National Testing Agency

Question Paper Name :	B Tech 26082021 Shift 2
Subject Name :	B TECH
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Display Marks:	Yes

B TECH

Group Number :	1
Group Id :	864351246
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 :	864351914
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20

Question Number : 1 Question Id : 86435120170 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Match **List - I** with **List - II** :

	List - I		List - II
(a)	Magnetic Induction	(i)	$ML^2T^{-2}A^{-1}$
(b)	Magnetic Flux	(ii)	$M^0L^{-1}A$
(c)	Magnetic Permeability	(iii)	$MT^{-2}A^{-1}$
(d)	Magnetization	(iv)	$MLT^{-2}A^{-2}$

Choose the **most appropriate** answer from the options given below :

Options :

86435167091. (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

86435167092. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

86435167093. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

86435167094. (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

Question Number : 2 Question Id : 86435120171 Question Type : MCQ Option Shuffling : Yes Is Q **Correct Marks : 4 Wrong Marks : 1**

A transmitting antenna at top of a tower has a height of 50 m and the height of receiving antenna is 80 m. What is the range of communication for Line of Sight (LoS) mode ?

[use radius of earth $= 6400$ km]

Options :

86435167095. 45.5 km

86435167096. 80.2 km

86435167097. 144.1 km

86435167098. 57.28 km

Question Number : 3 Question Id : 86435120172 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If the length of the pendulum in pendulum clock increases by 0.1%, then the error in time per day is :

Options :

86435167099. 86.4 s

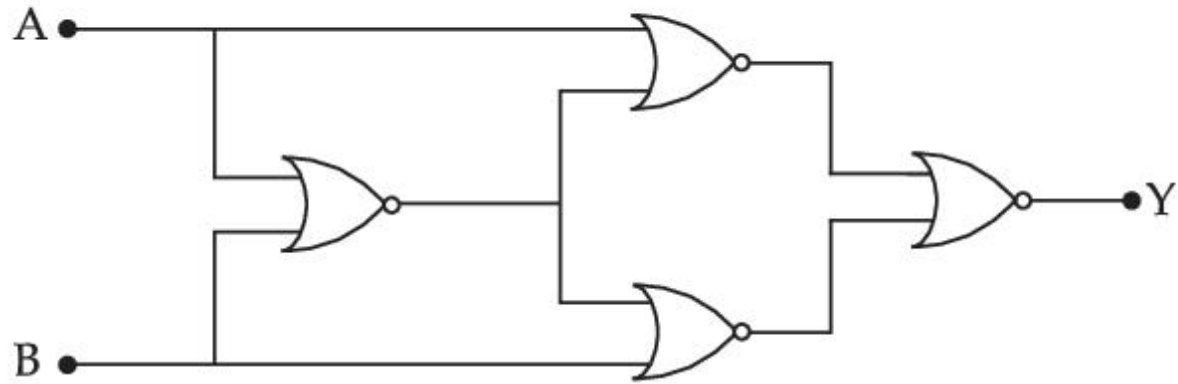86435167100. 8.64 s

86435167101. 43.2 s

86435167102. 4.32 s

Four NOR gates are connected as shown in figure. The truth table for the given figure is :

Options :

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

86435167103.

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

86435167104.

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

86435167105.

A	B	Y
0	0	0
0	1	1
1	0	0
1	1	1

86435167106.

Question Number : 5 Question Id : 86435120174 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A bomb is dropped by a fighter plane flying horizontally. To an observer sitting in the plane, the trajectory of the bomb is a :

Options :

86435167107. parabola in the direction of motion of plane

86435167108. straight line vertically down the plane

86435167109. parabola in a direction opposite to the motion of plane
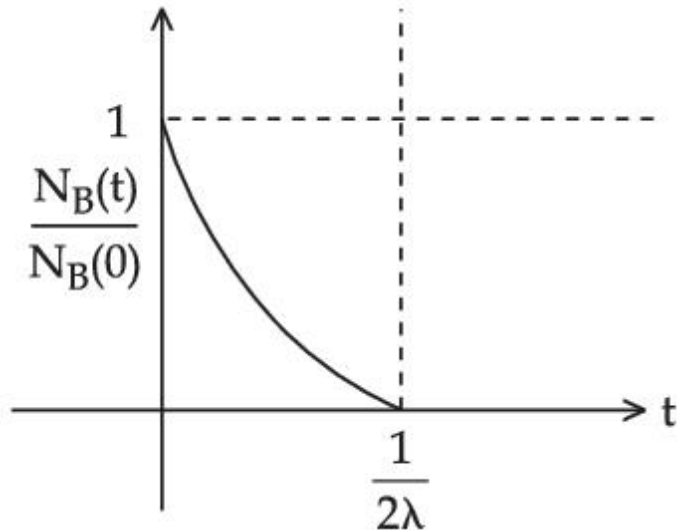
86435167110. hyperbola

Question Number : 6 Question Id : 86435120175 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
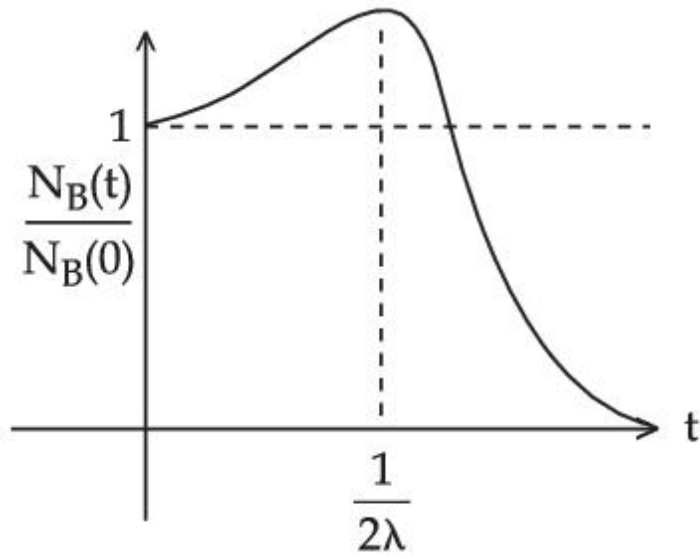**Correct Marks : 4 Wrong Marks : 1**

At time $t = 0$, a material is composed of two radioactive atoms A and B, where $N_A(0) = 2N_B(0)$. The decay constant of both kind of radioactive atoms is λ. However, A disintegrates to B and B disintegrates to C. Which of the following figures represents the evolution of $N_B(t)/N_B(0)$ with respect to time t ?

$$\begin{bmatrix} N_A(0) = \text{No. of A atoms at } t = 0 \\ N_B(0) = \text{No. of B atoms at } t = 0 \end{bmatrix}$$
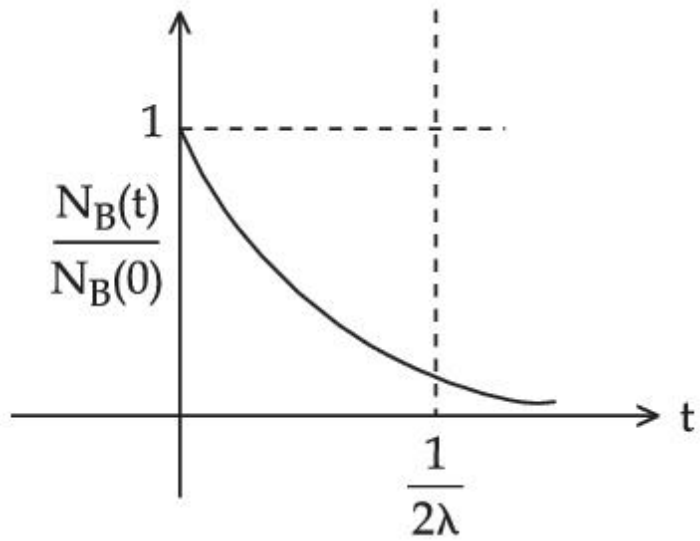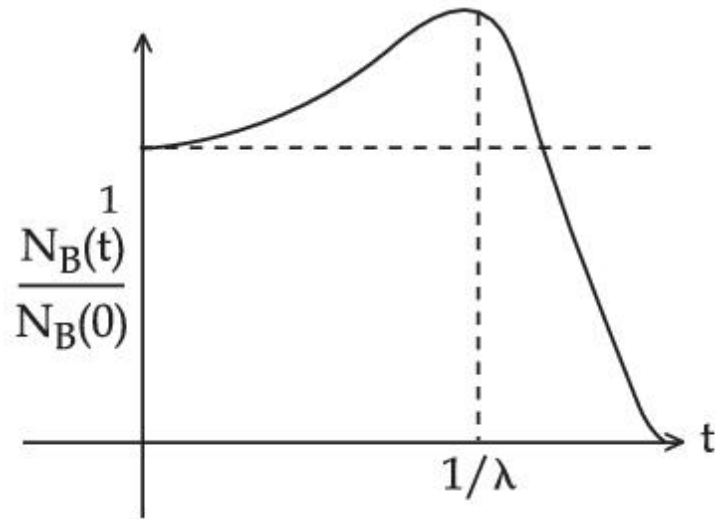
Options :

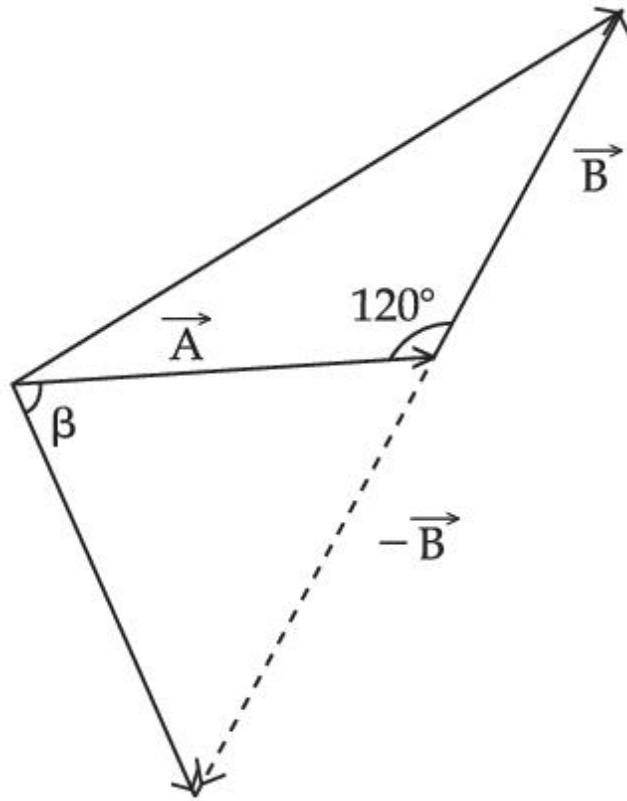86435167111.

86435167112.

86435167113.

86435167114.

Question Number : 7 Question Id : 86435120176 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The angle between vector $\left(\vec{A}\right)$ and $\left(\vec{A} - \vec{B}\right)$ is :

Options :

86435167115. $\tan^{-1}\left(\dfrac{A}{0.7\ B}\right)$

86435167116. $\tan^{-1}\left(\dfrac{\sqrt{3}\ B}{2A - B}\right)$

$$\tan^{-1}\left(\frac{B\cos\theta}{A - B\sin\theta}\right)$$

$$\tan^{-1}\left(\frac{-\dfrac{B}{2}}{A - B\dfrac{\sqrt{3}}{2}}\right)$$

86435167118.

Question Number : 8 Question Id : 86435120177 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The de-Broglie wavelength of a particle having kinetic energy E is λ. How much extra energy must be given to this particle so that the de-Broglie wavelength reduces to 75% of the initial value ?

Options :

86435167119. E

86435167120. $\dfrac{1}{9}$ E

86435167121. $\dfrac{7}{9}$ E

86435167122. $\dfrac{16}{9}$ E

Question Number : 9 Question Id : 86435120178 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A particle of mass m is suspended from a ceiling through a string of length L. The particle moves in a horizontal circle of radius r such that $r = \dfrac{L}{\sqrt{2}}$. The speed of particle will be :
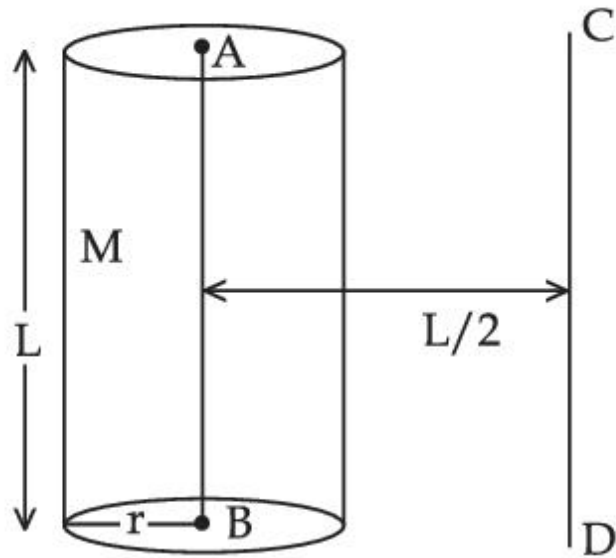
Options :

86435167123. $\sqrt{rg}$

86435167124. $\sqrt{\dfrac{rg}{2}}$

86435167125. $\sqrt{2rg}$

86435167126. $2\sqrt{rg}$

Question Number : 10 Question Id : 86435120179 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The solid cylinder of length 80 cm and mass M has a radius of 20 cm. Calculate the density of the material used if the moment of inertia of the cylinder about an axis CD parallel to AB as shown in figure is 2.7 kg m².

Options :

86435167127. $14.9 \ \text{kg/m}^3$

86435167128. $1.49 \times 10^2 \ \text{kg/m}^3$

86435167129. $7.5 \times 10^1 \ \text{kg/m}^3$

86435167130. $7.5 \times 10^2 \ \text{kg/m}^3$

A light beam is described by $E = 800 \sin\omega\left(t - \dfrac{x}{c}\right)$. An electron is allowed to move normal to the propagation of light beam with a speed of $3 \times 10^7 \text{ ms}^{-1}$. What is the maximum magnetic force exerted on the electron ?

Options :

86435167131. 1.28×10^{-18} N

86435167132. 12.8×10^{-18} N

86435167133. 12.8×10^{-17} N

86435167134. 1.28×10^{-21} N

Question Number : 12 Question Id : 86435120181 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The temperature of equal masses of three different liquids x, y and z are 10°C, 20°C and 30°C respectively. The temperature of mixture when x is mixed with y is 16°C and that when y is mixed with z is 26°C. The temperature of mixture when x and z are mixed will be :
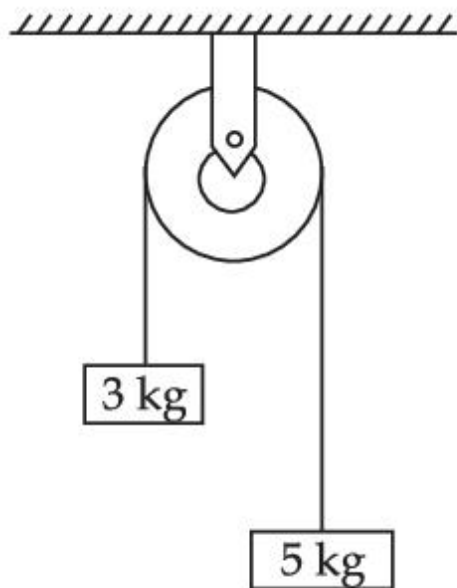
Options :

86435167135. 20.28°C

86435167136. 23.84°C

86435167137. 25.62°C

86435167138. 28.32°C

Question Number : 13 Question Id : 86435120182 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Two blocks of masses 3 kg and 5 kg are connected by a metal wire going over a smooth pulley. The breaking stress of the metal is $\frac{24}{\pi} \times 10^2$ Nm^{-2}. What is the minimum radius of the wire ?

(take $g = 10$ ms^{-2})

Options :

86435167139. 12.5 cm

86435167140. 125 cm

86435167141. 1250 cm

86435167142. 1.25 cm

Question Number : 14 Question Id : 86435120183 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A refrigerator consumes an average 35 W power to operate between temperature $-10°C$ to $25°C$. If there is no loss of energy then how much average heat per second does it transfer ?

Options :

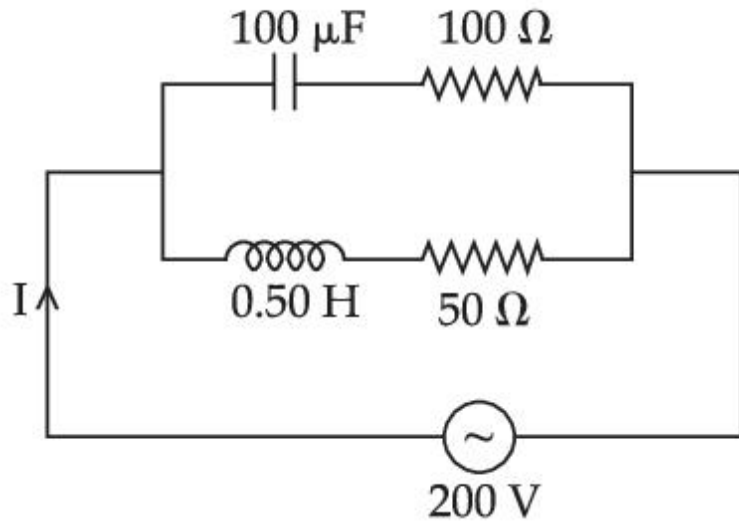86435167143. 35 J/s

86435167144. 263 J/s

86435167145. 298 J/s

86435167146. 350 J/s

Question Number : 15 Question Id : 86435120184 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In the given circuit the AC source has $\omega=100$ rad s^{-1}. Considering the inductor and capacitor to be ideal, what will be the current I flowing through the circuit ?

Options :

86435167147. 6 A

86435167148. 4.24 A

86435167149. 0.94 A

86435167150. 5.9 A

Question Number : 16 Question Id : 86435120185 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A cylindrical container of volume 4.0×10^{-3} m^3 contains one mole of hydrogen and two moles of carbon dioxide. Assume the temperature of the mixture is 400 K. The pressure of the mixture of gases is :

[Take gas constant as 8.3 J mol^{-1} K^{-1}]

Options :

86435167151. 24.9×10^5 Pa

86435167152. 24.9×10^3 Pa

86435167153. 24.9 Pa

86435167154. 249×10^1 Pa

Question Number : 17 Question Id : 86435120186 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

An electric bulb of 500 watt at 100 volt is used in a circuit having a 200 V supply. Calculate the resistance R to be connected in series with the bulb so that the power delivered by the bulb is 500 W.

Options :

86435167155. $20 \, \Omega$
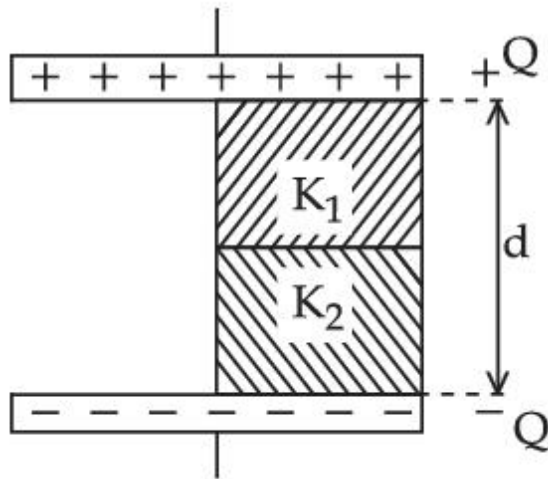
86435167156. $10 \, \Omega$

86435167157. $5 \, \Omega$

86435167158. $30 \, \Omega$

Question Number : 18 Question Id : 86435120187 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A parallel-plate capacitor with plate area A has separation d between the plates. Two dielectric slabs of dielectric constant K_1 and K_2 of same area A/2 and thickness d/2 are inserted in the space between the plates. The capacitance of the capacitor will be given by :

Options :

86435167159.
$$\frac{\varepsilon_0 A}{d} \left(\frac{1}{2} + \frac{2(K_1 + K_2)}{K_1 K_2} \right)$$

86435167160.
$$\frac{\varepsilon_0 A}{d} \left(\frac{1}{2} + \frac{K_1 K_2}{2(K_1 + K_2)} \right)$$

86435167161. $$\frac{\varepsilon_0 A}{d}\left(\frac{1}{2}+\frac{K_1+K_2}{K_1\,K_2}\right)$$

86435167162. $$\frac{\varepsilon_0 A}{d}\left(\frac{1}{2}+\frac{K_1\,K_2}{K_1+K_2}\right)$$

Question Number : 19 Question Id : 86435120188 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If you are provided a set of resistances 2 Ω, 4 Ω, 6 Ω and 8 Ω. Connect these resistances so as to obtain an equivalent resistance of $\frac{46}{3}$ Ω.

Options :

86435167163. 6 Ω and 8 Ω are in parallel with 2 Ω and 4 Ω in series

86435167164. 2 Ω and 6 Ω are in parallel with 4 Ω and 8 Ω in series

86435167165. 2 Ω and 4 Ω are in parallel with 6 Ω and 8 Ω in series

86435167166. 4 Ω and 6 Ω are in parallel with 2 Ω and 8 Ω in series

Question Number : 20 Question Id : 86435120189 Question Type : MCQ Option Shuffling : Yes Is Correct Marks : 4 Wrong Marks : 1

The two thin coaxial rings, each of radius 'a' and having charges $+Q$ and $-Q$ respectively are separated by a distance of 's'. The potential difference between the centres of the two rings is :

Options :

86435167167. $\dfrac{Q}{4\pi\varepsilon_0}\left[\dfrac{1}{a} - \dfrac{1}{\sqrt{s^2 + a^2}}\right]$

86435167168. $\dfrac{Q}{4\pi\varepsilon_0}\left[\dfrac{1}{a} + \dfrac{1}{\sqrt{s^2 + a^2}}\right]$

86435167169. $\dfrac{Q}{2\pi\varepsilon_0}\left[\dfrac{1}{a} + \dfrac{1}{\sqrt{s^2 + a^2}}\right]$

86435167170. $\dfrac{Q}{2\pi\varepsilon_0}\left[\dfrac{1}{a} - \dfrac{1}{\sqrt{s^2 + a^2}}\right]$

Physics Section B

Section Id :	864351915
Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10

**Number of Questions to be attempted :**   5

Section Marks :   20

Enable Mark as Answered Mark for Review and Clear Response :   Yes

Sub-Section Number :   1

Sub-Section Id :   8643511142

Question Shuffling Allowed :   Yes

Question Number : 21 Question Id : 86435120190 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The coefficient of static friction between two blocks is 0.5 and the table is smooth. The maximum horizontal force that can be applied to move the blocks together is _____ N. (take $g = 10 \ ms^{-2}$)
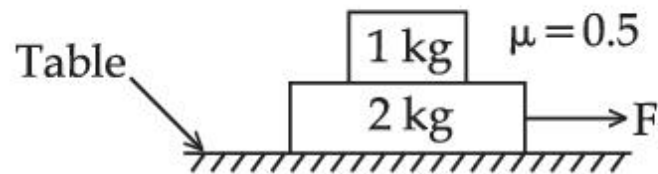
Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

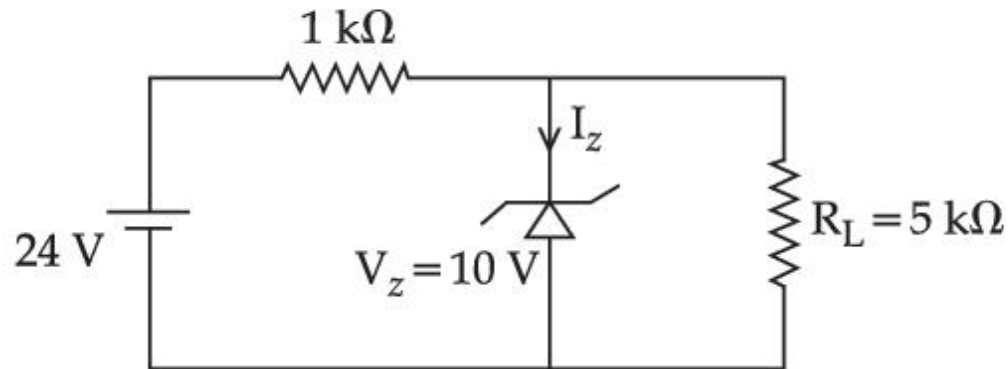**Answers Type :** Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 22 Question Id : 86435120191 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

For the given circuit, the power across zener diode is _____ mW.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 23 Question Id : 86435120192 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The acceleration due to gravity is found upto an accuracy of 4% on a planet. The energy supplied to a simple pendulum of known mass 'm' to undertake oscillations of time period T is being estimated. If time period is measured to an accuracy of 3%, the accuracy to which E is known as _____%.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
1

Question Number : 24 Question Id : 86435120193 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Two simple harmonic motions are represented by the equations $x_1 = 5 \sin\left(2\pi t + \dfrac{\pi}{4}\right)$ and

$x_2 = 5\sqrt{2}(\sin 2\pi t + \cos 2\pi t)$. The amplitude of second motion is _____ times the

amplitude in first motion.

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

1

Question Number : 25 Question Id : 86435120194 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the maximum value of accelerating potential provided by a radio frequency oscillator is 12 kV. The number of revolution made by a proton in a cyclotron to achieve one sixth of the speed of light is _____.
$[m_p = 1.67 \times 10^{-27}$ kg, $e = 1.6 \times 10^{-19}$ C, Speed of light $= 3 \times 10^8$ m/s]

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

Question Number : 26 Question Id : 86435120195 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A source of light is placed in front of a screen. Intensity of light on the screen is I. Two Polaroids P_1 and P_2 are so placed in between the source of light and screen that the intensity of light on screen is I/2. P_2 should be rotated by an angle of _____(degrees) so that the intensity of light on the screen becomes $\frac{3I}{8}$.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
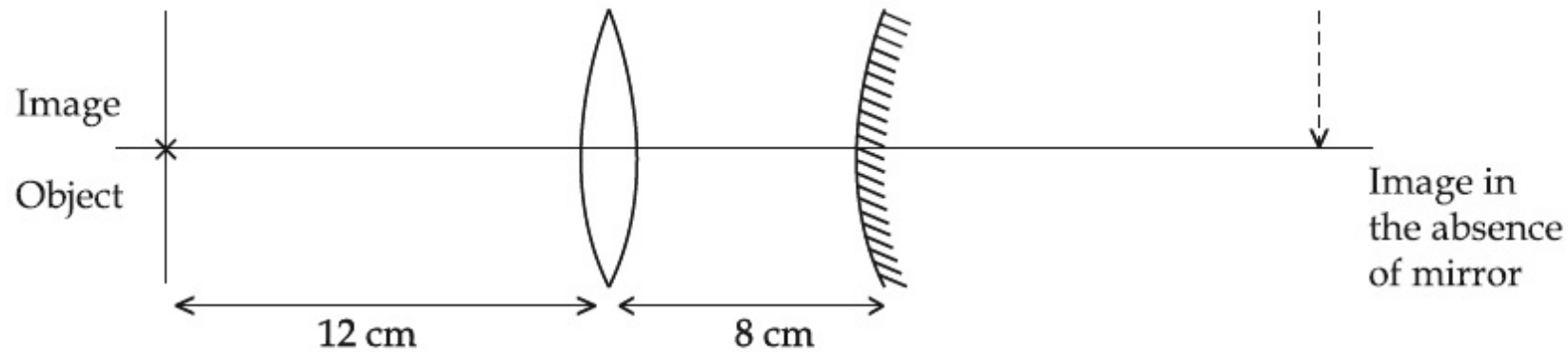**Possible Answers :**
1

Question Number : 27 Question Id : 86435120196 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

An object is placed at a distance of 12 cm from a convex lens. A convex mirror of focal length 15 cm is placed on other side of lens at 8 cm as shown in the figure. Image of object coincides with the object.

When the convex mirror is removed, a real and inverted image is formed at a position. The distance of the image from the object will be _____(cm).

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

1

Question Number : 28 Question Id : 86435120197 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A circular coil of radius 8.0 cm and 20 turns is rotated about its vertical diameter with an angular speed of 50 rad s^{-1} in a uniform horizontal magnetic field of 3.0×10^{-2} T. The maximum emf induced the coil will be _____ $\times 10^{-2}$ volt (rounded off to the nearest integer).

Response Type : Numeric

Question Number : 29 Question Id : 86435120198 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A coil in the shape of an equilateral triangle of side 10 cm lies in a vertical plane between the pole pieces of permanent magnet producing a horizontal magnetic field 20 mT. The torque acting on the coil when a current of 0.2 A is passed through it and its plane becomes parallel to the magnetic field will be $\sqrt{x} \times 10^{-5}$ Nm. The value of x is _____.

Question Number : 30 Question Id : 86435120199 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Two waves are simultaneously passing through a string and their equations are : $y_1 = A_1 \sin k(x - vt)$, $y_2 = A_2 \sin k(x - vt + x_0)$. Given amplitudes $A_1 = 12$ mm and $A_2 = 5$ mm, $x_0 = 3.5$ cm and wave number $k = 6.28$ cm^{-1}. The amplitude of resulting wave will be _____ mm.

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

1