

National Testing Agency

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Duration : 180
Total Marks : 300
Display Marks: Yes

B TECH

Group Number : 1
Group Id : 67603323
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 : 676033133
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 : 676033133
Question Shuffling Allowed : Yes

**Question Number : 1 Question Id : 6760331981 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1**

A p-type semiconductor has acceptor levels 60 meV above the valence band.
What will be the maximum wavelength of em wave which can create a hole ?
(Plank's constant = 4.14×10^{-15} eV-s, Speed of light in vacuum = 3×10^8 ms⁻¹)

Options :

6760335941. 20.7 μm

6760335942. 30.8 μm

6760335943. 40.9 μm

6760335944. 50.0 μm

**Question Number : 2 Question Id : 6760331982 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1**

For an electron orbiting around the nucleus in a hydrogen like atom with atomic number Z ; T , U and E denote the kinetic, potential and total energy respectively of the electron. Which of the following statements are valid in this context ?

- (A) T , U is same for all orbits
- (B) $T + U$ is same for all orbits
- (C) $2T + U$ is same for all orbits
- (D) $E + U$ is same for all orbits
- (E) $E + T$ is same for all orbits

Choose the most appropriate answer from the options given below :

Options :

6760335945. (B) only

6760335946. (C) only

6760335947. (A) and (D) only

6760335948. (C) and (E) only

Question Number : 3 Question Id : 6760331983 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two wavelengths $\lambda_1=496\text{nm}$ and $\lambda_2=620\text{nm}$ fall on a metal surface. Calculate the work function if the ratio of max speed of photoelectron is $v_1:v_2=\sqrt{2}:1$ for corresponding λ_1 and λ_2 respectively.

(Take $hc=1240\text{eV-nm}$)

Options :

6760335949. 0.5 eV

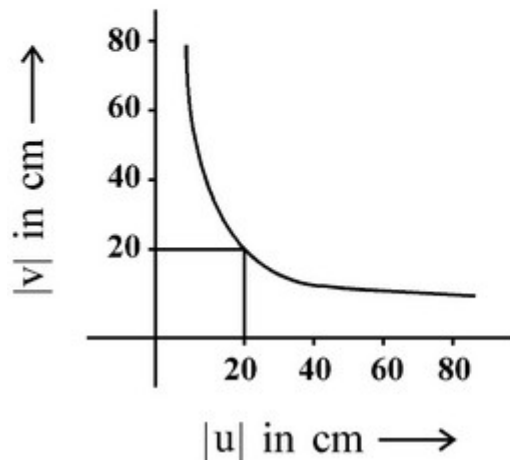
6760335950. 1.5 eV

6760335951. 1.8 eV

6760335952. 2.5 eV

Question Number : 4 Question Id : 6760331984 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The reported graph shows the variation of 'v' with 'u', where 'u' represents the distance of the object from the lens and v represent the distance of image from lens. This lens forms a real image of the object. The power of the lens is -



Options :

6760335953. -10 D

6760335954. 10 D

6760335955. -5 D

6760335956. 5 D

Question Number : 5 Question Id : 6760331985 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A choke coil is needed to operate an arc lamp at 160 V (rms) and 50 Hz. The arc lamp has an effective resistance of 5Ω when running at 10A (rms). The inductance of the choke coil is -

Options :

6760335957. 4.84×10^{-2} H

6760335958. 2.71×10^{-2} H

6760335959. 5.67×10^{-2} H

6760335960. 1.67×10^{-2} H

Question Number : 6 Question Id : 6760331986 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A given mass 1g of copper is drawn into a wire and made into a circular loop. The circular loop is placed perpendicularly in a magnetic field which is varying at a rate of $0.17 \frac{T}{s}$. The induced current in the loop approximately is _____.

(Resistivity and density of copper are $1.7 \times 10^{-8} \Omega m$ and 9000 kg/m^3)

Options :

6760335961. 0.88 A

6760335962. 0.088 A

6760335963. 8.8 A

6760335964. 0.088 mA

Question Number : 7 Question Id : 6760331987 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The same current is passed through two identical conducting wires of the same length L . One of them, w_1 , is bent in the form of a circular loop of N_1 turns while the other wire, w_2 , is bent in the form of a circular loop of N_2 turns. The ratio of the magnetic fields at the centre of the coils w_1 and w_2 will be -

Options :

6760335965. $\frac{N_1}{N_2}$

6760335966. $\frac{N_2}{N_1}$

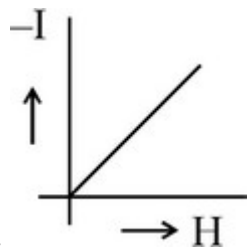
6760335967. $\left(\frac{N_1}{N_2}\right)^2$

6760335968. $\left(\frac{N_2}{N_1}\right)^2$

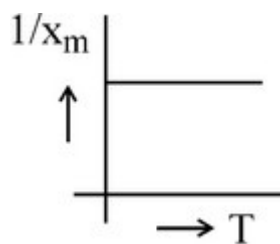
Question Number : 8 Question Id : 6760331988 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which of the following curve represents properties similar to CuCl_2 (Paramagnetic) ?

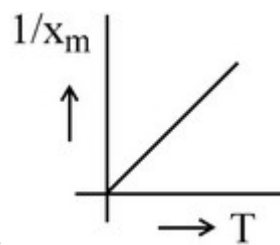
Options :



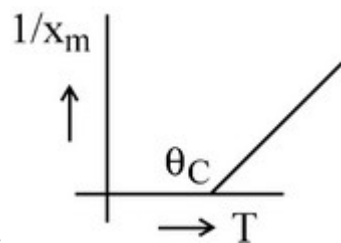
6760335969.



6760335970.



6760335971.



6760335972.

Question Number : 9 Question Id : 6760331989 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : Yes Correct Marks : 4 Wrong Marks : 1

The electric potential at any point P(x, y, z) is $V = x^3z - x^2y - 3$ volts.

The electric field \vec{E}_Q at point Q(2, 3, 1) will be (in V/m) -

Options :

6760335973. $8\hat{i} - 12\hat{j} - 3\hat{k}$

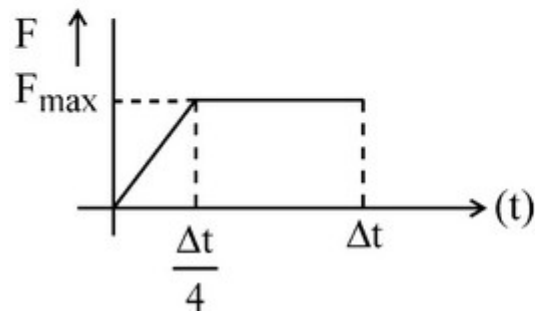
6760335974. $4(2\hat{i} - 3\hat{j})$

6760335975. $4(\hat{j} - 2\hat{k})$

6760335976. $2(2\hat{k} - 3\hat{i})$

Question Number : 10 Question Id : 6760331990 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A body of mass 'M' is moving with a velocity 'v'. It makes a one dimensional head on elastic collision with a stationary body of same mass. They are in contact for a very small time ' Δt '. The contact force between them varies as shown in the figure. Find the magnitude of \bar{F}_{\max} .



Options :

$$6760335977. \frac{mv}{7\Delta t}$$

$$6760335978. \frac{8mv}{7\Delta t}$$

$$6760335979. \frac{7mv}{8\Delta t}$$

$$6760335980. \frac{mv}{8\Delta t}$$

Question Number : 11 Question Id : 6760331991 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The tension in a string is increased by 44%. If its frequency of vibration is to remain unchanged, its length must be increased by

Options :

$$6760335981. 12\%$$

$$6760335982. 20\%$$

$$6760335983. 24\%$$

$$6760335984. 56\%$$

Question Number : 12 Question Id : 6760331992 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Consider two thermally insulated vessels filled with air, having volumes (V_1), (V_2), Pressure P_1 , P_2 and temperature T_1 , T_2 for vessels 1 and 2 respectively. What is the temperature inside the vessel at equilibrium if joining valve of vessels 1 and 2 is opened ?

Options :

6760335985.
$$\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_2 + P_2 V_2 T_1}$$

6760335986.
$$\frac{T_1 T_2 (P_1 V_1 - P_2 V_2)}{P_1 V_1 T_2 - P_2 V_2 T_1}$$

6760335987.
$$\frac{T_1 T_2 (P_1 V_1 + P_2 V_2)}{P_1 V_1 T_1 + P_2 V_2 T_2}$$

6760335988.
$$P_1 V_1 + P_2 V_2$$

Question Number : 13 Question Id : 6760331993 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Given below are two statements :

Statement I : Second law of thermodynamics is derived from the fact that it is impossible to run an irreversible engine without aid of external agency.

Statement II : Second law of thermodynamics provides the concept of entropy.

In the light of above statements choose the most appropriate answer from the options given below -

Options :

6760335989. Both statement I and II are correct.

6760335990. Both statements I and II are incorrect.

6760335991. Statement I is correct but statement II is incorrect.

6760335992. Statement I is incorrect but statement II is correct.

Question Number : 14 Question Id : 6760331994 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A copper rod of length 1m is stretched by 30 mm within elastic limit. The energy stored in the stretched rod is converted into heat, then the rise in temperature of the rod is _____.

[Given Young's Modulus $\gamma=1.05 \times 10^{11} \text{N/m}^2$ Specific gravity of copper = 9 specific heat capacity $S = 100 \text{ Cal/kg/}^\circ\text{C}$]

Options :

6760335993. 1.25°C

6760335994. 12.5°C

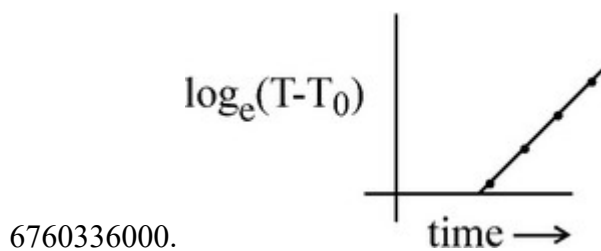
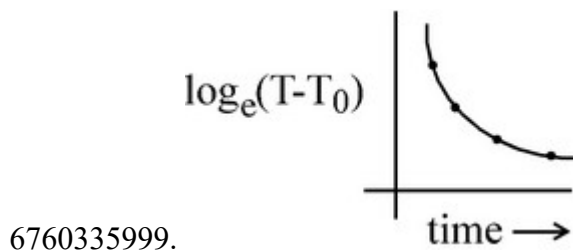
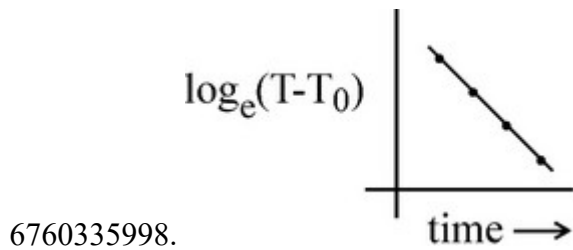
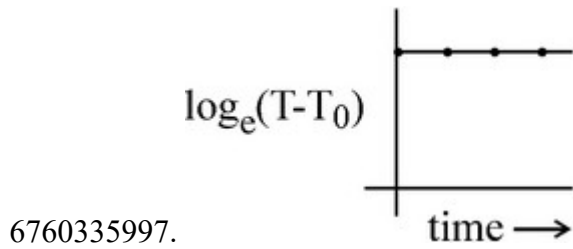
6760335995. 15.0°C

6760335996. 15.5°C

Question Number : 15 Question Id : 6760331995 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which is the correct graph to explain the Newton's law of cooling. T and T_0 are the temperatures of hot body and surrounding respectively.

Options :



Question Number : 16 Question Id : 6760331996 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The distance of an equatorial satellite from the centre of Earth which is always above a certain place on the Earth's surface is -

Options :

6760336001. $\left(\frac{GM}{\omega^2}\right)^{1/3}$

6760336002. $\left(\frac{GM}{\omega^2}\right)^{1/2}$

6760336003. $\left(\frac{GM}{\omega^2}\right)^{2/3}$

6760336004. $\left(\frac{GM}{\omega^2}\right)$

Question Number : 17 Question Id : 6760331997 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A neutron of mass m_n collides against a moderator nucleus of mass $10 m_n$ at rest. Considering the collision to be one dimensional, the fractional kinetic energy lost by the neutron (f_1) is [Given : The collision is elastic]

Options :

6760336005. 0.67

6760336006. 0.33

6760336007. 0.72

6760336008. 0.38

Question Number : 18 Question Id : 6760331998 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The position time relation of a body of mass 0.02 kg is given by (one-dimensional motion)

$$x = 9 \text{ cm (for } t = 3, 9, 15, 21\text{s)}$$

$$x = 0 \text{ cm (for } t = 0, 6, 12, 18, 24\text{s)}$$

If the time between two consecutive impulse is '3s', find the magnitude of each impulse.

Options :

6760336009. $1.2 \times 10^{-3} \text{ kg m/s}$

6760336010. 1.2 kg m/s

6760336011. $1.2 \times 10^{-1} \text{ kg m/s}$

6760336012. 1200 g cms^{-1}

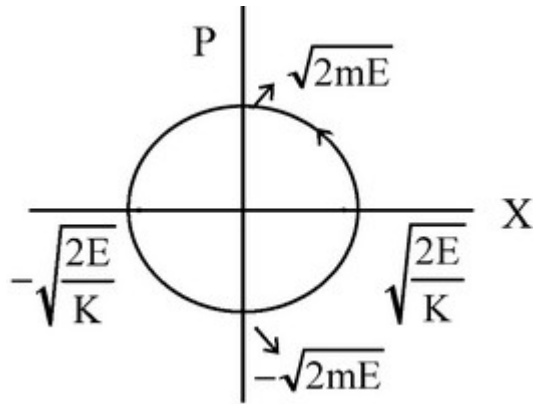
Question Number : 19 Question Id : 6760331999 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The potential energy function for a particle executing SHM is given by

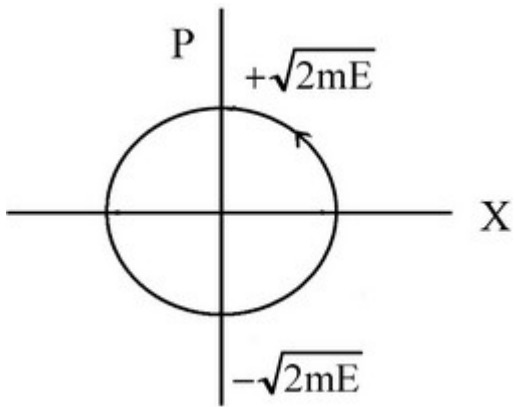
$$V(x) = \frac{1}{2}kx^2, \text{ where } k \text{ is the force constant of the oscillator. Which of the}$$

following diagram correctly shows the position - momentum curve for the motion.

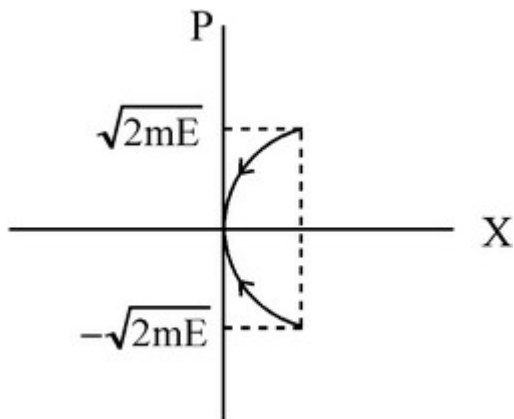
Options :



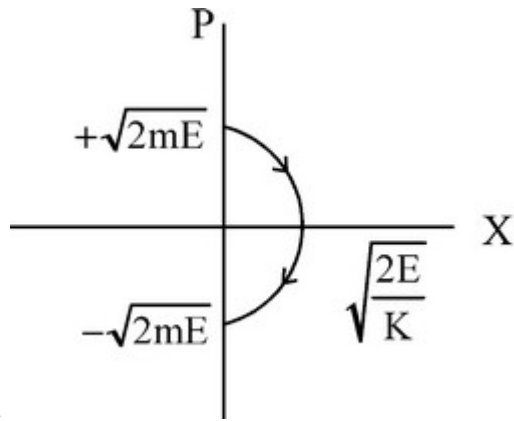
6760336013.



6760336014.



6760336015.



6760336016.

Question Number : 20 Question Id : 6760332000 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A student measured volume of a 3 dimensional body of height, length and breadth h , l and b respectively using three vernier callipers A, B and C. He found the volumes to be V_A , V_B , V_C respectively and forgot to apply the zero error correction

The actual value of volume is V_0 . If $V_A > V_0$, $V_B - V_C$ is a positive value and $V_C < V_0$, then what is not true about A, B and C.

Options :

6760336017. V_A and V_B may have values more than V_0 and V_C .

6760336018. A has positive zero error, C has negative zero error.

6760336019. B may have positive, negative or no zero error.

6760336020. A has a negative zero error and C has a positive zero error.

Physics Section B

Section Id :	676033134
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 :	676033134
Question Shuffling Allowed :	Yes

Question Number : 21 Question Id : 6760332001 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

An Amplitude Modulated (AM) wave is expressed as

$$C=5(1+0.3\cos 200\pi t)\cos(1\times 10^8\pi t) \text{ volts.}$$

Its percentage modulation is _____%.

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 : 6760332002 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Two heaters X and Y are connected in parallel across the supply of V volts. Heater X generates 500 kCal of heat in 20 minutes while Y generates 1000 kCal in 10 minutes. The resistance of heater X is 10Ω . If these heaters are connected in series across the same voltage, then the heat produced in 5 minutes will be _____ kCal.

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 :** 6760332003 **Question Type :** SA

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

The magnitude of resultant of two forces acting at a point is 12N and the sum of their magnitude is 18N. If the resultant is at right angles with the smaller one, then the differences in the magnitude of the two forces will be _____ N.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

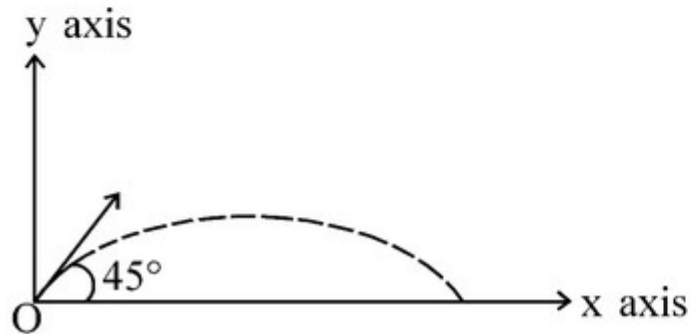
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Question Number : 24 **Question Id :** 6760332004 **Question Type :** SA

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

A particle of mass 1 kg is projected at $t = 0$ from a point 'O' on the ground with a speed 'u' at an angle 45° to the horizontal. The magnitude of angular momentum of the particle about 'O' at time $\frac{u}{g}$ is given by $\frac{7u^3}{ag}$. Then the

value of a is _____. (Take $\frac{1}{\sqrt{2}} = 0.7$ and $g = 10 \text{ m/s}^2$)



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

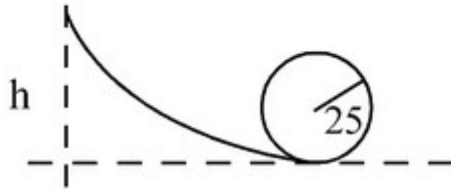
Possible Answers :

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Question Number : 25 **Question Id :** 6760332005 **Question Type :** SA

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

A small solid spherical marble of mass M and radius 5 cm rolls along loop track without slipping. The height above the base, from where it has to start rolling down incline such that the sphere just completes the vertical circular loop of radius 25 cm is _____ cm. ($g = 10 \text{ m/s}^2$)



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 26 **Question Id :** 6760332006 **Question Type :** SA

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

Employing a resistance of 8Ω , a capacitor is charged through a battery of 12V .

In $2\mu\text{s}$ time, the potential difference across the capacitor is found to be 6V .

The storage capacity of the capacitor is $\frac{x}{100}\mu\text{F}$. Then the value of x is _____.

$(\ln 2 = 0.69)$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

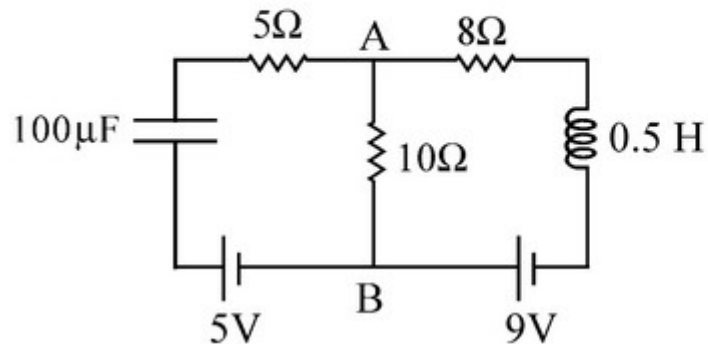
Possible Answers :

100

Question Number : 27 Question Id : 6760332007 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

As per the reported figure, the value of voltage across the terminals A B (i.e. V_{AB}) is _____ V during the proper flow of current.



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 : 6760332008 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The voltage between the plates of a capacitor of capacitance $5\mu\text{F}$ is changing

at a rate of $8 \times 10^2 \frac{\text{V}}{\text{s}}$. The displacement current is _____ mA.

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 : 6760332009 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A light source of 25.1 mW emits 2×10^{16} photons per second. An unknown metal is brought in front of this light source from which electrons of speed upto 10^6 m/s are emitted upon the incidence of the photons from the light source. The work function of the unknown metal is _____ eV.

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 : 6760332010 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

In the Bohr's atomic model, second energy state potential energy of hydrogen is $(-E)$. the kinetic energy of electron in the first energy state will be _____ E.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100