PASS Mock Quiz 2

Sean Kirkby

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Short Answer Questions

1.

Which of the following statements are true regarding magnetic fields and electric fields?

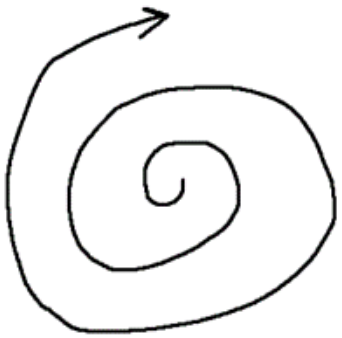
a) Electric charges generate an electric field and a magnetic field

b) The net electric flux density and net magnetic flux through a closed surface is always 0

c) Electric fields and magnetic fields pointing in the same direction have the same effect moving charges

d) none of the above

2.



Given the proton's trajectory above (apologies for the bad drawing). What direction is the magnetic field pointing? What is happening to it's magnitude as time goes on?

a) into the page, decreasing

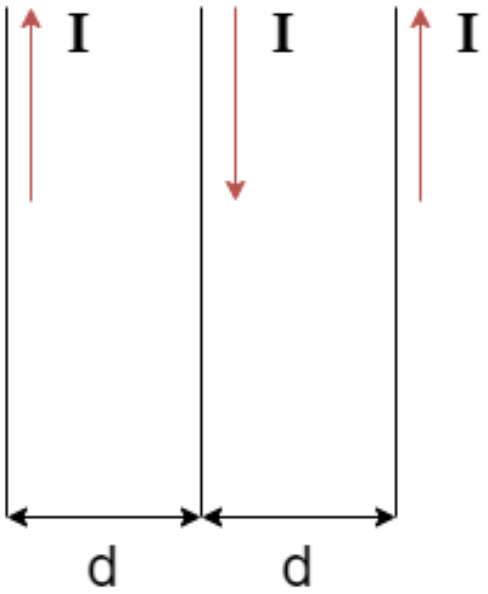
b) out of the page, decreasing

c) into the page, increasing

d) out of the page, increasing

e) none of the above

3.



Given The diagram above, Assuming all wires have the same length, "I" represents the magnitude of each wire's current and "d" represents the distance between the wires. Which direction will the wires move?

a) Away from the center

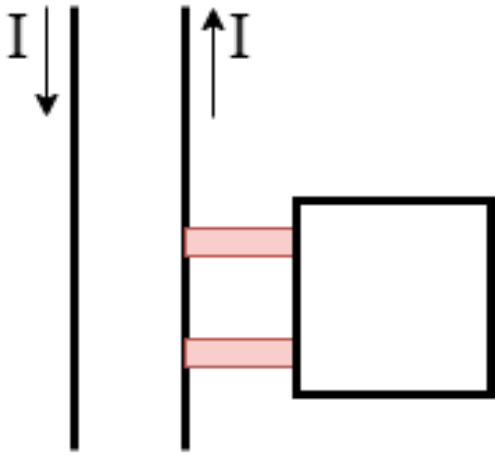
b) Towards the center

c) All to the left

d) All to the right

e) None of the above

4.



Given the diagram above, assuming all components shown can move freely without resistance, and the initial current within the loop is 0A. what is the resultant direction of the current within the loop as time progresses?

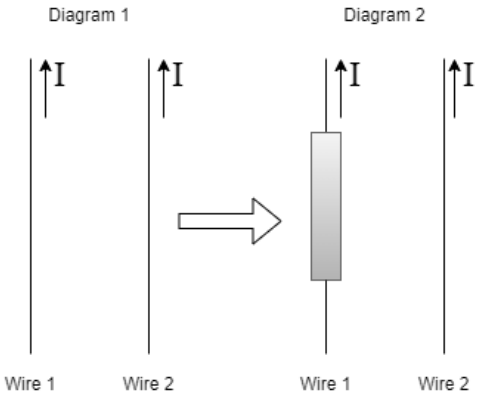
*Note: the red boxes represent non-conducting brackets which hold the loop and the left wire at a constant distance from each other.

a) Clock wise

b) Counter clock wise

c) No current

5.



Given the diagrams above, and the grey box on the right represents a solenoid. How does the force exerted on wire 2 change in diagram 2 in comparison to diagram 1

a) The forces direction changes but it's magnitude doesn't

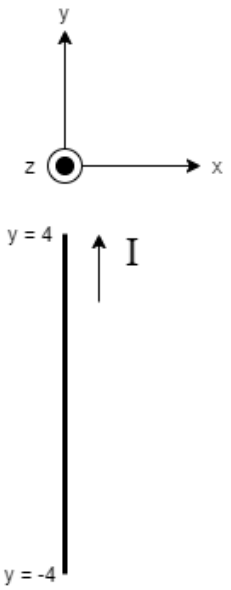
b) The forces magnitude increases

c) The forces magnitude decreases

d) None of the above

Long Answer Questions

1.



Given the diagram above with the wire being aligned on the y axis answer the following questions:

a) What is the resultant force (magnitude and direction) on an electron moving at $2\frac{m}{s}$ at the position (2,0,0)?

b) What is the magnitude of H at the position (2,0,1)?

2.

$H_1 = 4a_x + 7a_y$ (A/m) exists in a medium with permeability $\mu_r = 5$ for $x > 0$. The permeability in the region $x < 0$ is $\mu_r = 2$. Find H_2 for:

a) No Surface Current

b) Surface current $J_s = 3a_z(A/m)$

3.

Given The magnetic potential $A = x^3 a_y$ Wb/m

a) What is the resultant flux through a surface defined by: $z = 0$, $0 < x < 10$, $0 < y < 10$?

b) Using the same potential from the last question, there is a square wire loop located at x = 1, with side length 0.2m and a current 2ma. What is the resultant torque?

4.

Consider a circular single wire loop centered at r = 0, with resistance 5Ω and radius of 1m. What would be the resultant current in this loop if it is placed within a field $B = 3r^2t\hat{z}$?