National Testing Agency

Question Paper Name :	B TECH 4th Aug 2021 Shift 1
Subject Name :	B TECH
Creation Date :	2021-08-04 12:59:17
Duration :	180
Total Marks :	300
Display Marks:	Yes

B TECH

Group Number :	1
Group Id :	67603318
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 :	676033103
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 :	676033103
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 6760331531 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A wave of wavelength 0.75 cm is produced in air and travels at a speed of 300 m/s. Which of the following is most appropriate option ?

Options :

6760334591. It is a sound wave.

6760334592. It is an ultrasonic wave.

6760334593. It is not audible.

6760334594. It is an ultrasonic wave and It is not audible both are correct.

Question Number : 2 Question Id : 6760331532 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A ship's anchor of density 7500 kg/m^3 appears 196N lighter when completely submerged in water of density 1000 kg/m^3 than in air. The anchor's weight in air will be _____ N.
(Take g = 9.8 m/s^2)

Options :

6760334595. 6500

6760334596. 1960

6760334597. 5540

6760334598. 1470

Question Number : 3 Question Id : 6760331533 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

In a hydrogen atom, if energy of the n^{th} level is denoted by E_n and $\Delta E_n = E_{n+1} - E_n$, then for very large values of 'n' the ratio $\left|\frac{\Delta E_n}{E_n}\right|$

Options :

6760334599. Does not vary with n

6760334600. Varies as $\frac{1}{n}$

6760334601. Varies as $\frac{1}{n^2}$

6760334602. Varies as $\frac{1}{n^3}$

Question Number : 4 Question Id : 6760331534 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A hypothetical radioactive nuclei decays according to the following series

$${}^{180}_{72}A \xrightarrow{\alpha} A_1 \xrightarrow{\beta^-} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$$

The atomic number and mass number of A_4 will be respectively

Options :

6760334603. 69, 172

6760334604. 69, 171

6760334605. 70, 172

6760334606. 68, 171

Question Number : 5 Question Id : 6760331535 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Consider a Hydrogen atom in its first excited state, what is the expression of magnetic field at the centre due to the circular motion of electron in its orbit?

Options :

6760334607. $\frac{\mu_0 e^5 \pi m_e^2}{256 \epsilon_0^3 h^5}$

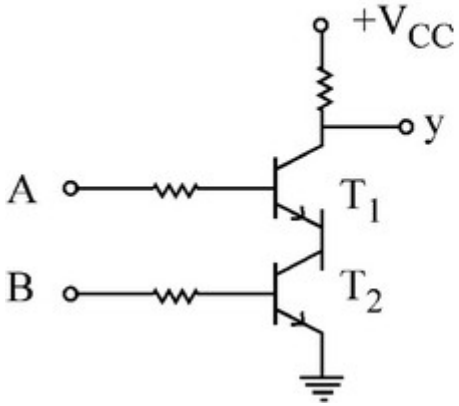
6760334608. $\frac{\mu_0 e^7 \pi m_e^2}{8 \epsilon_0^2 h^5}$

6760334609. $\frac{\mu_0 e^7 \pi m_e^2}{256 \epsilon_0^3 h^5}$

6760334610. Zero

Question Number : 6 Question Id : 6760331536 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which logic gate will be realised by the following circuit ?



Options :

6760334611. AND

6760334612. NAND

6760334613. NOR

6760334614. OR

Question Number : 7 Question Id : 6760331537 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The refractive index of a prism is 1.6. When prism is immersed in a liquid of 1.2 refractive index, then the change in the angle of minimum deviation will be _____.

(Assume prism is equilateral) Given $\sin^{-1}\left(\frac{4}{5}\right)=53^{\circ}$

$$\sin^{-1}\left(\frac{2}{3}\right)=41^{\circ}$$

Options :

6760334615. 19.8°

6760334616. 16.2°

6760334617. 36°

6760334618. 24°

Question Number : 8 Question Id : 6760331538 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A television transmission tower has a height of 250 m. The approximate distance upto which the broadcast can be received is

(Assume the radius of earth = 6.4×10^6 m)

Options :

6760334619. 0 km

6760334620. 56 km

6760334621. 6400 km

6760334622. 64 km

Question Number : 9 Question Id : 6760331539 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Assume there is a possibility of constant Electric field and Magnetic field and a charged particle under the influence of these forces tries to move along a circle. Identify which of the following are possible.

Options :

6760334623. $E \neq 0, B \neq 0$

6760334624. $E = 0, B = 0$

6760334625. $E \neq 0, B = 0$

6760334626. $E = 0, B \neq 0$

Question Number : 10 Question Id : 6760331540 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A metal rod of 10 cm length is moving with a velocity 5 m/s at the centre of a current carrying circular coil of radius 4 cm and 2A current. The induced emf at the ends of the rod is _____.

Options :

6760334627. $\frac{\pi}{100}$mV

6760334628. $\frac{\pi}{200}$mV

6760334629. $\frac{\pi}{125}$mV

6760334630. $\frac{\pi}{250}$mV

Question Number : 11 Question Id : 6760331541 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A piece of wood has dimensions ℓ, b and h. Its relative density is 'd'. It is floating in water such that the side 'h' is vertical. If it is pushed down gently and released, the angular frequency will be

Options :

6760334631. $\sqrt{\frac{g}{dh}}$

6760334632. $\sqrt{\frac{\ell bg}{dh}}$

6760334633. $\sqrt{\frac{dg}{h}}$

6760334634. $\sqrt{\frac{dg}{\ell bh}}$

Question Number : 12 Question Id : 6760331542 Question Type : MCQ Option Shuffling : Yes Is Question Mand

Correct Marks : 4 Wrong Marks : 1

The force on mass 'm' due to gravity is '$\vec{F}_1$' at a height $h=\frac{R_e}{3}$ from the Earth's surface. At what depth 'd' inside Earth the body will experience a force '$\vec{F}_2$' such that $|\vec{F}_1|=|\vec{F}_2|=\vec{F}$

Options :

6760334635. $\frac{5}{9}R_e$

6760334636. $\frac{7}{9}R_e$

6760334637. $\frac{7}{16}R_e$

6760334638. $\frac{5}{16}R_e$

Question Number : 13 Question Id : 6760331543 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Choose the correct option for the centre of mass of a uniform disc of radius 'R' from which a circular section of radius r ($2r < R$) has been removed. The centre of the hole is at a distance 'a' from the centre of the disc.
[Take the centre of the whole disc as the origin]

Options :

6760334639. $\frac{ar^2}{(R^2-r^2)}$

6760334640. $\frac{ar}{R-r}$

6760334641. $\frac{ar}{R+r}$

6760334642. $\frac{ar^2}{(R^2+r^2)}$

Question Number : 14 Question Id : 6760331544 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The magnetic field in any region is given by $\vec{B}=B_0\left(2+\frac{x}{a}\right)\hat{k}$. A square loop of edge length 'l' is placed with its edge along x and y axis. The loop is moved with a constant velocity $\vec{v}=v_0\hat{i}$.

The emf induced in the loop will be -

Options :

6760334643. zero

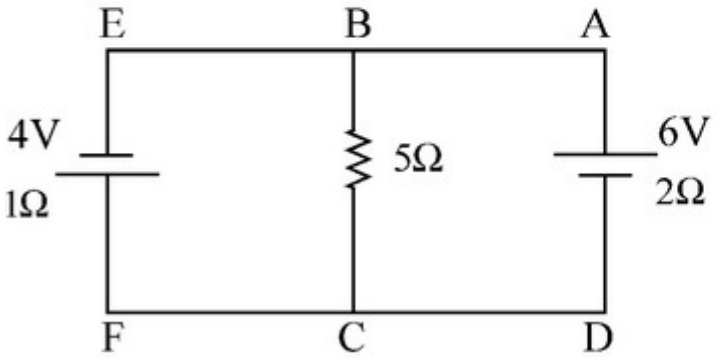
6760334644. $v_0B_0\ell$

6760334645. $v_0B_0\frac{\ell^2}{a}$

6760334646. $v_0B_0\frac{\ell^2}{2a}$

Question Number : 15 Question Id : 6760331545 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A 4V battery with internal resistance 1Ω and a 6V battery with 2Ω internal resistance are connected to a resistor of 5Ω as shown in fig. The current in the 5Ω resistor is



Options :

6760334647. $\frac{2}{17}$ A from B to C

6760334648. $\frac{1}{17}$ A from B to C

6760334649. $\frac{2}{17}$ A from C to B

6760334650. $\frac{1}{17}$ A from C to B

Question Number : 16 Question Id : 6760331546 Question Type : MCQ Option Shuffling : Yes Is Question Mand

Correct Marks : 4 Wrong Marks : 1

A steel wire of 1 mm^2 cross-sectional area having Young's modulus 2×10^{11} N/m^2 is stretched between two fixed points at a temperature of 40°C. The tension developed in the wire when its temperature falls to 30°C is given by (Coefficient of linear expansion of steel = $11 \times 10^{-6}/°C$)

Options :

6760334651. 22 N

6760334652. 11 N

6760334653. 2×10^6 N

6760334654. 10^5 N

Question Number : 17 Question Id : 6760331547 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If a particle of mass 'm' moves in x–y plane according to the equation

$\vec{r}=(\hat{i}+\hat{j})$ (A sin314 t + B cos314 t) m

The frequency of SHM in Hz will be given by

Options :

6760334655. 100 Hz

6760334656. 50 Hz

6760334657. 157 Hz

6760334658. 314 Hz

Question Number : 18 Question Id : 6760331548 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The actual length, breadth and thickness ℓ, b and h of a rectangular slab are 0.2 m, 0.12 m and 0.13 m respectively. If 'ℓ' is measured by a vernier callipers (zero is on the right of the main scale zero and 8^{th} vernier division coincides with main scale division when its jaws coincide with each other) 'b' and 'h' are measured by another vernier scale (4^{th} vernier division coincide with the main scale but zero on vernier shifts towards left when jaws are closed). The least count for both is 0.01 cm. What is the positive and negative zero error of the instruments (in cm) respectively.

Options :

6760334659. $0.08,\ 0.02$

6760334660. $0.04,\ 0.08$

6760334661. $0.08,\ 0.04$

6760334662. $0.02,\ 0.04$

Question Number : 19 Question Id : 6760331549 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The moment of force $\overline{F}=2\hat{i}+\hat{j}+2\hat{k}$ acting at a point $-\hat{i}+2\hat{j}+\hat{k}$ about the point $3\hat{i}+\hat{j}+4\hat{k}$ is given by

Options :

6760334663. $10\hat{i}+4\hat{j}-12\hat{k}$

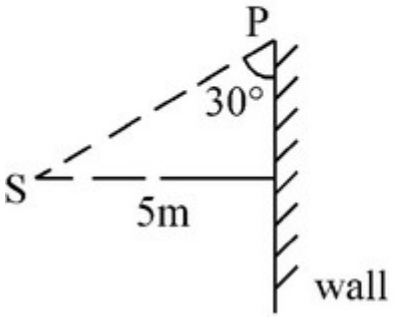
6760334664. $10\hat{i}-4\hat{j}+12\hat{k}$

6760334665. $5\hat{i}+2\hat{j}-6\hat{k}$

6760334666. $5\hat{i}-2\hat{j}+6\hat{k}$

Question Number : 20 Question Id : 6760331550 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

In the given figure, S is a spot light, it rotates in a horizontal plane with a constant angular velocity of 0.1 rad/s. The velocity of spot P will be given by



Options :

6760334667. 0.1 m/s

6760334668. 0.5 m/s

6760334669. 2 m/s

6760334670. 5 m/s

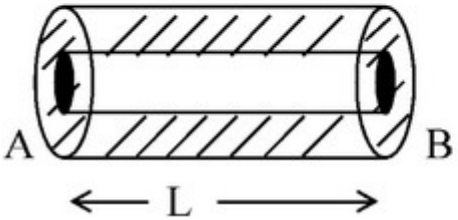
Physics Section B

Section Id : 676033104

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 :	676033104
Question Shuffling Allowed :	Yes

Question Number : 21 Question Id : 6760331551 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

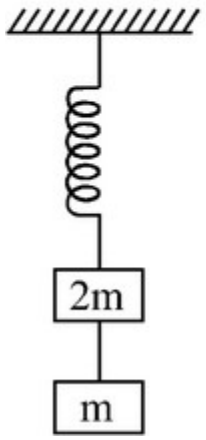
A wire of length L is coated by another conducting material of double resistivity and the thickness of the layer is equal to the radius of the wire. The resistance of the wire between its ends after coating will decrease by _____%.



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 : 6760331552 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A system shown in the figure is in equilibrium and at rest. The spring and string are massless. When the string is cut, the acceleration of mass '2m' will be _____ m/s^2. (given $g = 10\ m/s^2$)



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

Question Number : 23 Question Id : 6760331553 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A drop of liquid of mass 1.8×10^{-5} kg falls away from the bottom of a charged conducting sphere of radius 20 cm, carrying with it a charge of 1nC and leaving on the sphere a uniformly distributed charge of $2.5\mu C$. The speed of the drop, after it has fallen 30 cm is $\sqrt{\frac{x^3}{2}}$ m/s. The value of x will be _____.
$(g = 10\ m/s^2)$

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 : 6760331554 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
A solid cylinder and a spherical shell of identical mass and radius roll down the same inclined plane without slipping. They start from rest. The ratio of angular velocity of spherical shell to angular velocity of cylinder is $\frac{3}{\sqrt{x}}$ when they reach the ground. The value of x will be _____.
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 : 6760331555 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
1 g of water at 100°C is converted into steam at the same temperature and at 1 atmospheric pressure. The change in internal energy is _____ J.
[Consider latent heat of vaporisation is 2256 J/g and 1 atm = 10^5 Pa]
[Volume of water and steam at 1 atm = 1 cm^3 and 1671 cm^3 respectively]
Response Type : Numeric

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

Question Number : 26 Question Id : 6760331556 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The ratio of average speed to the rms speed of oxygen molecule is $\sqrt{\frac{8}{x\pi}}$.

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 :
100

Question Number : 27 Question Id : 6760331557 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A one paise coin made of magnesium and weighing 0.5g is electrically neutral and contain equal number of positive and negative charge. The magnitude of positive or negative charge in it will be _____ kC.

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

100

Question Number : 28 Question Id : 6760331558 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A potential difference of 800 V is applied across the plates of a parallel plate capacitor. The separation between the plates is 5 mm and a uniform magnetic field is applied parallel to the plates horizontally. An electron projected vertically parallel to the plates, with a velocity of 2×10^6 m/s moves undeflected between the plates. The magnitude of the magnetic field will be ____ $\times 10^{-2}$ T.

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

Question Number : 29 Question Id : 6760331559 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A magnetic material of volume 25 cm^3 is placed in a magnetic intensity 5×10^4 A/m. The magnetic moment generated due to the field is 5 Am^2. The value of magnetic induction will be _____ mT.

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

Question Number : 30 Question Id : 6760331560 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

A parallel beam of light incident on a solid glass sphere of radius 50 cm and refractive index 1.5. The distance of image from the outer edge of sphere is _____ cm.

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