SAT Physics practice paper

Question 1

If the addition of $2{,}000$ joules of heat to 10 kilograms of a substance raises its temperature $2\,^{\circ}\mathrm{C}$, the specific heat of the substance is

Select an Answer

A

$0.01\,\mathrm{J/kg\cdot\,^{\circ}C}$

B

$0.2\,\mathrm{J/kg\cdot\,^{\circ}C}$

C

$50\,\mathrm{J/kg\cdot\,^{\circ}C}$

D

$100\,\mathrm{J/kg\cdot\,^{\circ}C}$

E

$200\,\mathrm{J/kg\cdot\,^{\circ}C}$

Question 2

An object with mass m and speed v_0 directed to the right strikes a wall and rebounds with speed v_0 directed to the left.
The change in the object's kinetic energy is

Select an Answer

A

$-mv_0^2$

B

$-\frac{1}{2}m\,v_0^2$

C

Zero

D

$\frac{1}{2}m\,v_0^2$

E

$m v_0^2$

Question 3

A teacher measures and records her own mass to an accuracy of better than $1/2$ percent. Which of the following is most likely the mass that she recorded?

Select an Answer

A
6.43kg

B
60kg

C
64.3kg

D
600kg

E
643kg

Question 4

An experiment is performed to measure the specific heat of copper. A lump of copper is heated in an oven, then dropped into a beaker of water. To calculate the specific heat of copper, the experimenter must know or measure the value of all of the quantities below EXCEPT the

Select an Answer

A mass of the water
B original temperatures of the copper and the water
C final (equilibrium) temperature of the copper and the water
D time taken to achieve equilibrium after the copper is dropped into the water
E specific heat of the water

Question 5

In a given process, 12 joules of heat is added to an ideal gas and the gas does 8 joules of work. Which of the following is true about the internal energy of the gas during this process?

Select an Answer

A It has increased by 20 joules.
B It has increased by 4 joules.
C It has not changed.
D It has decreased by 4 joules.
E It has decreased by 20 joules.

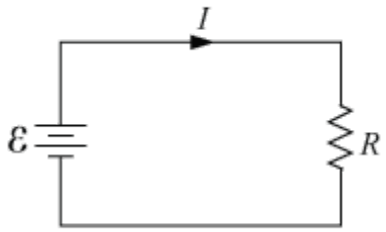
Question 6

Which of the following is true of the magnetic field produced by a current in a long, straight wire?

Select an Answer

A The field is uniform.
B The field increases in strength as the distance from the wire increases.
C The field lines are directed parallel to the wire, but opposite to the direction of the current.
D The field lines are directed radially outward from the wire.
E The field lines form circles about the wire.

Question 7



A single resistor R is connected to a battery as shown above. The current is I and the power dissipated as heat is P. The circuit is changed by doubling the emf ε of the battery while R is kept constant.
After the change, the current is

Select an Answer

A
$\frac{I}{4}$

B
$\frac{I}{2}$

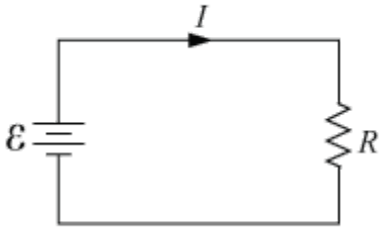
C
I

D
$2I$

E

$4I$

Question 8



A single resistor R is connected to a battery as shown above. The current is I and the power dissipated as heat is P. The circuit is changed by doubling the emf ε of the battery while R is kept constant.

After the change, the power dissipated in R is

Select an Answer

A

$\frac{P}{4}$

B

$\frac{P}{2}$

C

P

D

$2P$

E

$4P$

Question 9

An object with mass m and speed v_0 directed to the right strikes a wall and rebounds with speed v_0 directed to the left.

The change in the object's momentum is

Select an Answer

A

$2mv_0$ directed to the left

B

mv_0 directed to the left

C

Zero

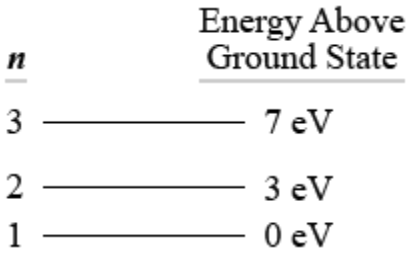
D

mv_0 directed to the right

E

$2mv_0$ directed to the right

Question 10



The three lowest energy levels of an atom are shown above. An atom in the $n = 3$ state can, in a single transition, spontaneously emit a photon having an energy of

Select an Answer

A

$3eV$ only

B

$4eV$ only

C

$7eV$ only

D

$4eV$ or $7eV$ only

E

$3eV$ or $4eV$ only

Question 11

A ball, initially at rest at $t = 0$ seconds, rolls with constant acceleration down an inclined plane 10 meters long. If the ball rolls 1 meter in the first 2 seconds, how far will it have rolled at $t = 4$ seconds?

Select an Answer

A
2m

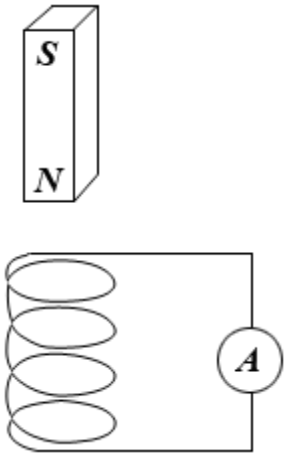
B
3m

C
4m

D
5m

E
8m

Question 12



A bar magnet is located next to a coil of wire that is fixed in position and connected to an ammeter A, as shown above. There will be an induced electric current through the ammeter if the magnet is moving in which of the following ways?

I.	Toward the coil with constant speed
II.	Toward the coil with increasing speed
III.	Away from the coil with constant speed
IV.	Away from the coil with increasing speed

Select an Answer

A
I or II only

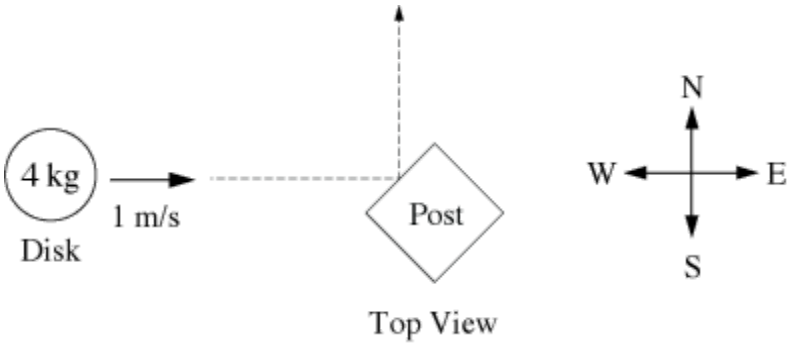
B
I or III only

C
II or IV only

D
III or IV only

E
I or II or III or IV

Question 13



A 4-kilogram disk slides over level ice toward the east at a velocity of 1 meter per second, as shown above. The disk strikes a post and rebounds toward the north at the same speed. The change in the magnitude of the eastward component of the momentum of the disk is

Select an Answer

A
$-4\ \text{kg}\cdot\text{m/s}$

B
$-1\ \text{kg}\cdot\text{m/s}$

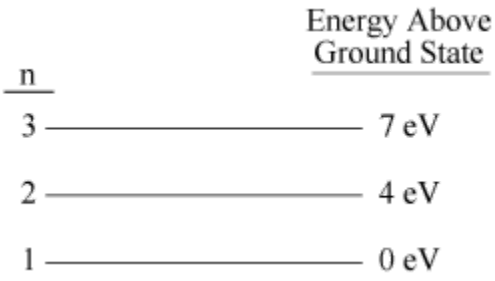
C
$0\ \text{kg}\cdot\text{m/s}$

D
$1\ \text{kg}\cdot\text{m/s}$

E

4 kg·m/s

Question 14

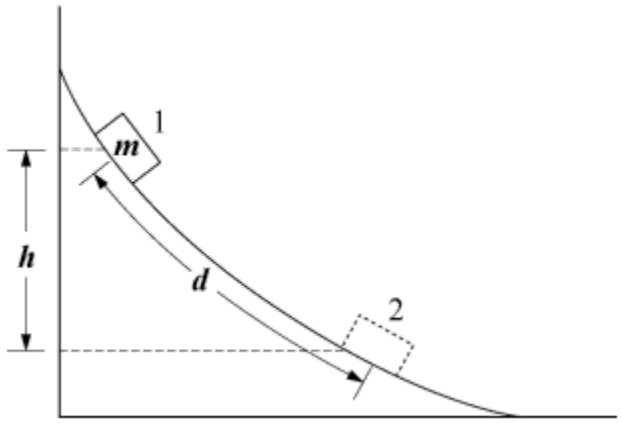


Three energy levels of an atom are shown above. Atoms in the $n = 2$ state can spontaneously emit photons having which of the following energies?

Select an Answer

A
4 eV only
B
7 eV only
C
3 eV and 4 eV only
D
3 eV and 7 eV only
E
3 eV, 4 eV, 7 eV

Question 15



A box of mass m is released from rest at position 1 on the frictionless curved track shown above. It slides a distance d along the track in time t to reach position 2, dropping a vertical distance h. Let v and a be the instantaneous speed and instantaneous acceleration, respectively, of the box at position 2. Which of the following equations is valid for this situation?

Select an Answer

A
$h = vt$

B
$h = \frac{1}{2}gt^2$

C
$d = \frac{1}{2}at^2$

D
$v^2 = 2ad$

E
$mgh = \frac{1}{2}mv^2$

Question 16

The Earth has a radius of $6{,}400$ kilometers. A satellite orbits the Earth at a distance of $12{,}800$ kilometers from the center of the Earth. If the weight of the satellite on Earth is 100 kilonewtons, the gravitational force on the satellite in orbit is

Select an Answer

A
11 kilonewtons

B
25 kilonewtons

C
50 kilonewtons

D
100 kilonewtons

E
200 kilonewtons

Question 17

A pendulum of length ℓ with a bob of mass m is oscillating with small amplitude. Which of the following changes in the pendulum would double its period?

Select an Answer

A
Doubling the mass m of the bob
B
Doubling the initial force used to set the pendulum in motion
C
Doubling the amplitude of the pendulum's swing
D
Quadrupling the mass m of the bob
E
Quadrupling the length ℓ of the pendulum

Question 18

A piece of chalk is thrown vertically upward and caught during its descent at the same height from which it was thrown. The position of the chalk is measured from when it left the hand. The positive direction for position, velocity, and acceleration is upward.
What are the signs of the position, velocity, and acceleration during the ascending part of the trajectory?

	Position	Velocity	Acceleration
(A)	Positive	Positive	Positive
(B)	Positive	Positive	Negative
(C)	Positive	Negative	Negative
(D)	Negative	Positive	Negative
(E)	Negative	Negative	Negative

Select an Answer

A (A)

B (B)
C (C)
D (D)
E (E)

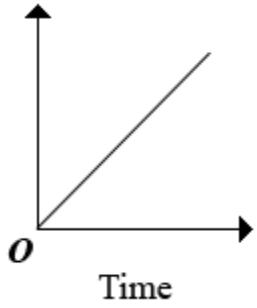
Question 19

The set of lettered choices below refers to multiple questions. Select the one lettered choice that best answers each question. A choice may be used once, more than once, or not at all in each set.

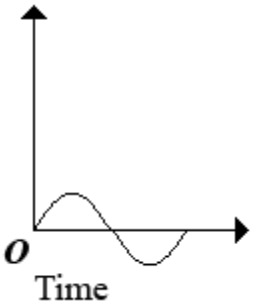
Which graph represents the total heat produced by a resistor carrying a steady current as a function of time from time $t = 0$?

Select an Answer

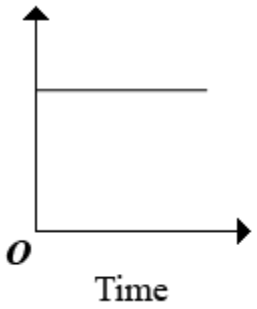
A



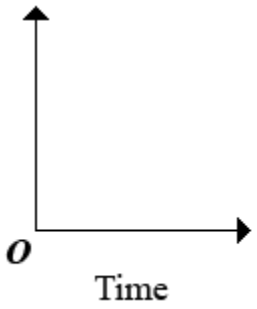
B



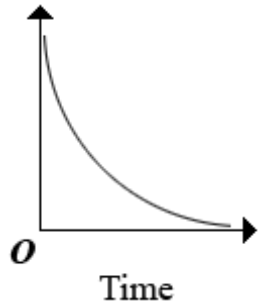
C



D



E



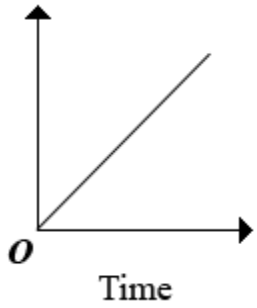
Question 20

The set of lettered choices below refers to multiple questions. Select the one lettered choice that best answers each question. A choice may be used once, more than once, or not at all in each set.

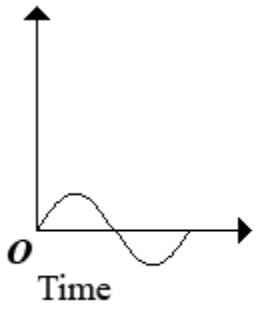
Which graph best represents the magnetic field measured at the center of a coil due to a steady current as a function of time?

Select an Answer

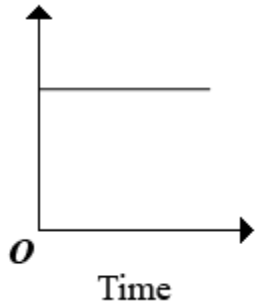
A



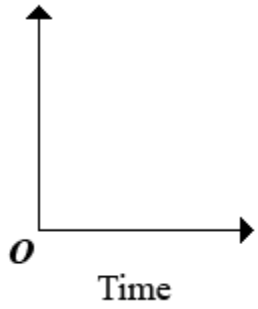
B



C



D



E