SAT Physics Practice Papers 10

SET 1

1. A wire made of brass and a wire made of silver have the same length, but the diameter of the brass wire is 4 times the diameter of the silver wire. The resistivity of brass is 5 times greater than the resistivity of silver. If R_B denotes the resistance of the brass wire and R_S denotes the resistance of the silver wire, which of the following is true?

A. $R_B = \dfrac{5}{16} R_S$

B. $R_B = \dfrac{4}{5} R_S$

C. $R_B = \dfrac{5}{4} R_S$

D. $R_B = \dfrac{5}{2} R_S$

E. $R_B = \dfrac{16}{5} R_S$

2. For an ohmic conductor, doubling the voltage without changing the resistance will cause the current to

A. decrease by a factor of 4

B. decrease by a factor of 2

C. remain unchanged

D. increase by a factor of 2

E. increase by a factor of 4

3. If a 60-watt lightbulb operates at a voltage of 120 V, what is the resistance of the bulb?
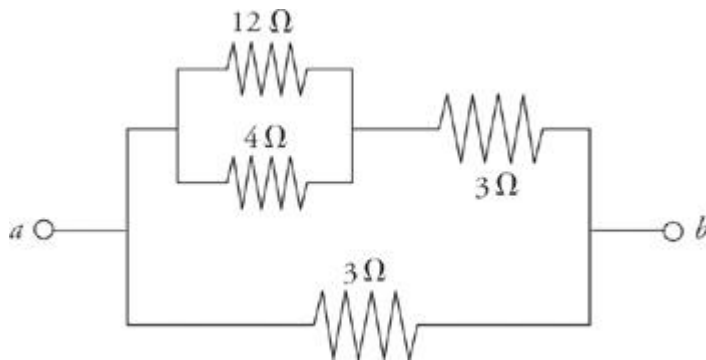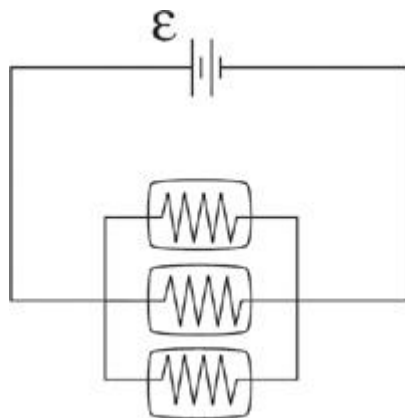
A. 2Ω

B. 30Ω

C. 240Ω

D. 720Ω

E. 7,200Ω

4. A battery whose emf is 40 V has an internal resistance of 5 Ω. If this battery is connected to a 15 Ω resistor R, what will be the voltage drop across R ?

A. 10 V

B. 30 V

C. 40 V

D. 50 V

E. 70 V

5.

Determine the equivalent resistance between points *a* and *b*.

A. 0.167 Ω

B. 0.25 Ω

C. 0.333 Ω

D. 1.5 Ω

E. 2.0 Ω

6.

Three identical light bulbs are connected to a source of emf, as shown in the diagram above. What will happen if the middle bulb burns out?

A. All the bulbs will go out.

B. The light intensity of the other two bulbs will decrease (but they won't go out).

C. The light intensity of the other two bulbs will increase.

D. The light intensity of the other two bulbs will remain the same.

E. More current will be drawn from the source of emf.

7. How much energy is dissipated as heat in 20 s by a 100 Ω resistor that carries a current of 0.5 A ?

A. 50 J

B. 100 J

C. 250 J

D. 500 J

E. 1,000 J

8. Two resistors, *A* and *B*, are in series in a circuit that carries a nonzero current. If the resistance of Resistor *A* is 4 times greater than the resistance of Resistor *B*, which of the following correctly compares the currents through these resistors (I_A and I_B, respectively) and the voltage drops across them (V_A and V_B, respectively)?

A. $I_A = I_B$ and $V_A = V_B$

B. $I_A = I_B$ and $V_A = 4V_B$
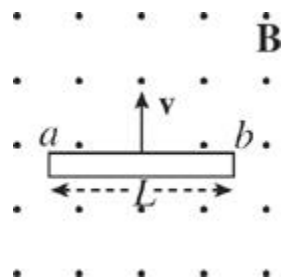
C. $I_A = I_B$ and $V_B = 4V_A$

D. $I_A = 4I_B$ and $V_A = 4V_B$

E. $I_B = 4I_A$ and $V_B = 4V_A$

SET 2

1. A metal rod of length *L* is pulled upward with constant velocity **v** through a uniform magnetic field **B** that points out of the plane of the page.

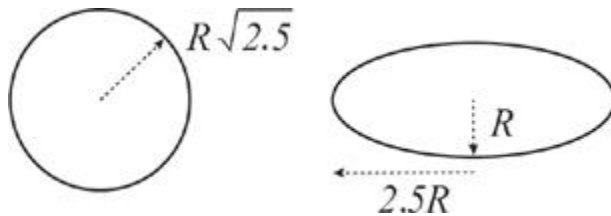What is the potential difference between points *a* and *b* ?

A. 0

B. $\dfrac{1}{2}$ vBL, with point a at the higher potential

C. $\dfrac{1}{2}$ vBL, with point b at the higher potential

D. vBL, with point a at the higher potential

E. vBL, with point b at the higher potential

2. The circle and ellipse below have the same area.

If both loops are held so that their plane is perpendicular to a uniform magnetic field, **B**, how would Φ_C, the magnetic flux through the circular loop, compare to Φ_E, the magnetic flux through the elliptical loop?
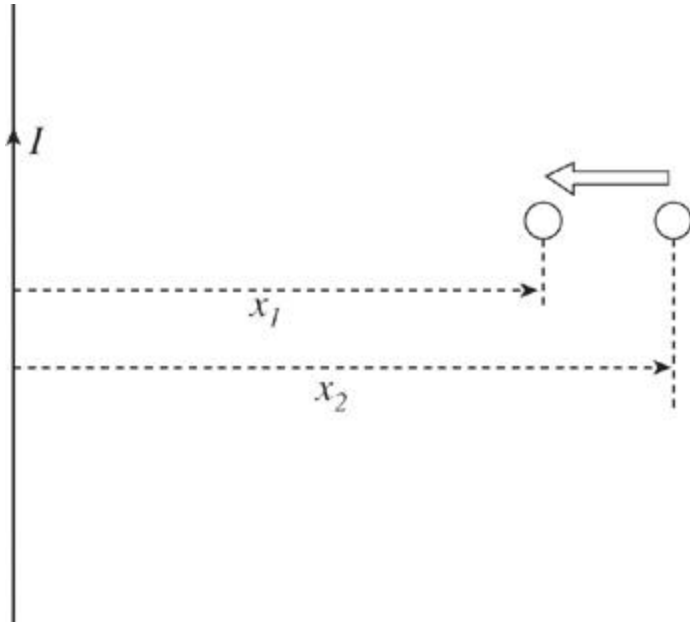
A. $\Phi_C = 2.5\Phi_E$

B. $\Phi_C = \sqrt{2.5}\ \Phi_E$

C. $\Phi_C = \Phi_E$

D. $\Phi_E = \sqrt{2.5}\ \Phi_C$

E. $\Phi_E = 2.5\Phi_C$

3. The figure below shows a small circular loop of wire in the plane of a long, straight wire that carries a steady current I upward. If the loop is moved from distance x_2 to distance x_1 from the straight wire, what will be the direction of the induced current in the loop and the direction of the corresponding magnetic field it produces?

A. The induced current will be clockwise, and the magnetic field it produces will point out of the plane of the page.

B. The induced current will be clockwise, and the magnetic field it produces will point into the plane of the page.

C. The induced current will be counterclockwise, and the magnetic field it produces will point out of the plane of the page.

D. The induced current will be counterclockwise, and the magnetic field it produces will point into the plane of the page.

E. None of the above

4. A square loop of wire (side length = *s*) surrounds a long, straight wire such that the wire passes through the center of the square.
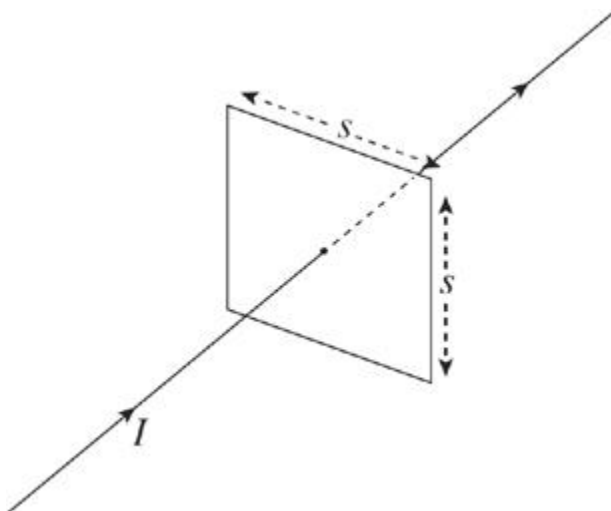
If the current in the wire is I, determine the current induced in the square loop.

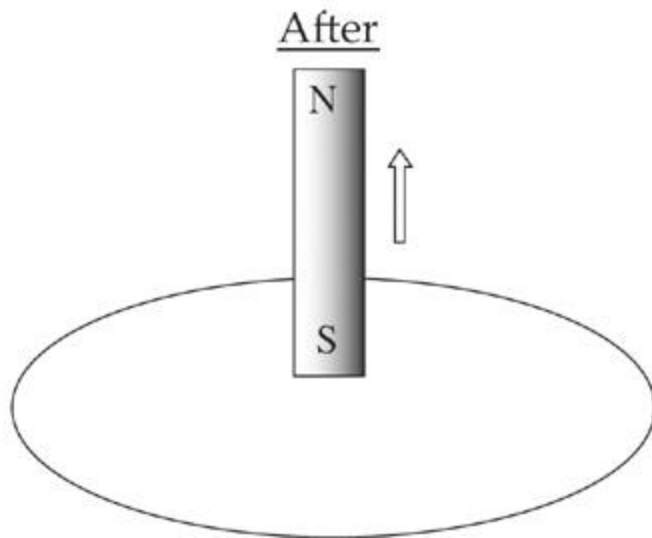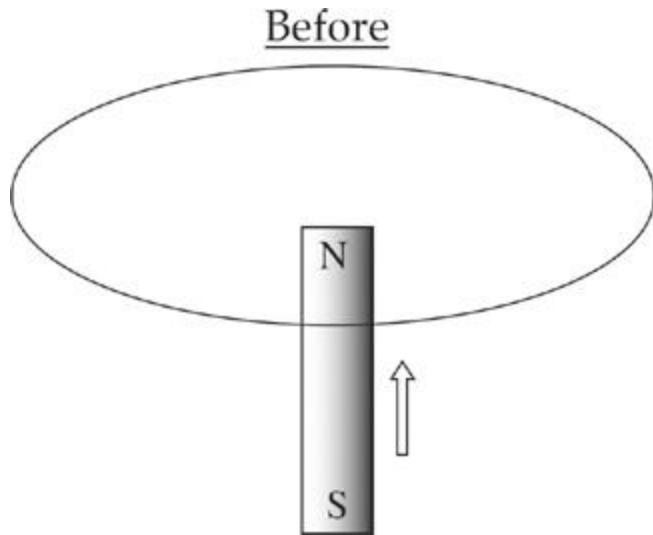A. $\dfrac{2\mu_0 Is}{\pi\left(1+\sqrt{2}\right)}$

B. $\dfrac{\mu_0 Is}{\pi\sqrt{2}}$

C. $\dfrac{\mu_0 Is}{\pi}$

D. $\dfrac{\mu_0 Is\sqrt{2}}{\pi}$

E. 0

5. In the figure below, a permanent bar magnet is pulled upward with a constant velocity through a loop of wire.

Before

After

Which of the following best describes the direction(s) of the current induced in the loop (looking down on the loop from above)?

A. Always clockwise

B. Always counterclockwise

C. First clockwise, then counterclockwise

D. First counterclockwise, then clockwise

E. No current will be induced in the loop.

SET 3

1. What is the wavelength of a 5 Hz wave that travels with a speed of 10 m/s ?

A. 0.25 m

B. 0.5 m

C. 1 m

D. 2 m

E. 50 m

2. A rope of length 5 m is stretched to a tension of 80 N. If its mass is 1 kg, at what speed would a 10 Hz transverse wave travel down the string?

A. 2 m/s

B. 5 m/s

C. 20 m/s

D. 50 m/s

E. 200 m/s

3. A transverse wave on a long horizontal rope with a wavelength of 8 m travels at 2 m/s. At $t = 0$, a particular point on the rope has a vertical displacement of $+A$, where A is the amplitude of the wave. At what time will the vertical displacement of this same point on the rope be $-A$?

A. $t = \dfrac{1}{8}$ s

B. $t = \dfrac{1}{4}$ s

C. $t = \dfrac{1}{2}$ s

D. $t = 2$ s

E. $t = 4$ s

4. What is the wavelength of a wave with period 2 s and speed 2 cm/s ?

A. 0.25 cm

B. 0.5 cm

C. 1 cm

D. 2 cm

E. 4 cm

5. A string, fixed at both ends, supports a standing wave with a total of 4 nodes. If the length of the string is 6 m, what is the wavelength of the wave?

A. 0.67 m

B. 1.2 m

C. 1.5 m

D. 3 m

E. 4 m

6. A string, fixed at both ends, has a length of 6 m and supports a standing wave with a total of 4 nodes. If a transverse wave can travel at 40 m/s down the rope, what is the frequency of this standing wave?

A. 6.7 Hz

B. 10.0 Hz

C. 13.3 Hz

D. 20.0 Hz

E. 26.7 Hz

7. A sound wave travels through a metal rod with wavelength λ and frequency f. Which of the following best describes the wave when it passes into the surrounding air?

Wavelength   Frequency

A. Less than λ Equal to f

B. Less than λ Less than f

C. Greater than λ Equal to f

D. Greater than λ Less than f

E. Greater than λ Greater than f

8. In the figure below, two speakers, S_1 and S_2, emit sound waves of wavelength 2 m, in phase with each other.

S₁ ...... P

1.5 m

Q

←------- 4 m -------→

1.5 m

S₂
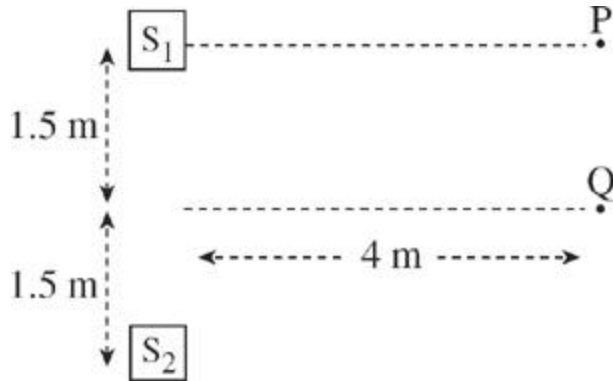
Let A_P be the amplitude of the resulting wave at point P, and A_Q the amplitude of the resultant wave at point Q. How does A_P compare to A_Q ?

A. $A_p < A_Q$

B. $A_p = A_Q$

C. $A_p > A_Q$

D. $A_p < 0$, $A_Q > 0$

E. A_p and A_Q vary with time, so no comparison can be made.

9. An observer is 2 m from a source of sound waves. By how much will the sound level decrease if the observer moves to a distance of 20 m ?

A. 1 dB

B. 2 dB

C. 10 dB

D. 18 dB

E. 20 dB

10. An organ pipe that's closed at one end has a length of 17 cm. If the speed of sound through the air inside is 340 m/s, what is the pipe's fundamental frequency?

A. 250 Hz

B. 500 Hz

C. 1,000 Hz

D. 1,500 Hz

E. 2,000 Hz

11. A bat emits a 40 kHz "chirp" with a wavelength of 8.75 mm toward a tree and receives an echo 0.4 s later. How far is the bat from the tree?

A. 35 m

B. 70 m

C. 105 m

D. 140 m

E. 175 m

12. A car is traveling at 20 m/s away from a stationary observer. If the car's horn emits a frequency of 600 Hz, what frequency will the observer hear? (Use v = 340 m/s for the speed of sound.)

A. (34/36)(600 Hz)

B. (34/32)(600 Hz)

C. (36/34)(600 Hz)

D. (32/34)(600 Hz)

E. (32/36)(600 Hz)