

National Testing Agency

Question Paper Name : B Tech 27th Aug2021 Shift 1
Subject Name : B TECH
Creation Date : 2021-08-27 19:09:57
Duration : 180
Total Marks : 300
Display Marks: Yes

B TECH

Group Number : 1
Group Id : 864351250
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 : 864351938
Section Number : 1
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 20
Number of Questions to be attempted : 20
Section Marks : 80



Enable Mark as Answered Mark for Review and Clear Response : Yes
Sub-Section Number : 1
Sub-Section Id : 8643511165
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 86435120530 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

In Millikan's oil drop experiment, what is viscous force acting on an uncharged drop of radius 2.0×10^{-5} m and density 1.2×10^3 kgm^{-3} ? Take viscosity of liquid = 1.8×10^{-5} Nsm^{-2} . (Neglect buoyancy due to air).

Options :

86435168171. 5.8×10^{-10} N

86435168172. 1.8×10^{-10} N

86435168173. 3.8×10^{-11} N

86435168174. 3.9×10^{-10} N

Question Number : 2 Question Id : 86435120531 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Moment of inertia of a square plate of side l about the axis passing through one of the corner and perpendicular to the plane of square plate is given by :

Options :

86435168175. $\frac{MI^2}{12}$

86435168176. $\frac{2}{3} MI^2$

86435168177. $\frac{MI^2}{6}$

86435168178. MI^2

Question Number : 3 Question Id : 86435120532 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A huge circular arc of length 4.4 ly subtends an angle '4s' at the centre of the circle. How long it would take for a body to complete 4 revolution if its speed is 8 AU per second ?

Given : 1 ly = 9.46×10^{15} m

1 AU = 1.5×10^{11} m

Options :

86435168179. 4.5×10^{10} s

86435168180. 4.1×10^8 s

86435168181. 3.5×10^6 s

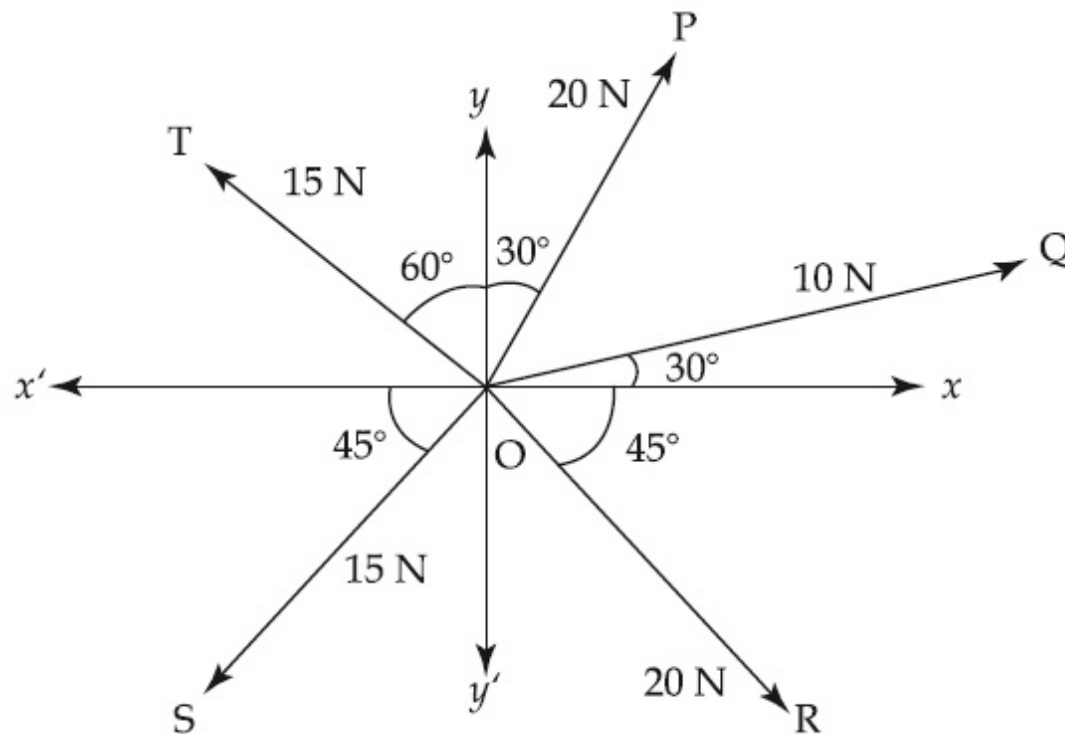


86435168182. 7.2×10^8 s

Question Number : 4 Question Id : 86435120533 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The resultant of these forces \vec{OP} , \vec{OQ} , \vec{OR} , \vec{OS} and \vec{OT} is approximately _____ N.

[Take $\sqrt{3} = 1.7$, $\sqrt{2} = 1.4$ Given \hat{i} and \hat{j} unit vectors along x, y axis]



Options :

86435168183. $3\hat{i} + 15\hat{j}$



86435168184. $-1.5 \hat{i} - 15.5 \hat{j}$

86435168185. $9.25 \hat{i} + 5 \hat{j}$

86435168186. $2.5 \hat{i} - 14.5 \hat{j}$

Question Number : 5 Question Id : 86435120534 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which of the following is not a dimensionless quantity ?

Options :

86435168187. Quality factor

86435168188. Power factor

86435168189. Relative magnetic permeability (μ_r)

86435168190. Permeability of free space (μ_0)

Question Number : 6 Question Id : 86435120535 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

If E and H represents the intensity of electric field and magnetising field respectively, then the unit of E/H will be :



Options :

86435168191. mho

86435168192. ohm

86435168193. joule

86435168194. newton

Question Number : 7 Question Id : 86435120536 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

An ideal gas is expanding such that $PT^3 = \text{constant}$. The coefficient of volume expansion of the gas is :

Options :

86435168195. $\frac{1}{T}$

86435168196. $\frac{2}{T}$

86435168197. $\frac{3}{T}$



86435168198. $\frac{4}{T}$

Question Number : 8 Question Id : 86435120537 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A balloon carries a total load of 185 kg at normal pressure and temperature of 27°C. What load will the balloon carry on rising to a height at which the barometric pressure is 45 cm of Hg and the temperature is -7°C . Assuming the volume constant ?

Options :

86435168199. 123.54 kg

86435168200. 214.15 kg

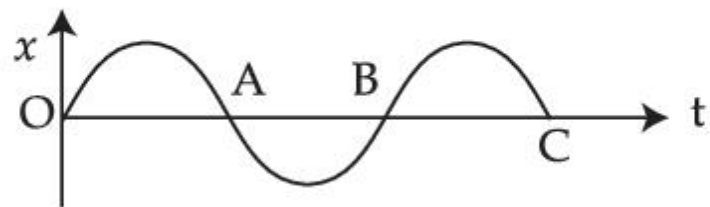
86435168201. 219.07 kg

86435168202. 181.46 kg

Question Number : 9 Question Id : 86435120538 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

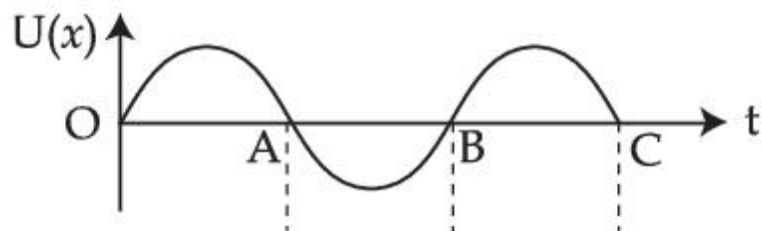


The variation of displacement with time of a particle executing free simple harmonic motion is shown in the figure.

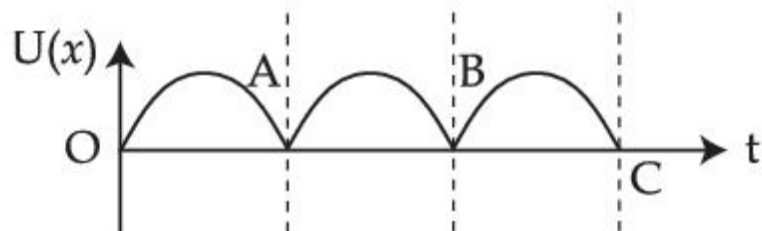


The potential energy $U(x)$ versus time (t) plot of the particle is correctly shown in figure :

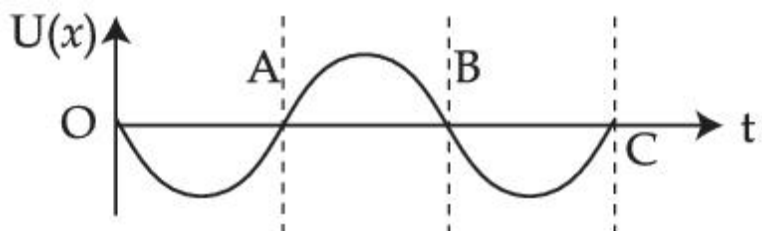
Options :



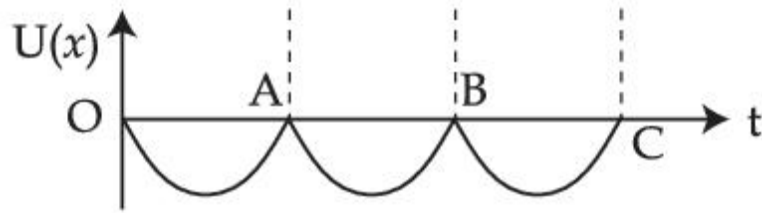
86435168203.



86435168204.



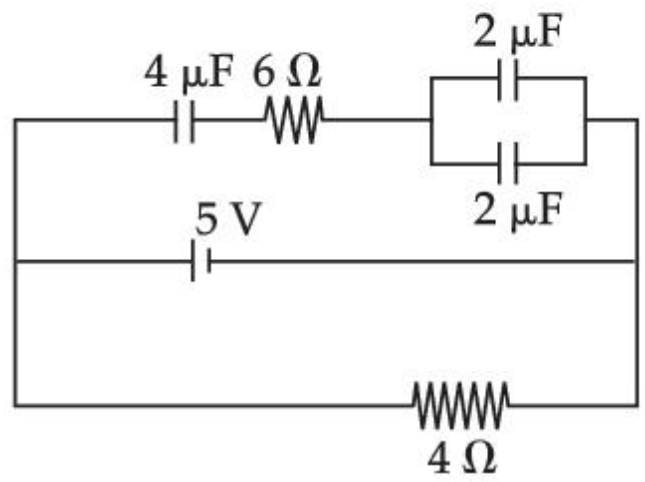
86435168205.



86435168206.

Question Number : 10 Question Id : 86435120539 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Calculate the amount of charge on capacitor of $4 \mu\text{F}$. The internal resistance of battery is 1Ω :



Options :

- 86435168207. zero
- 86435168208. $4 \mu\text{C}$
- 86435168209. $8 \mu\text{C}$

86435168210. $16 \mu\text{C}$

Question Number : 11 Question Id : 86435120540 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A uniformly charged disc of radius R having surface charge density σ is placed in the xy plane with its center at the origin. Find the electric field intensity along the z -axis at a distance Z from origin :

Options :

86435168211.
$$E = \frac{\sigma}{2\epsilon_0} \left(1 + \frac{Z}{(Z^2 + R^2)^{1/2}} \right)$$

86435168212.
$$E = \frac{\sigma}{2\epsilon_0} \left(1 - \frac{Z}{(Z^2 + R^2)^{1/2}} \right)$$

86435168213.
$$E = \frac{2\epsilon_0}{\sigma} \left(\frac{1}{(Z^2 + R^2)^{1/2}} + Z \right)$$

86435168214.
$$E = \frac{\sigma}{2\epsilon_0} \left(\frac{1}{(Z^2 + R^2)} + \frac{1}{Z^2} \right)$$

Question Number : 12 Question Id : 86435120541 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No



Correct Marks : 4 Wrong Marks : 1

Five identical cells each of internal resistance 1Ω and emf 5 V are connected in series and in parallel with an external resistance ' R '. For what value of ' R ', current in series and parallel combination will remain the same ?

Options :

86435168215. 1Ω

86435168216. 5Ω

86435168217. 10Ω

86435168218. 25Ω

Question Number : 13 Question Id : 86435120542 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two ions of masses 4 amu and 16 amu have charges $+2e$ and $+3e$ respectively. These ions pass through the region of constant perpendicular magnetic field. The kinetic energy of both ions is same. Then :

Options :

86435168219. lighter ion will be deflected more than heavier ion

86435168220. lighter ion will be deflected less than heavier ion

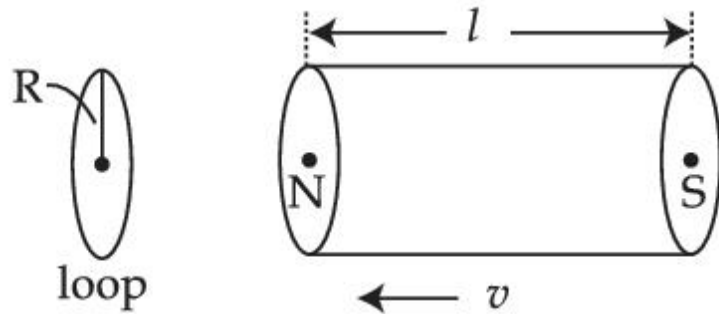
86435168221. both ions will be deflected equally

86435168222. no ion will be deflected

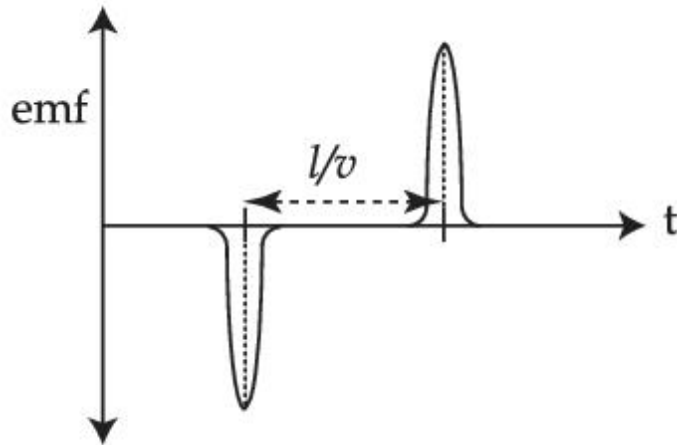


Question Number : 14 Question Id : 86435120543 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

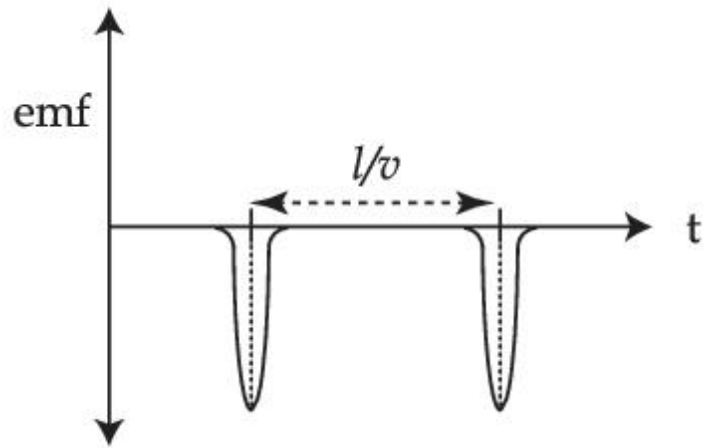
A bar magnet is passing through a conducting loop of radius R with velocity v . The radius of the bar magnet is such that it just passes through the loop. The induced e.m.f. in the loop can be represented by the approximate curve :



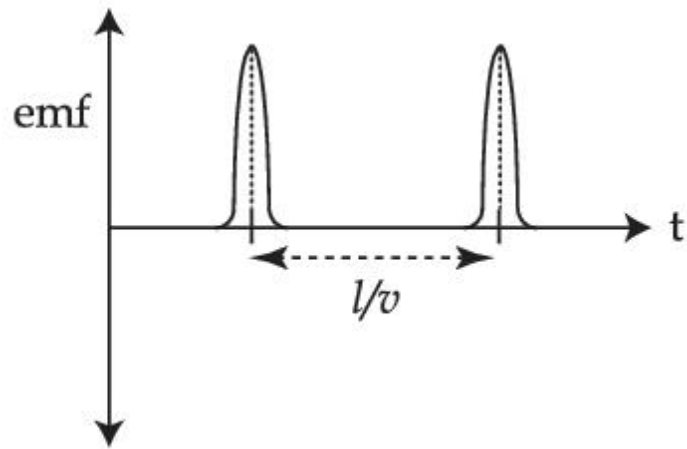
Options :



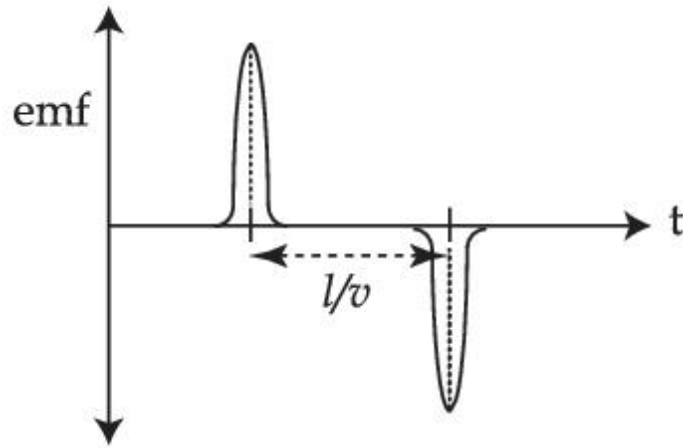
86435168223.



86435168224.



86435168225.



86435168226.

Question Number : 15 Question Id : 86435120544 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Electric field in a plane electromagnetic wave is given by

$$E = 50 \sin(500x - 10 \times 10^{10}t) \text{ V/m}$$

The velocity of electromagnetic wave in this medium is :

(Given C = speed of light in vacuum)

Options :

86435168227. $\frac{2}{3} C$

86435168228. C

86435168229. $\frac{3}{2} C$

86435168230. $\frac{C}{2}$

Question Number : 16 Question Id : 86435120545 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

An object is placed beyond the centre of curvature C of the given concave mirror. If the distance of the object is d_1 from C and the distance of the image formed is d_2 from C , the radius of curvature of this mirror is :

Options :

86435168231. $\frac{d_1 d_2}{d_1 - d_2}$

86435168232. $\frac{d_1 d_2}{d_1 + d_2}$

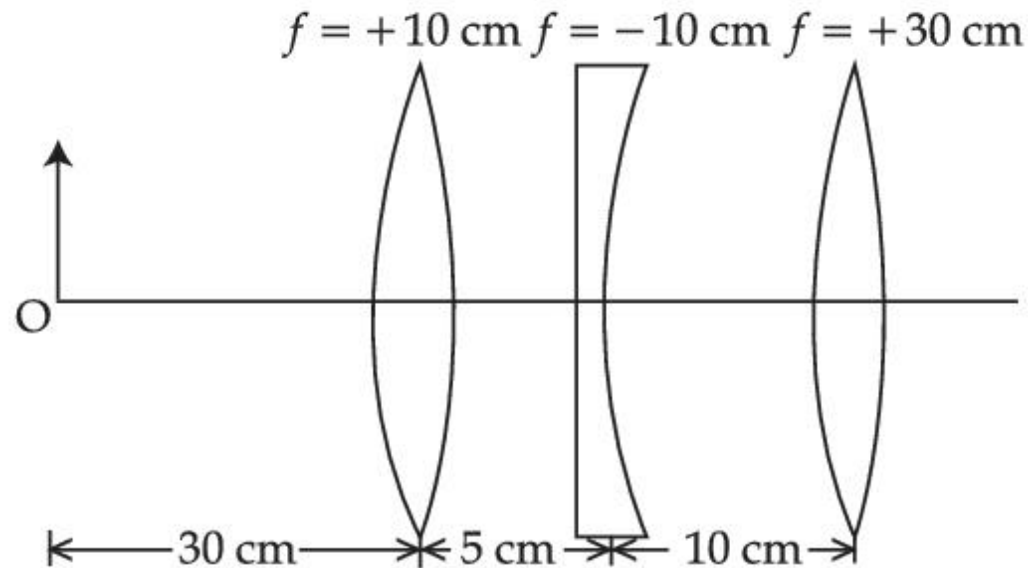
86435168233. $\frac{2d_1 d_2}{d_1 - d_2}$

86435168234. $\frac{2d_1 d_2}{d_1 + d_2}$

Question Number : 17 Question Id : 86435120546 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1



Find the distance of the image from object O, formed by the combination of lenses in the figure :



Options :

86435168235. 10 cm

86435168236. 20 cm

86435168237. 75 cm

86435168238. infinity

Question Number : 18 Question Id : 86435120547 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

In a photoelectric experiment, increasing the intensity of incident light :



Options :

86435168239.

increases the number of photons incident and also increases the K.E. of the ejected electrons.

86435168240.

increases the number of photons incident and the K.E. of the ejected electrons remains unchanged.

86435168241.

increases the frequency of photons incident and increases the K.E. of the ejected electrons.

86435168242.

increases the frequency of photons incident and the K.E. of the ejected electrons remains unchanged.

Question Number : 19 Question Id : 86435120548 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

There are 10^{10} radioactive nuclei in a given radioactive element. Its half-life time is 1 minute. How many nuclei will remain after 30 seconds ?

$$(\sqrt{2} = 1.414)$$

Options :

86435168243. 10^5

86435168244. 2×10^{10}



86435168245. 7×10^9

86435168246. 4×10^{10}

Question Number : 20 Question Id : 86435120549 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

For a transistor in CE mode to be used as an amplifier, it must be operated in :

Options :

86435168247. Cut-off region only

86435168248. Saturation region only

86435168249. Both cut-off and Saturation

86435168250. The active region only

Physics Section B

Section Id :	864351939
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 :

8643511166

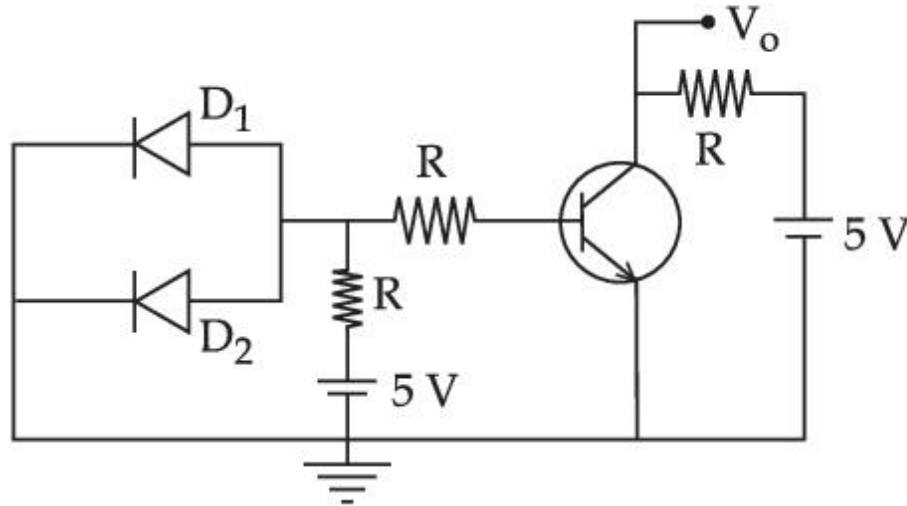
Question Shuffling Allowed :

Yes

Question Number : 21 Question Id : 86435120550 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A circuit is arranged as shown in figure. The output voltage V_o is equal to _____ V.



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 : 86435120551 Question Type : SA

Correct Marks : 4 Wrong Marks : 0



Two persons A and B perform same amount of work in moving a body through a certain distance d with application of forces acting at angles 45° and 60° with the direction of displacement respectively. The ratio of force applied by person A to the force applied by person B is $\frac{1}{\sqrt{x}}$. The value of x is _____.

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 :** 86435120552 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

If the velocity of a body related to displacement x is given by $v = \sqrt{5000 + 24x}$ m/s, then the acceleration of the body is _____ m/s².

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

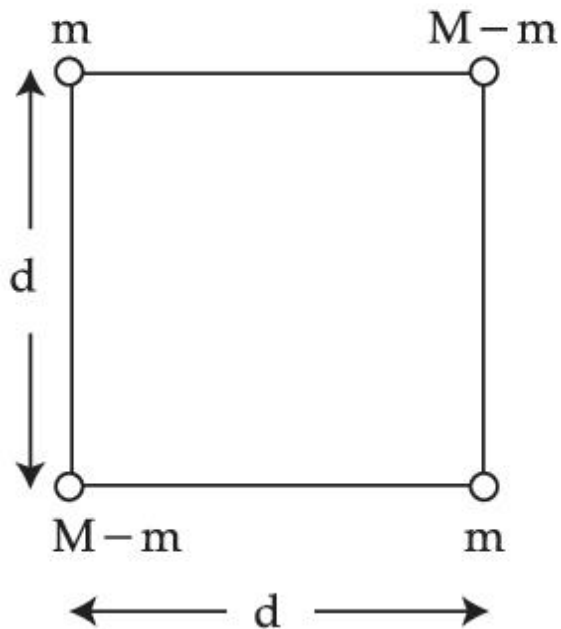
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Question Number : 24 **Question Id :** 86435120553 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0



A body of mass $(2M)$ splits into four masses $\{m, M - m, m, M - m\}$, which are rearranged to form a square as shown in the figure. The ratio of $\frac{M}{m}$ for which, the gravitational potential energy of the system becomes maximum is $x : 1$. The value of x is _____.



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 :** 86435120554 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0



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Two cars X and Y are approaching each other with velocities 36 km/h and 72 km/h respectively. The frequency of a whistle sound as emitted by a passenger in car X, heard by the passenger in car Y is 1320 Hz. If the velocity of sound in air is 340 m/s, the actual frequency of the whistle sound produced is _____ Hz.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 26 **Question Id :** 86435120555 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

First, a set of n equal resistors of $10\ \Omega$ each are connected in series to a battery of emf 20 V and internal resistance $10\ \Omega$. A current I is observed to flow. Then, the n resistors are connected in parallel to the same battery. It is observed that the current is increased 20 times, then the value of n is _____.

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 :** 86435120556 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0



A uniform conducting wire of length is $24a$, and resistance R is wound up as a current carrying coil in the shape of an equilateral triangle of side ' a ' and then in the form of a square of side ' a '. The coil is connected to a voltage source V_0 . The ratio of magnetic moment of the coils in case of equilateral triangle to that for square is $1 : \sqrt{y}$ where y is _____.

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 :** 86435120557 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

The alternating current is given by

$$i = \left\{ \sqrt{42} \sin\left(\frac{2\pi}{T} t\right) + 10 \right\} \text{A}$$

The r.m.s. value of this current is _____ A.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 29 **Question Id :** 86435120558 **Question Type :** SA



Correct Marks : 4 Wrong Marks : 0

A transmitting antenna has a height of 320 m and that of receiving antenna is 2000 m. The maximum distance between them for satisfactory communication in line of sight mode is 'd'. The value of 'd' is _____ km.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

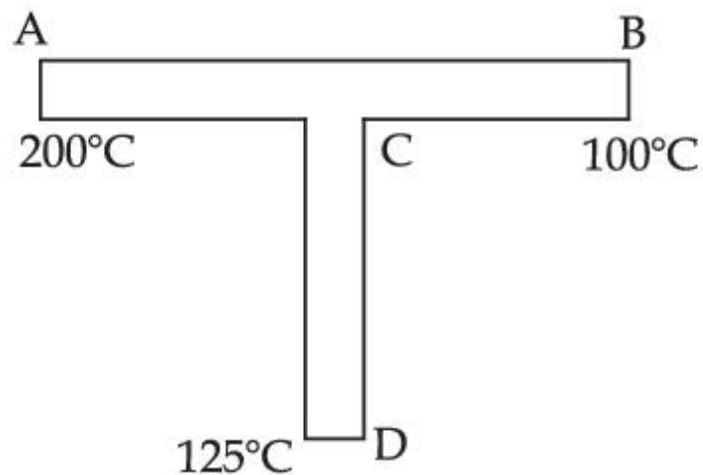
Possible Answers :

1

Question Number : 30 Question Id : 86435120559 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A rod CD of thermal resistance 10.0 KW^{-1} is joined at the middle of an identical rod AB as shown in figure. The ends A, B and D are maintained at 200°C , 100°C and 125°C respectively. The heat current in CD is P watt. The value of P is _____.



Response Type : Numeric

Evaluation Required For SA : Yes



Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

