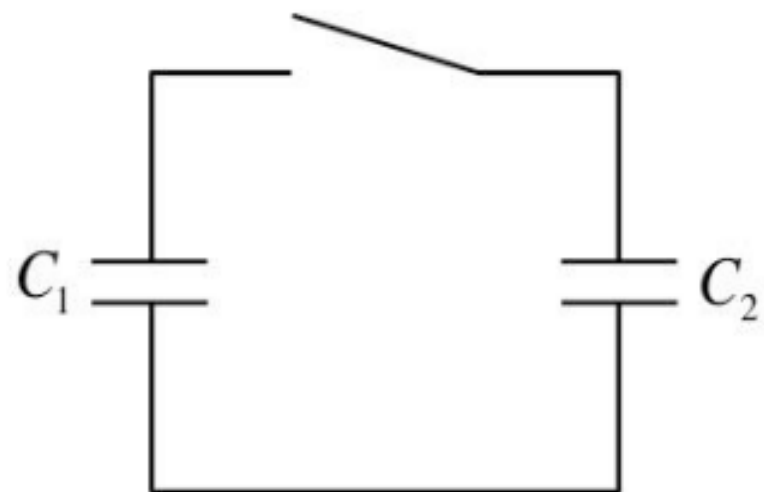1. Capacitors C_1 and C_2 are identical. Initially, capacitor C_1 is charged and stores 4.0 J of potential energy and capacitor C_2 is uncharged. After the switch is closed, what will be the total energy stored in this circuit?

a) 16 J
b) 2.0 J
c) 1.0 J
d) 8.0 J
e) 4.0 J

2. A cylindrical resistor is composed of 1/3 gold and 2/3 iron as shown ($\rho_{Au} = 2.35 \times 10^{-8}$ Ωm, and $\rho_{Fe} = 9.68 \times 10^{-8}$ Ωm). The radius of the cylinder is $r = 55$ μm, and its total resistance is $R = 1.5$ Ω. What is its length L?

a) 6.6 cm
b) 12 cm
c) 23 cm
d) 30 cm
e) 75 cm

3. In the RC circuit shown below, $\varepsilon = 100$ V, $C = 1.0\ \mu\text{F}$, and $R = 1.0\ \text{k}\Omega$. The switch has been in position 1 for a long time. At time $t = 0$, the switch is flipped to position 2. How much charge is left on the capacitor plates after $t = 10$ ms?

a) 0.67 nC
b) 45 nC
c) 14 nC
d) 37 nC
e) 4.5 nC
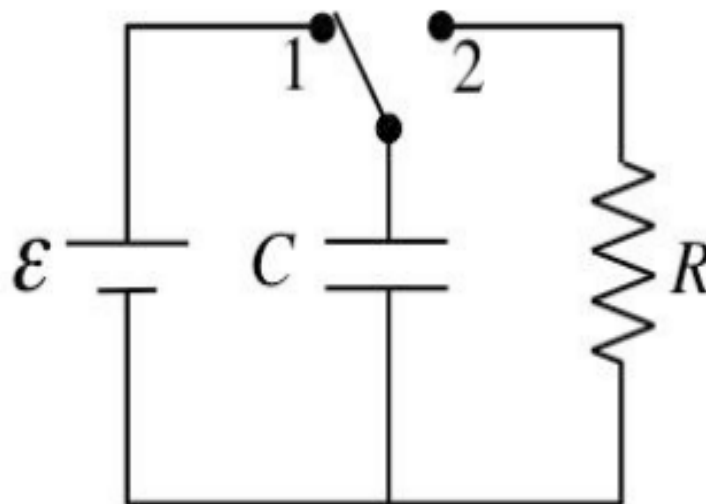
7. A uniform magnetic field is directed into the page. A charged particle, moving in the plane of the page, follows a clockwise spiral of decreasing radius as shown. Which of the following is a reasonable explanation?
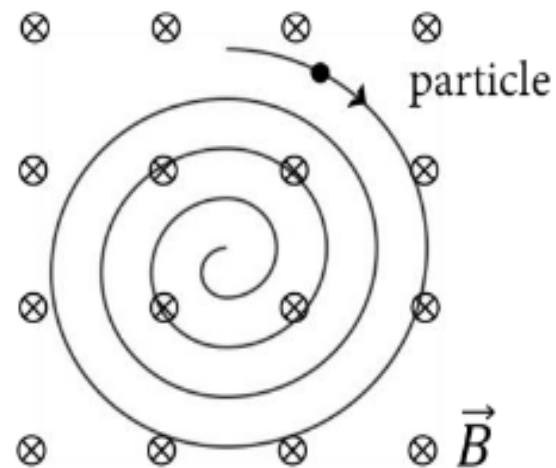

a) the charge is negative and slowing down
b) the charge is positive and slowing down
c) the charge is positive and speeding up
d) the charge is negative and speeding up
e) none of the above

10. In Figure (a) below, a small solid sphere has been given a uniform positive charge Q. The electric potential at the surface of the sphere is V_a, relative to $V = 0$ at infinity. In Figure (b), a thick, uncharged conducting shell (stippled in the figure) has been placed around the charged, solid sphere, without touching it. The electric potential at the surface of the solid sphere (relative to $V = 0$ at infinity) is now V_b. Which of the following is true?

Q

(a)

Q
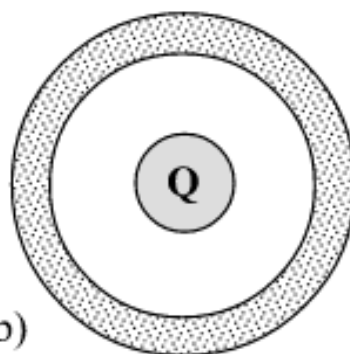
(b)

a) $V_b = V_a$

b) $V_b < V_a$

c) $V_b > V_a$

d) $V_b = \infty$

e) $V_b = 0$

14. Two equal positive point charges, each of charge q, are separated by distance L. There are no other charges anywhere. The potential at the midpoint of the line joining the charges is defined to be zero. The electrostatic potential at an infinite distance from the two charges is:

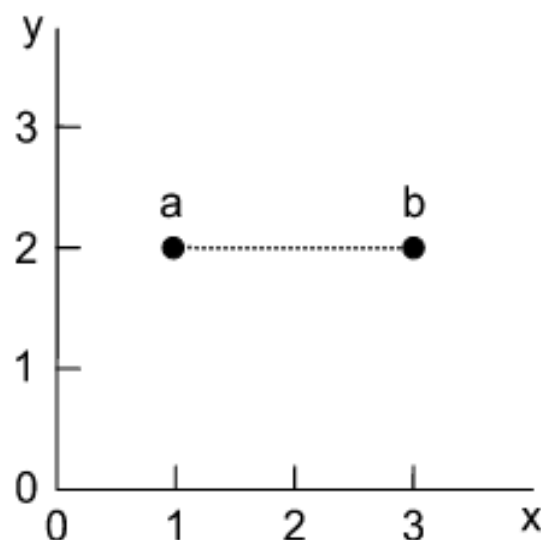a) $-\dfrac{1}{4\pi\varepsilon_0}\dfrac{2q}{L}$

b) $+\dfrac{1}{4\pi\varepsilon_0}\dfrac{2q}{L}$

c) $-\dfrac{1}{4\pi\varepsilon_0}\dfrac{4q}{L}$

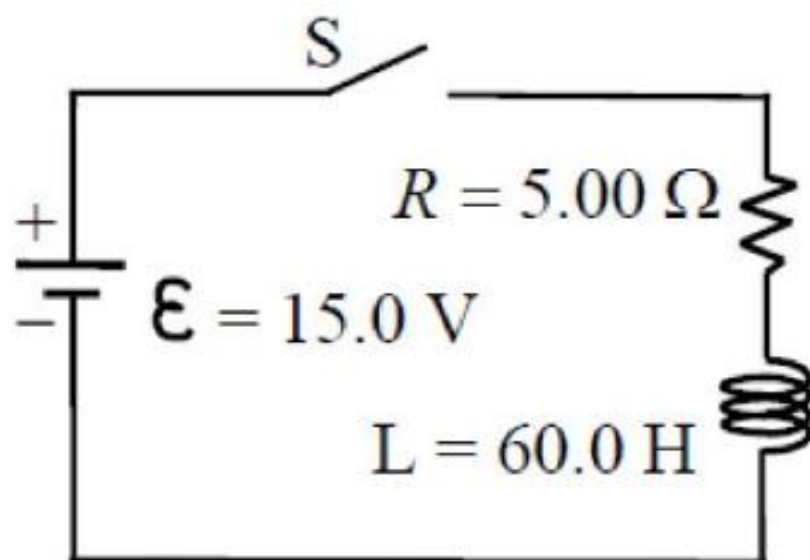d) $+\dfrac{1}{4\pi\varepsilon_0}\dfrac{4q}{L}$

e) Zero

16. The electric field in a particular region of space is given by $\vec{E} = y^2\hat{\imath} + 2xy\hat{\jmath}$. What is the electric potential difference, $V_{ab} = V_b - V_a$, between point a at $(x_a, y_a) = (1, 2)$ and point b at $(x_b, y_b) = (3, 2)$?
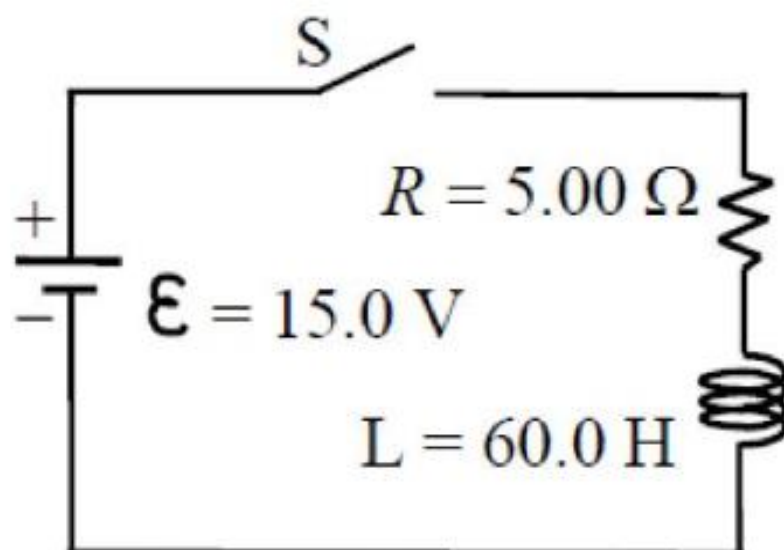

a) $V_{ab} = -8$ V
b) $V_{ab} = +24$ V
c) $V_{ab} = +8$ V
d) $V_{ab} = -24$ V
e) $V_{ab} = 0$ V

24. The switch, S, in the figure below is closed at time $t = 0$. At what time is the current in the circuit equal to 2.40 A? (Select the closest answer.)


a) 0.134 s
b) 19.3 s
c) 12.0 s
d) 4.80 s
e) 1.61 s

24. The switch, S, in the figure below is closed at time $t = 0$. At what time is the current in the circuit equal to 2.40 A? (Select the closest answer.)


a) 0.134 s
b) 19.3 s
c) 12.0 s
d) 4.80 s
e) 1.61 s

25. The diagram at the right shows a triangular loop of wire of resistance R moving at constant speed towards a region of magnetic field directed out of the page. (The magnetic field is zero everywhere outside the region shown.) Take current as positive when it is directed clockwise around the loop, as indicated by the arrows below the triangle.
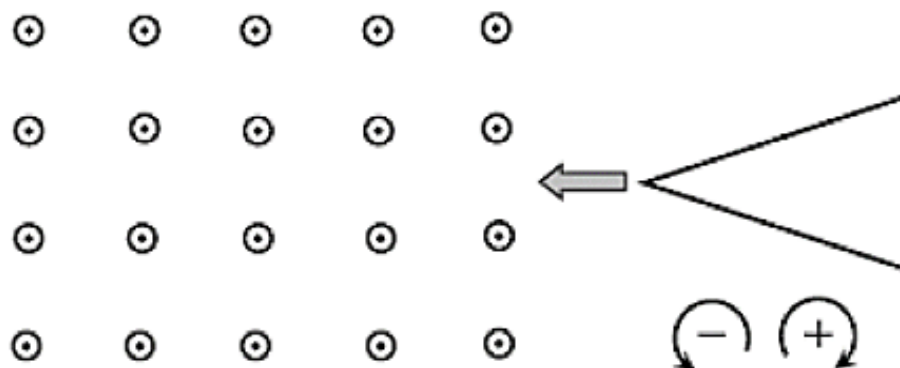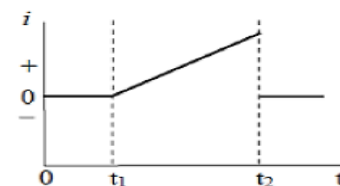
The leading edge of the loop first encounters the magnetic field at time t_1, and the loop becomes fully immersed in the field at time t_2. Which one of the five graphs shown below correctly describes the current, i, induced in the loop as a function of time, t?
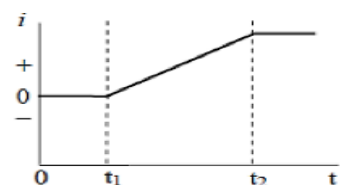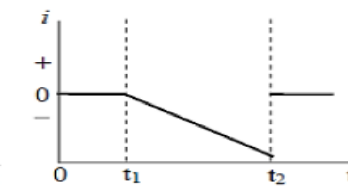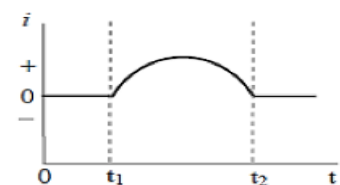

a)
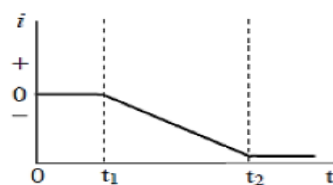
b)

c)

d)

e)

For answers check out "Apr_review_Answers.PDF"