపుణుడు. 4 సెకండు నిపుణుడు నిపుణుడు నిపుణుడు నిపుణుడు నిపుణుడు (8, b, 20). అంటే b విలుము \(\square\). (విషయాన్ని నిపుణుడు నిపుణుడు నిపుణుడు నిపుణుడు)

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

100
A force \( \mathbf{F} = 4 \mathbf{i} + 3 \mathbf{j} + 4 \mathbf{k} \) is applied on an intersection point of \( x = 2 \) plane and \( x \)-axis. The magnitude of torque of this force about a point \((2, 3, 4)\) 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: 24 Question Id: 8643512004 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

\[ x = 2 \text{ ఎందుకంటే అని ఇది గణితం పైతంటే} \text{ ఇంటర్సెషన్} \text{ సమీపం లో యొక్క} \mathbf{F} = 4 \mathbf{i} + 3 \mathbf{j} + 4 \mathbf{k} \text{ ఎందుకంటే}

వస్తు పైకి మృదులంపైతంటే. \((2, 3, 4)\) సమీపం నుండి అని ఉండాలంటే వచ్చి ఎందుకంటే  

(ఎందుకంటే మృదులంపైచిందు పైచిందు)

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: 8643512005 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
A solid disc of radius ‘a’ and mass ‘m’ rolls down without slipping on an inclined plane making an angle $\theta$ with the horizontal. The acceleration of the disc will be $\frac{2}{b} g \sin \theta$ where $b$ is _________. (Round off to the Nearest Integer)

($g =$ acceleration due to gravity
$\theta =$ angle as shown in figure)
For an ideal heat engine, the temperature of the source is 127°C. In order to have 60% efficiency the temperature of the sink should be __________°C. (Round off to the Nearest Integer)

100
In a parallel plate capacitor set up, the plate area of capacitor is 2 m² and the plates are separated by 1 m. If the space between the plates are filled with a dielectric material of thickness 0.5 m and area 2 m² (see fig) the capacitance of the set-up will be __________ ε₀. (Dielectric constant of the material = 3.2) (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 : 27 Question Id : 8643512007 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The energy dissipated by a resistor is 10 mJ in 1 s when an electric current of 2 mA flows through it. The resistance is \( \frac{10 \text{ mJ}}{1 \text{ s} \times 2 \text{ mA}} \). (Round off to the Nearest Integer)
1 s ² 2 mA విత్తి కునాగా అయి రిసిటర్ సాంచి సాధ్యం చాలా 10 mJ. రిసిటర్ రేట్స్_________Ω. (అంటే లిప్యాన్ రేట్స్ లిప్యాన్ రిసిటర్ అంశాలు)

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

A deviation of 2° is produced in the yellow ray when prism of crown and flint glass are achromatically combined. Taking dispersive powers of crown and flint glass as 0.02 and 0.03 respectively and refractive index for yellow light for these glasses are 1.5 and 1.6 respectively. The refracting angles for crown glass prism will be _________° (in degree). (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

ప్రిస్మ్ కునాగా అయి రిసిటర్ దృశ్యానికి సరిమాట్ సాధ్యం చాలా 10 mJ. రిసిటర్ రేట్స్_________Ω. (అంటే లిప్యాన్ రేట్స్ లిప్యాన్ రిసిటర్ అంశాలు)

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Question Number : 30  Question Id : 8643512010  Question Type : SA
Correct Marks : 4  Wrong Marks : 0
A closed organ pipe of length L and an open organ pipe contain gases of densities $\rho_1$ and $\rho_2$ respectively. The compressibility of gases are equal in both the pipes. Both the pipes are vibrating in their first overtone with same frequency. The length of the open pipe is $\frac{x}{3} L \sqrt{\frac{\rho_1}{\rho_2}}$
where $x$ 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
Chemistry Section A

Question Number : 31 Question Id : 8643512011 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The INCORRECT statement regarding the structure of \( C_{60} \) is:

Options :

8643516031. It contains 12 six-membered rings and 24 five-membered rings.

8643516032. The six-membered rings are fused to both six and five-membered rings.

8643516033. The five-membered rings are fused only to six-membered rings.

8643516034. Each carbon atom forms three sigma bonds.

Question Number : 31 Question Id : 8643512011 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\( C_{60} \) నుండి ఎంత కాంప్రేజ్లు అయితే 12 వినియుంచే అంట-పాకిన కాంప్రేజ్లు అయితే 24 కాంప్రేజ్లు?

Options :

8643516031. ఒకే చేసిన కాంప్రేజ్లు 12 వినియుంచే అంట-పాకిన కాంప్రేజ్లు అయితే 24 కాంప్రేజ్లు.

8643516032. అంట-పాకిన కాంప్రేజ్లు అయితే, అంట-పాకిన అంట-పాకిన కాంప్రేజ్లు కాంప్రేజ్లు ఒకే (fused) సూక్షమం.

8643516033.
The INCORRECT statements below regarding colloidal solutions is:

Options:

8643516035. A colloid solution shows colligative properties.
8643516036. A colloid solution shows Brownian motion of colloidal particles.
8643516037. The flocculating power of Al\(^{3+}\) is more than that of Na\(^+\).
8643516038. An ordinary filter paper can stop the flow of colloidal particles.
The characteristics of elements X, Y and Z with atomic numbers, respectively, 33, 53 and 83 are:

Options:
8643516039. X, Y and Z are metals.
8643516040. X and Z are non-metals and Y is a metalloid.
8643516041. X is a metalloid, Y is a non-metal and Z is a metal.
8643516042. X and Y are metalloids and Z is a metal.

Question Number : 33 Question Id : 8643512013 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following reduction reaction CANNOT be carried out with coke?

Options:
8643516039. Fe₂O₃ → Fe
8643516040. ZnO → Zn
8643516041. Cu₂O → Cu
8643516042. PbO → Pb

Question Number : 34 Question Id : 8643512014 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following reduction reaction CANNOT be carried out with coke?
\[ \text{Al}_2\text{O}_3 \rightarrow \text{Al} \]

8643516046.

**Question Number : 34**  
**Question Id : 8643512014**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

**Options :**

8643516043. \[ \text{Fe}_2\text{O}_3 \rightarrow \text{Fe} \]

8643516044. \[ \text{ZnO} \rightarrow \text{Zn} \]

8643516045. \[ \text{Cu}_2\text{O} \rightarrow \text{Cu} \]

8643516046. \[ \text{Al}_2\text{O}_3 \rightarrow \text{Al} \]

**Question Number : 35**  
**Question Id : 8643512015**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

The correct statements about \( \text{H}_2\text{O}_2 \) are:

(A) used in the treatment of effluents.

(B) used as both oxidising and reducing agents.

(C) the two hydroxyl groups lie in the same plane.

(D) miscible with water.

Choose the correct answer from the options given below:

**Options :**

8643516047. (A), (B) and (D) only

8643516048. (B), (C) and (D) only

8643516049. (A), (C) and (D) only

8643516050. (A), (B), (C) and (D)
Question Number : 35 Question Id : 8643512015 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ \text{H}_2\text{O}_2 \quad \text{is not treated as a mixture.} \]

(A)  ప్రమాణీకుడు (effluents) చేయడానికి (treatment) ఇది భాగానికి కొత్తాలు.

(B) ప్రమాణీకుడు రోడులు గుర్తించడానికి బహుళంగా కొత్తాలు.

(C) ఇది ప్రమాణీకుడు రోడులుగా ఇది కట్టడం కొత్తాలు.

(D) ప్రమాణీకుడు సమూహానికి (miscible).

ఇది ప్రమాణీకుడు రోడు లోగా కొత్తాలు నిర్ధిష్టంగా సృష్టింపడం కొత్తాలు.

Options:
8643516047. (A), (B) నిలోత్ప (D) యొక్క ప్రమాణీకుడు
8643516048. (B), (C) నిలోత్ప (D) యొక్క ప్రమాణీకుడు
8643516049. (A), (C) నిలోత్ప (D) యొక్క ప్రమాణీకుడు
8643516050. (A), (B), (C) నిలోత్ప (D)

Question Number : 36 Question Id : 8643512016 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Identify the elements X and Y using the ionisation energy values given below:

<table>
<thead>
<tr>
<th>Elements</th>
<th>1st Ionization Energy (kJ/mol)</th>
<th>2nd Ionization Energy (kJ/mol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>495</td>
<td>4563</td>
</tr>
<tr>
<td>Y</td>
<td>731</td>
<td>1450</td>
</tr>
</tbody>
</table>

Options:
8643516051. \( X = \text{Na}; Y = \text{Mg} \)
8643516052. \( X = \text{Mg}; Y = \text{Na} \)
8643516053. \[ X = F ; \quad Y = Mg \]

8643516054. \[ X = Mg ; \quad Y = F \]

**Question Number : 36**  
**Question Id : 8643512016**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

<table>
<thead>
<tr>
<th>X</th>
<th>1st</th>
<th>2nd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>731</td>
<td>1450</td>
</tr>
</tbody>
</table>

**Options :**

8643516051. \[ X = Na ; \quad Y = Mg \]

8643516052. \[ X = Mg ; \quad Y = Na \]

8643516053. \[ X = F ; \quad Y = Mg \]

8643516054. \[ X = Mg ; \quad Y = F \]

**Question Number : 37**  
**Question Id : 8643512017**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

The exact volumes of 1 M NaOH solution required to neutralise 50 mL of 1 M H₃PO₃ solution and 100 mL of 2 M H₃PO₂ solution, respectively, are:

**Options :**

8643516055. 50 mL and 50 mL

8643516056. 100 mL and 50 mL

8643516057. 100 mL and 200 mL

8643516058. 100 mL and 100 mL
50 mL of 1 M H₃PO₃ is mixed 100 mL of 2 M H₃PO₂ and excess NaOH to prepare 1 M NaOH.

Options:
8643516055. 50 mL 1 M 50 mL 1 M
8643516056. 100 mL 1 M 50 mL
8643516057. 100 mL 1 M 200 mL
8643516058. 100 mL 1 M 100 mL

Arrange the following metal complex/compounds in the increasing order of spin only magnetic moment. Assume all the three, high spin system.
(Atomic numbers Ce = 58, Gd = 64 and Eu = 63)

(a) (NH₄)₂[Ce(NO₃)₆]  (b) Gd(NO₃)₃ and  (c) Eu(NO₃)₃

Answer is:
Options:
8643516059. (a) < (b) < (c)
8643516060. (a) < (c) < (b)
8643516061. (b) < (a) < (c)
8643516062. (c) < (a) < (b)
[(NH₄)₂[Ce(NO₃)₆]] (b) Gd(NO₃)₃ (c) Eu(NO₃)₃

Question Number : 39  Question Id : 8643512019  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

Fex₂ and Fey₃ are known when x and y are :

Options :
8643516063. x=F, Cl, Br, I and y=F, Cl, Br, I
8643516064. x=F, Cl, Br, I and y=F, Cl, Br
8643516065. x=F, Cl, Br and y=F, Cl, Br, I
8643516066. x=Cl, Br, I and y=F, Cl, Br, I
Question Number : 40  Question Id : 8643512020  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

The green house gas/es is (are) :
(A) Carbon dioxide  
(B) Oxygen  
(C) Water vapour  
(D) Methane  
Choose the most appropriate answer from the options given below:
Options :
(A) only

8643516067.

(A) and (C) only

8643516068.

(A), (C) and (D) only

8643516069.

(A) and (B) only

8643516070.
Question Number : 41 Question Id : 8643512021 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Match List-I with List-II:

<table>
<thead>
<tr>
<th>List-I</th>
<th>List-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test/Reagents/Observation(s)</td>
<td>Species detected</td>
</tr>
<tr>
<td>(a) Lassaigne’s Test</td>
<td>(i) Carbon</td>
</tr>
<tr>
<td>(b) Cu(II) oxide</td>
<td>(ii) Sulphur</td>
</tr>
<tr>
<td>(c) Silver nitrate</td>
<td>(iii) N, S, P, and halogen</td>
</tr>
<tr>
<td>(d) The sodium fusion extract gives black precipitate with acetic acid and lead acetate</td>
<td>(iv) Halogen Specifically</td>
</tr>
</tbody>
</table>

The correct match is:

Options :

8643516071.  (a)-(i), (b)-(iii), (c)-(iv), (d)-(iii)
8643516072. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
8643516073. (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
8643516074. (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

Question Number : 41 Question Id : 8643512021 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Options :
(a) (b) (c) (d)
Correct Marks : 4 Wrong Marks : 1

Statement I : Sodium hydride can be used as an oxidising agent.

Statement II : The lone pair of electrons on nitrogen in pyridine makes it basic.

Choose the CORRECT answer from the options given below:

Options:
8643516075. Both statement I and statement II are true

8643516076. Both statement I and statement II are false

8643516077. Statement I is true but statement II is false

8643516078. Statement I is false but statement II is true

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Question Number : 42 Question Id : 8643512022 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Statement I : నాయ్డీ ఇస్త్రిని చెపుతున్న సాగుత్రావు వస్తుంది.

Statement II : మీదిన నీరు విలుసే ప్రాంతం యొక్క దానులను అందచేసడంతో యొక్క లభించడం వేయబడింది.

Options:
8643516075. నాయ్డీ ఇస్త్రిని చెపుతున్న సాగుత్రావు వస్తుంది కాని

8643516076. నాయ్డీ ఇస్త్రిని చెపుతున్న సాగుత్రావు కాని లభించడం వేయబడింది.

8643516077. నాయ్డీ ఇస్త్రిని చెపుతున్న సాగుత్రావు కాని లభించడం వేయబడింది

8643516078. నాయ్డీ ఇస్త్రిని చెపుతున్న సాగుత్రావు కాని లభించడం వేయబడింది.

---

Question Number : 43 Question Id : 8643512023 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
An unsaturated hydrocarbon X on ozonolysis gives A. Compound A when warmed with ammonical silver nitrate forms a bright silver mirror along the sides of the test tube. The unsaturated hydrocarbon X is:

Options:

\[ \text{CH}_3 - \text{C} = \text{C} - \text{CH}_3 \]
8643516079.

\[ \text{CH}_3 - \text{C} = \text{C} - \text{CH}_3 \]
\[ \begin{array} \text{CH}_3 \text{CH}_3 \end{array} \]
8643516080.

\[ \text{HC} = \text{C} - \text{CH}_2 - \text{CH}_3 \]
8643516081.

\[ \begin{array} \text{CH}_3 \text{CH}_3 \text{C} = \end{array} \]
8643516082.
Identify the reagent(s) ‘A’ and condition(s) for the reaction

Options:
8643516083. $A = \text{Cl}_2$; dark, Anhydrous AlCl$_3$

8643516084. $A = \text{HCl}$, ZnCl$_2$

8643516085. $A = \text{Cl}_2$; UV light

8643516086. $A = \text{HCl}$; Anhydrous AlCl$_3$

Identify the reagent(s) ‘A’ and condition(s) for the reaction in Telugu

సంవత్సరంలో జరిపబడిన రాశిలు (అంశాలు) ‘A’ నాణాను నితయానికి (అంశాలు) బట్టి ఉండి?

Options:
8643516083. $A = \text{Cl}_2$; dark (ఎంతికి), అనాభి ఆలిచ్చరు

8643516084. $A = \text{HCl}$, ZnCl$_2$

8643516085. $A = \text{Cl}_2$; UV పొలి

8643516086. $A = \text{HCl}$; Anhydrous AlCl$_3$
A = HCl; एलिट एलसिली म्युड्रायल

Question Number : 45 Question Id : 8643512025 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

![Chemical Reaction](image1)

In the above reaction, the reagent "A" is:

Options:

- LiAlH₄
- Alkaline KMnO₄, H⁺
- HCl, Zn-Hg
- NaBH₄, H₃O⁺

Question Number : 45 Question Id : 8643512025 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

![Chemical Reaction](image2)

हेलेन मार्गल रेजिंट "A":

Options:

- LiAlH₄
- Alkaline KMnO₄, H⁺
The structure of $X$ is:

Options:

- ![Option 1](image1)
- ![Option 2](image2)
- ![Option 3](image3)
Question Number : 46  Question Id : 8643512026  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

\[
\text{CN} \quad \xrightarrow{(i) \text{ C}_6\text{H}_5\text{MgBr}, \text{ Ether, dry}} \quad \text{OCH}_3 \\
\text{C}_6\text{H}_5 \quad \xrightarrow{(ii) \text{H}_3\text{O}^+} \quad \text{X} \quad (\text{ప్రశ్న} \text{ ప్రతిస్థాపన)}
\]

X ఉస్తుతీసం : 

Options :

\[
\text{O} \quad \xrightarrow{} \quad \text{C}_6\text{H}_5 \\
\text{C}_6\text{H}_5 \quad \xrightarrow{} \quad \text{OCH}_3 \\
\text{NH}_2 \quad \xrightarrow{} \quad \text{C}_6\text{H}_5 \\
\text{NH}_2 \quad \xrightarrow{} \quad \text{C}_6\text{H}_5
\]
Which of the following is least basic?

Options:

1. \((\text{CH}_3\text{CO})_2\text{NH}\)
2. \((\text{C}_2\text{H}_5)_2\text{NH}\)
3. \((\text{CH}_3\text{CO})\text{NHC}_2\text{H}_5\)
4. \((\text{C}_2\text{H}_5)_3\text{N}\)
Ammonolysis of Alkyl halides followed by the treatment with NaOH solution can be used to prepare primary, secondary and tertiary amines. The purpose of NaOH in the reaction is:

Options:

8643516099. to remove basic impurities
8643516100. to activate NH₃ used in the reaction
8643516101. to increase the reactivity of alkyl halide
8643516102. to remove acidic impurities

Question Number : 49 Question Id : 8643512029 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Which of the following polymer is used in the manufacture of wood laminates?

Options:

8643516103. Melamine formaldehyde resin
8643516104. Urea formaldehyde resin

8643516105. *cis*-poly isoprene

8643516106. Phenol and formaldehyde resin

**Question Number : 49 Question Id : 8643512029 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

What is the common name of wood? (wood) వందల నామంచే ఎదుగుపెట్టి?

**Options :**

8643516103. వందల నామంచే ఎదుగుపెట్టడు

8643516104. వందల నామంచే ఎదుగుపెట్టడు

8643516105. వందల నామంచే ఎదుగుపెట్టడు

8643516106. వందల నామంచే ఎదుగుపెట్టడు

**Question Number : 50 Question Id : 8643512030 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The secondary structure of protein is stabilised by:

**Options :**

8643516107. van der Waals forces

8643516108. Peptide bond

8643516109. Hydrogen bonding

8643516110. glycosidic bond
When 35 mL of 0.15 M lead nitrate solution is mixed with 20 mL of 0.12 M chromic sulphate solution, \( \text{________} \times 10^{-5} \) moles of lead sulphate precipitate out. (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 : 8643512031 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

35 mL of 0.15 M HCl and 20 mL of 0.12 M HCl are mixed. The HCl concentration after mixing is


\[ \text{[HCl]} = \frac{35 \times 0.15 + 20 \times 0.12}{35 + 20} \text{ M} \]

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 : 8643512032 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Ga (atomic mass 70 u) crystallizes in a hexagonal close packed structure. The total number of voids in 0.581 g of Ga is

\[ \text{[Given : } N_A = 6.023 \times 10^{23}] \]

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

100
The number of orbitals with \( n = 5, m_1 = +2 \) 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
25°C లో, 50 g వాటి HCl ఉపయోగించి FeCl₂ ను సింటేషన్ చేసేందుకు, 1 bar యొక్క స్ప్రెస్స్యూప్ తాకపెట్టించినపుడు. తూర్పు ఉపయోగించిన FeCl₂ మంది ఎంత ఉంది?

\[ R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}. \quad \text{ముగించండి ముగించండి ఎంత ఉంది?} \]

\[ \text{[ Fe నిర్ధారణ ఫిషా యు = 55.85 u]} \]

**Question Number : 55 Question Id : 8643512035 Question Type : SA**
**Correct Marks : 4 Wrong Marks : 0**

At 363 K, the vapour pressure of A is 21 kPa and that of B is 18 kPa. One mole of A and 2 moles of B are mixed. Assuming that this solution is ideal, the vapour pressure of the mixture is _________ kPa. (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 : 55 Question Id : 8643512035 Question Type : SA**
**Correct Marks : 4 Wrong Marks : 0**

363 K లో, A మిది 21 kPa ను సింటేషన్ చేసడం కంటే B మిది 18 kPa. అంటే A మిది 2 మిది B మిది సించి చేసి. ముగించిన (ఎంపిక) ఎంతపైపితోనే ఎంతపైపితోనే, ముగించిన (ఎంపిక) ఎంతపైపితోనే ఎంతపైపితోనే _________ kPa. (అంటే ముగించిన (ఎంపిక) ఎంతపైపితోనే ఎంతపైపితోనే ఎంతపైపితోనే).

**Response Type : Numeric**
**Evaluation Required For SA : Yes**
**Show Word Count : Yes**
**Answers Type : Equal**
**Text Areas : PlainText**
Sulphurous acid (H₂SO₃) has Ka₁ = 1.7 × 10⁻² and Ka₂ = 6.4 × 10⁻⁸. The pH of 0.588 M H₂SO₃ 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

A 5.0 m mol dm⁻³ aqueous solution of KCl has a conductance of 0.55 mS when measured in a cell of cell constant 1.3 cm⁻¹. The molar conductivity of this solution is ________ mSm² mol⁻¹. (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: 8643512037  Question Type: SA
Correct Marks: 4  Wrong Marks: 0

\[ \text{conductance} \, 0.55 \, \text{mS} \, \text{m}^2 \, \text{mol}^{-1}. \, \text{The} \, \text{conductance} \, \text{of} \, 5.0 \, \text{mmol dm}^{-3} \, \text{KCl} \, \text{saturated} \, \text{solution} \, \text{is} \, \text{given} \, \text{as} \, 1.3 \, \text{cm}^{-1}. \]

Response Type: Numeric
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers: 100

Question Number: 58  Question Id: 8643512038  Question Type: SA
Correct Marks: 4  Wrong Marks: 0

A and B decompose via first order kinetics with half-lives 54.0 min and 18.0 min respectively. Starting from an equimolar non-reactive mixture of A and B, the time taken for the concentration of A to become 16 times that of B is \[ \text{________} \, \text{min}. \] (Round off to the Nearest Integer).

Response Type: Numeric
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers: 100

Question Number: 58  Question Id: 8643512038  Question Type: SA
Correct Marks: 4  Wrong Marks: 0

A and B decompose via first order kinetics with half-lives 54.0 min and 18.0 min respectively. Starting from an equimolar non-reactive mixture of A and B, the time taken for the concentration of A to become 16 times that of B is \[ \text{________} \, \text{min}. \] (Round off to the Nearest Integer).

Response Type: Numeric
Show Word Count: Yes
[\text{Ti(H}_2\text{O})_6\text{]}^{3+} \text{ absorbs light of wavelength 498 nm during a } d-d \text{ transition. The octahedral splitting energy for the above complex is } \underline{\quad} \times 10^{-19} \text{ J. (Round off to the Nearest Integer). } \quad h = 6.626 \times 10^{-34} \text{ Js; } c = 3 \times 10^8 \text{ ms}^{-1}

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

100

\text{[Ti(H}_2\text{O})_6\text{]}^{3+}, 498 \text{ nm సంభాగానికి ఉండి అయితే } d-d \text{ అంతర్భాగచేయంతే దీని పరిమితం. కనే పైపు అంతర్భాగానికి మలిన నంబర్ పరిమితం. } \quad h = 6.626 \times 10^{-34} \text{ Js; } c = 3 \times 10^8 \text{ ms}^{-1}

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

100

\text{In Duma’s method of estimation of nitrogen, 0.1840 g of an organic compound gave 30 mL of nitrogen collected at 287 K and 758 mm of Hg pressure. The percentage composition of nitrogen in the compound is } \underline{\quad}. (Round off to the Nearest Integer).

[Given: Aqueous tension at 287 K = 14 mm of Hg]

\textbf{Response Type: Numeric}
\textbf{Evaluation Required For SA: Yes}
Question Number : 60 Question Id : 8643512040 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

758 mm Hg वाले रंगे 30 mL वाले रंगे का अन्न तथा नमक के मिश्रण का सही आयुक्त करें ___ (नमक की मात्रा 50 mL आयुक्त करें).

[287 K ने 14 mm of Hg]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100
If the foot of the perpendicular from point \((4, 3, 8)\) on the line \(L_1: \frac{x-a}{l} = \frac{y-2}{3} = \frac{z-b}{4} ,\)
\(l \neq 0\) is \((3, 5, 7)\), then the shortest distance between the line \(L_1\) and line
\(L_2: \frac{x - 2}{3} = \frac{y - 4}{4} = \frac{z - 5}{5}\) is equal to:

Options:
\[
\frac{1}{\sqrt{6}} \\
8643516121.
\]
\[
\frac{1}{2} \\
8643516122.
\]
\[
\frac{1}{\sqrt{3}} \\
8643516123.
\]
\[
\frac{\sqrt{2}}{3} \\
8643516124.
\]

Question Number : 61 Question Id : 8643512041 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The equation \(L_1: \frac{x-a}{l} = \frac{y-2}{3} = \frac{z-b}{4} , l \neq 0\) has points \((4, 3, 8)\) and \((3, 5, 7)\)
The equation \(L_1\) intersects the equation \(L_2: \frac{x - 2}{3} = \frac{y - 4}{4} = \frac{z - 5}{5}\) at which coordinates:

Options:
\[
\frac{1}{\sqrt{6}} \\
8643516121.
\]
\[
\frac{1}{2} \\
8643516122.
\]
\[
\frac{1}{\sqrt{3}} \\
8643516123.
\]
Let the lengths of intercepts on x-axis and y-axis made by the circle \( x^2 + y^2 + ax + 2ay + c = 0 \), \((a < 0)\) be \(2\sqrt{2}\) and \(2\sqrt{5}\), respectively. Then the shortest distance from origin to a tangent to this circle which is perpendicular to the line \(x + 2y = 0\), is equal to:

Options :

8643516125. \(\sqrt{10}\)

8643516126. \(\sqrt{11}\)

8643516127. \(\sqrt{7}\)

8643516128. \(\sqrt{6}\)
Let \( \mathbf{a} = \hat{i} + 2 \hat{j} - 3 \hat{k} \) and \( \mathbf{b} = 2 \hat{i} - 3 \hat{j} + 5 \hat{k} \). If \( \mathbf{r} \times \mathbf{a} = \mathbf{b} \times \mathbf{r} \), \( \mathbf{r} \cdot (\alpha \hat{i} + 2 \hat{j} + \hat{k}) = 3 \)

and \( \mathbf{r} \cdot (2 \hat{i} + 5 \hat{j} - \alpha \hat{k}) = -1 \), \( \alpha \in \mathbb{R} \), then the value of \( \alpha + |\mathbf{r}|^2 \) is equal to:

Options:

8643516129. 9
8643516130. 11
8643516131. 13
8643516132. 15

\[\hat{\mathbf{a}} = \hat{i} + 2 \hat{j} - 3 \hat{k}, \quad \hat{\mathbf{b}} = 2 \hat{i} - 3 \hat{j} + 5 \hat{k}, \quad \mathbf{r} \times \hat{\mathbf{a}} = \hat{\mathbf{b}} \times \mathbf{r}, \quad \mathbf{r} \cdot (\alpha \hat{i} + 2 \hat{j} + \hat{k}) = 3 \]

and \( \mathbf{r} \cdot (2 \hat{i} + 5 \hat{j} - \alpha \hat{k}) = -1 \), \( \alpha \in \mathbb{R} \), then \( \alpha + |\mathbf{r}|^2 \) is equal to:

Options:

8643516129. 9
8643516130. 11
8643516131. 13
8643516132. 15

Question Number : 64 Question Id : 8643512044 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let \( f \) be a real valued function, defined on \( \mathbb{R} - \{-1, 1\} \) and given by

\[
f(x) = 3 \log_e \left| \frac{x - 1}{x + 1} \right| - \frac{2}{x - 1}.
\]

Then in which of the following intervals, function \( f(x) \) is increasing?

Options:

\[
(-\infty, \infty) - \{-1, 1\}
\]

\[
(-\infty, -1) \cup \left( \left[ \frac{1}{2}, \infty \right) - \{1\} \right)
\]

\[
(-\infty, \frac{1}{2}] - \{-1\}
\]

\[
(-1, \frac{1}{2}]
\]

Question Number : 64 Question Id : 8643512044 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

\( \mathbb{R} - \{-1, 1\} \) ఎంటియోసి విభాగాల కలపంగా మేపెల్ల్ ఫ ఎంపికి

\[
f(x) = 3 \log_e \left| \frac{x - 1}{x + 1} \right| - \frac{2}{x - 1}
\]

ఇం అంకేయాలు అనేమి. ఖచ్చ దయచేయి అధికారిత ఫ్యాక్స్ ఎంపికి కావాలాం?

Options:

\[
(-\infty, \infty) - \{-1, 1\}
\]

\[
(-\infty, -1) \cup \left( \left[ \frac{1}{2}, \infty \right) - \{1\} \right)
\]

\[
(-\infty, \frac{1}{2}] - \{-1\}
\]

\[
(-1, \frac{1}{2}]
\]
If the points of intersections of the ellipse \( \frac{x^2}{16} + \frac{y^2}{b^2} = 1 \) and the circle \( x^2 + y^2 = 4b \), \( b > 4 \) lie on the curve \( y^2 = 3x^2 \), then \( b \) is equal to:

Options:

8643516137. 5

8643516138. 6

8643516139. 10

8643516140. 12
Let $C$ be the locus of the mirror image of a point on the parabola $y^2 = 4x$ with respect to the line $y = x$. Then the equation of tangent to $C$ at $P(2, 1)$ is:

**Options:**

8643516141. $x + 3y = 5$

8643516142. $2x + y = 5$

8643516143. $x - y = 1$

8643516144. $x + 2y = 4$

---

Let $A$ denote the event that a 6-digit integer formed by 0, 1, 2, 3, 4, 5, 6 without repetitions, be divisible by 3. Then probability of event $A$ is equal to:

**Options:**

8643516145. $\frac{4}{9}$
Question Number : 67 Question Id : 8643512047 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 \( \frac{dy}{dx} + (\tan x) y = \sin x, \; 0 \leq x \leq \frac{\pi}{3} \), with \( y(0) = 0 \), then \( y\left(\frac{\pi}{4}\right) \) equal to :
Options :
\[
\left(\frac{1}{2\sqrt{2}}\right) \log_e 2
\]

8643516149.

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

8643516150.

\[
\log_e 2
\]

8643516151.

\[
\frac{1}{4} \log_e 2
\]

8643516152.

Question Number : 68 Question Id : 8643512048 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[
y(0) = 0 \implies \frac{dy}{dx} + (\tan x) y = \sin x, 0 \leq x \leq \frac{\pi}{3} \implies y = y(x)
\]

\[
y\left(\frac{\pi}{4}\right) = :\]

Options :

\[
\left(\frac{1}{2\sqrt{2}}\right) \log_e 2
\]

8643516149.

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

8643516150.

\[
\log_e 2
8643516151.

\[
\frac{1}{4} \log_e 2
8643516152.

Question Number : 69 Question Id : 8643512049 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
Let $\alpha \in \mathbb{R}$ be such that the function $f(x) = \begin{cases} \frac{\cos^{-1}(1 - \{x\}^2) \sin^{-1}(1 - \{x\})}{\{x\} - \{x\}^3}, & x \neq 0 \\ \alpha, & x = 0 \end{cases}$ is continuous at $x = 0$, where $\{x\} = x - [x]$, $[x]$ is the greatest integer less than or equal to $x$. Then:

**Options:**

8643516153. $\alpha = 0$

8643516154. no such $\alpha$ exists

8643516155. $\alpha = \frac{\pi}{\sqrt{2}}$

8643516156. $\alpha = \frac{\pi}{4}$
If \((x, y, z)\) be an arbitrary point lying on a plane \(P\) which passes through the points \((42, 0, 0), (0, 42, 0)\) and \((0, 0, 42)\), then the value of the expression

\[
3 + \frac{x-11}{(y-19)^2 (z-12)^2} + \frac{y-19}{(x-11)^2 (z-12)^2} + \frac{z-12}{(x-11)^2 (y-19)^2} - \frac{x+y+z}{14(x-11)(y-19)(z-12)}
\]

is equal to:

Options:

8643516157. −45
8643516158. 39
8643516159. 0
8643516160. 3
Let $A = \{2, 3, 4, 5, ..., 30\}$ and $\sim$ be an equivalence relation on $A \times A$, defined by $(a, b) \sim (c, d)$ if and only if $ad = bc$. Then the number of ordered pairs which satisfy this equivalence relation with ordered pair $(4, 3)$ is equal to:

Options:

8643516161. 5
8643516162. 6
8643516163. 7
8643516164. 8
Let $P(x) = x^2 + bx + c$ be a quadratic polynomial with real coefficients such that $\int_{0}^{1} P(x) \, dx = 1$ and $P(x)$ leaves remainder 5 when it is divided by $(x - 2)$. Then the value of $9(b + c)$ is equal to:

Options:

8643516165.
8643516166.
8643516167.
8643516168.
Consider a rectangle ABCD having 5, 7, 6, 9 points in the interior of the line segments AB, CD, BC, DA respectively. Let \( \alpha \) be the number of triangles having these points from different sides as vertices and \( \beta \) be the number of quadrilaterals having these points from different sides as vertices. Then \( (\beta - \alpha) \) is equal to:

Options:

8643516169. 1173
8643516170. 1890
8643516171. 717
8643516172. 795
Consider the integral
\[ I = \int_{0}^{10} \frac{[x]e^{[x]}}{e^{x-1}} \, dx, \]
where \([x]\) denotes the greatest integer less than or equal to \(x\). Then the value of \(I\) is equal to:

Options:

8643516173. \(45\) (e + 1)
8643516174. \(9\) (e + 1)
8643516175. \(45\) (e - 1)
8643516176. \(9\) (e - 1)

Question Number: 75 Question Id: 8643512055 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No Correct Marks: 4 Wrong Marks: 1

Consider the integral
\[ x \text{ అంతర్జాల యొక్క } [x] \text{ నాటిని, } I = \int_{0}^{10} \frac{[x]e^{[x]}}{e^{x-1}} \, dx \text{ లేదా నిఘానం.} \]

అప్పుడు ఇది నిఘాన = :

Options:
8643516173. \(45\) (e + 1)
8643516174. \(9\) (e + 1)
8643516175. \(45\) (e - 1)
8643516176. \(9\) (e - 1)
Let \(A(-1, 1), B(3, 4)\) and \(C(2, 0)\) be given three points. A line \(y = mx, m > 0\), intersects lines \(AC\) and \(BC\) at point \(P\) and \(Q\) respectively. Let \(A_1\) and \(A_2\) be the areas of \(\Delta ABC\) and \(\Delta PQC\) respectively, such that \(A_1 = 3A_2\), then the value of \(m\) is equal to:

Options:

8643516177. \ 1
\[
\frac{4}{15}
\]
8643516178. \ 2
8643516179. \ 3
8643516180. \ 4

---

Let \(A(-1, 1), B(3, 4)\) and \(C(2, 0)\) be given three points. A line \(y = mx, m > 0\), intersects lines \(AC\) and \(BC\) at point \(P\) and \(Q\) respectively. \(\Delta ABC\) and \(\Delta PQC\) are triangles. \(A_1, A_2\) and \(A_1 = 3A_2\) are the areas, \(m\) is the slope of line.

Options:

8643516177. \ 1
\[
\frac{4}{15}
\]
8643516178. \ 2
8643516179. \ 3
8643516180. \ 4
The least value of $|z|$ where $z$ is complex number which satisfies the inequality

$$\exp \left( \frac{(|z| + 3)(|z| - 1)}{|z| + 1} \log_e 2 \right) \geq \log_\sqrt{2} |5\sqrt{7} + 9i|, i = \sqrt{-1},$$ is equal to:

Options:
8643516181. $2$
8643516182. $\sqrt{5}$
8643516183. $3$
8643516184. $8$

Question Number : 76 Question Id : 8643512056 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Question Number : 77 Question Id : 8643512057 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The maximum value of $f(x) = \begin{vmatrix} \sin^2 x & 1 + \cos^2 x & \cos 2x \\ 1 + \sin^2 x & \cos^2 x & \cos 2x \\ \sin^2 x & \cos^2 x & \sin 2x \end{vmatrix}, x \in R$ is:
Question Number : 77 Question Id : 8643512057 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ x \in \mathbb{R}, f(x) = \begin{vmatrix} \sin^2 x & 1 + \cos^2 x & \cos 2x \\ 1 + \sin^2 x & \cos^2 x & \cos 2x \\ \sin^2 x & \cos^2 x & \sin 2x \end{vmatrix}, \text{మీరు కొనసాగి వేసం:} \]

Options :
8643516185. \( \sqrt{5} \)
8643516186. 5
8643516187. \( \sqrt{7} \)
8643516188. \( \frac{3}{4} \)

Question Number : 78 Question Id : 8643512058 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Given that the inverse trigonometric functions take principal values only. Then, the number of real values of \( x \) which satisfy \( \sin^{-1}\left(\frac{3x}{5}\right) + \sin^{-1}\left(\frac{4x}{5}\right) = \sin^{-1} x \) is equal to :

Options :
8643516189. 0
Question Number : 78 Question Id : 8643512058 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ \sin^{-1} \left( \frac{3x}{5} \right) + \sin^{-1} \left( \frac{4x}{5} \right) = \sin^{-1} x \text{ का सहीतौर समस्त मात्रें हैं क्योंकि } x \hfill = \]

Options:
8643516189. 0
8643516190. 1
8643516191. 2
8643516192. 3

Question Number : 79 Question Id : 8643512059 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let \( f : S \rightarrow S \) where \( S = (0, \infty) \) be a twice differentiable function such that \( f(x+1) = xf(x) \). If \( g : S \rightarrow \mathbb{R} \) be defined as \( g(x) = \log_e f(x) \), then the value of \( |g''(5) - g''(1)| \) is equal to :

Options:
\[ \frac{205}{144} \]
8643516193. \[ \frac{205}{144} \]
\[ \frac{197}{144} \]
8643516194. \[ \frac{197}{144} \]
Question Number : 79 Question Id : 8643512059 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ f(x + 1) = xf(x) \] \text{ in } f : S \rightarrow S, \quad S = (0, \infty) \text{ where } f \text{ is a } \log \text{ function.} \quad g : S \rightarrow R \text{ where } g(x) = \log_e f(x) \text{ and } \left| g''(5) - g'(1) \right|. \text{ Find } \int g(x) dx.

Options :

\[ \begin{align*}
8643516193. & \quad 197 \\
8643516194. & \quad 187 \\
8643516195. & \quad 144
\end{align*} \]

8643516196. 1

Question Number : 80 Question Id : 8643512060 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let \( C_1 \) be the curve obtained by the solution of differential equation \( 2xy \frac{dy}{dx} = y^2 - x^2, \ x > 0. \)

Let the curve \( C_2 \) be the solution of \( \frac{2xy}{x^2 - y^2} = \frac{dy}{dx}. \) If both the curves pass through \((1, 1)\), then the area enclosed by the curves \( C_1 \) and \( C_2 \) is equal to :

Options :

\[ \frac{\pi}{4} + 1 \]

8643516197.
\[
\frac{\pi}{2} - 1
\]

8643516200. \( \pi + 1 \)

**Mathematics Section B**

Section Id : 864351138  
Section Number : 6  
Section type : Online  
Mandatory or Optional : Mandatory  
Number of Questions : 10  
Number of Questions to be attempted : 5  
Section Marks : 20
For real numbers $\alpha$, $\beta$, $\gamma$ and $\delta$, if

\[
\int \frac{(x^2-1) + \tan^{-1}\left(\frac{x^2+1}{x}\right)}{(x^4+3x^2+1) \tan^{-1}\left(\frac{x^2+1}{x}\right)} \, dx
\]

\[
= \alpha \log_{e}\left(\tan^{-1}\left(\frac{x^2+1}{x}\right)\right) + \beta \tan^{-1}\left(\frac{\gamma(x^2-1)}{x}\right) + \delta \tan^{-1}\left(\frac{x^2+1}{x}\right) + C
\]

where $C$ is an arbitrary constant, then the value of $10(\alpha + \beta \gamma + \delta)$ is equal to _________.

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:
100
\[
\int \frac{(x^2 - 1) + \tan^{-1}\left(\frac{x^2 + 1}{x}\right)}{(x^4 + 3x^2 + 1) \tan^{-1}\left(\frac{x^2 + 1}{x}\right)} \, dx
\]

\[
= \alpha \log_{e}\left(\tan^{-1}\left(\frac{x^2 + 1}{x}\right)\right) + \beta \tan^{-1}\left(\frac{\gamma(x^2 - 1)}{x}\right) + \delta \tan^{-1}\left(\frac{x^2 + 1}{x}\right) + C
\]

(अनुसार C एक अचर होगा) एक वास्तविक गणितीय अभीभूत, \(10(\alpha + \beta \gamma + \delta)\) के मूल्य वाला ___________.

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 : 8643512062 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

In \(\triangle ABC\), the lengths of sides AC and AB are 12 cm and 5 cm, respectively. If the area of \(\triangle ABC\) is 30 cm² and \(R\) and \(r\) are respectively the radii of circumcircle and incircle of \(\triangle ABC\), then the value of \(2R + r\) (in cm) 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 : 8643512062 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The distance of the point \((1, -2, 3)\) from the plane \(x + 2y - 3z + 10 = 0\) measured parallel to the line \(\frac{x-1}{3} = \frac{2-y}{m} = \frac{z+3}{1}\) is \(\frac{\sqrt{7}}{2}\), then the value of \(|m|\) 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: 8643512063 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

The distance of the point \((1, -2, 3)\) from the plane \(x + 2y - 3z + 10 = 0\) measured parallel to the line \(\frac{x-1}{3} = \frac{2-y}{m} = \frac{z+3}{1}\) is \(\frac{\sqrt{7}}{2}\), then the value of \(|m|\) 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: 8643512063 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

The distance of the point \((1, -2, 3)\) from the plane \(x + 2y - 3z + 10 = 0\) measured parallel to the line \(\frac{x-1}{3} = \frac{2-y}{m} = \frac{z+3}{1}\) is \(\frac{\sqrt{7}}{2}\), then the value of \(|m|\) is equal to \(\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\) 

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers: 100
Let \( \vec{c} \) be a vector perpendicular to the vectors \( \vec{a} = \hat{i} + \hat{j} - \hat{k} \) and \( \vec{b} = \hat{i} + 2\hat{j} + \hat{k} \). If
\[
\vec{c} \cdot (\hat{i} + \hat{j} + 3\hat{k}) = 8
\]
then the value of \( \vec{c} \cdot (\vec{a} \times \vec{b}) \) is equal to __________.

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

Let \( \vec{a} = \hat{i} + \hat{j} - \hat{k} \) and \( \vec{b} = \hat{i} + 2\hat{j} + \hat{k} \). Then \( \vec{a} \times \vec{b} \) is__

\[
\vec{c} \cdot (\hat{i} + \hat{j} + 3\hat{k}) = 8 \quad \text{and} \quad \vec{c} \cdot (\vec{a} \times \vec{b}) \quad \text{is} \quad \text{__________}.
\]

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

Let \( f : R \to R \) and \( g : R \to R \) be defined as
\[
f(x) = \begin{cases} 
  x + a, & x < 0 \\
  |x - 1|, & x \geq 0
\end{cases}
\quad \text{and} \quad g(x) = \begin{cases} 
  x + 1, & x < 0 \\
  (x - 1)^2 + b, & x \geq 0
\end{cases}
\]
where \( a, b \) are non-negative real numbers. If \((g \circ f)(x)\) is continuous for all \( x \in R \), then \( a + b \) is equal to __________.

Response Type: Numeric
Evaluation Required For SA: Yes
Question Number : 85 Question Id : 8643512065 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\[ f : \mathbb{R} \to \mathbb{R}, \quad g : \mathbb{R} \to \mathbb{R} \]

\[
\begin{align*}
    f(x) &= \begin{cases} 
        x + a, & x < 0 \\
        |x - 1|, & x \geq 0
    \end{cases} \\
g(x) &= \begin{cases} 
        x + 1, & x < 0 \\
        (x - 1)^2 + b, & x \geq 0
    \end{cases}
\end{align*}
\]

Therefore, \( a + b = \) __________.

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

Question Number : 86 Question Id : 8643512066 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Consider the statistics of two sets of observations as follows:

<table>
<thead>
<tr>
<th>Size</th>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation I</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Observation II</td>
<td>n</td>
<td>3</td>
</tr>
</tbody>
</table>

If the variance of the combined set of these two observations is \( \frac{17}{9} \), then the value of \( n \) 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 : 86 Question Id : 8643512066 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

100

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 : 8643512067 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $n$ be a positive integer. Let $A = \sum_{k=0}^{n} (-1)^k \binom{n}{k} \left[ \left(\frac{1}{2}\right)^k + \left(\frac{3}{4}\right)^k + \left(\frac{7}{8}\right)^k + \left(\frac{15}{16}\right)^k + \left(\frac{31}{32}\right)^k \right]$

If $63A = 1 - \frac{1}{2^{30}}$, then $n$ is equal to ________.

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

100
\[
A = \sum_{k=0}^{n} (-1)^k n C_k \left[ \left( \frac{1}{2} \right)^k + \left( \frac{3}{4} \right)^k + \left( \frac{7}{8} \right)^k + \left( \frac{15}{16} \right)^k + \left( \frac{31}{32} \right)^k \right]
\]

Therefore, \( 63A = 1 - \frac{1}{2^{30}} \), and hence \( n = \boxed{100} \).

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 : 8643512068  Question Type : SA
Correct Marks : 4  Wrong Marks : 0

Let \( A = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} \) and \( B = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} \) be two \( 2 \times 1 \) matrices with real entries such that \( A = XB \), where

\[
X = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ k \end{bmatrix}, \quad \text{and} \quad k \in \mathbb{R}.
\]

If \( a_1^2 + a_2^2 = \frac{2}{3} (b_1^2 + b_2^2) \) and \((k^2 + 1) b_2^2 \neq -2 b_1 b_2 \), then the value of \( k \) is \boxed{100}.

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 : 8643512068  Question Type : SA
Correct Marks : 4  Wrong Marks : 0

\[
A = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}
\]

\( A \) and \( B \) are two \( 2 \times 1 \) matrices with real entries. If \( A = XB \), where

\[
X = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 \\ 1 \\ k \end{bmatrix}, \quad k \in \mathbb{R}.
\]

If \( a_1^2 + a_2^2 = \frac{2}{3} (b_1^2 + b_2^2) \) and \((k^2 + 1) b_2^2 \neq -2 b_1 b_2 \), then the value of \( k \) is \boxed{100}.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100
Let $\frac{1}{16}$, $a$ and $b$ be in G.P. and $\frac{1}{a}$, $\frac{1}{b}$, $6$ be in A.P., where $a$, $b > 0$. Then $72(a + b)$ is equal to

__________.

Question Number : 89 Question Id : 8643512069 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 : 89 Question Id : 8643512069 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let $\frac{1}{16}$, $a$ and $b$ be in G.P. and $\frac{1}{a}$, $\frac{1}{b}$, $6$ be in A.P., where $a$, $b > 0$. Then $72(a + b)$ 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 : 8643512070 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let

$S_n(x) = \log_{a/2} x + \log_{a/3} x + \log_{a/6} x + \log_{a/11} x + \log_{a/18} x + \log_{a/27} x + ...$ up to $n$-terms,

where $a > 1$. If $S_{24}(x) = 1093$ and $S_{12}(2x) = 265$, then value of $a$ is equal to

__________.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100
\[ S_n(x) = \log_{a^{1/2}} x + \log_{a^{1/3}} x + \log_{a^{1/6}} x + \log_{a^{1/11}} x + \log_{a^{1/18}} x + \log_{a^{1/27}} x + \ldots \]

\[ \text{Given } a > 1. \ S_{24}(x) = 1093 \text{ and } S_{12}(2x) = 265. \text{ Find } x. \]

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