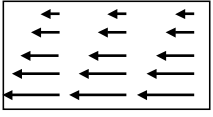


14

The figure shows a static magnetic field in a region of space. Could this region of space be “empty”?



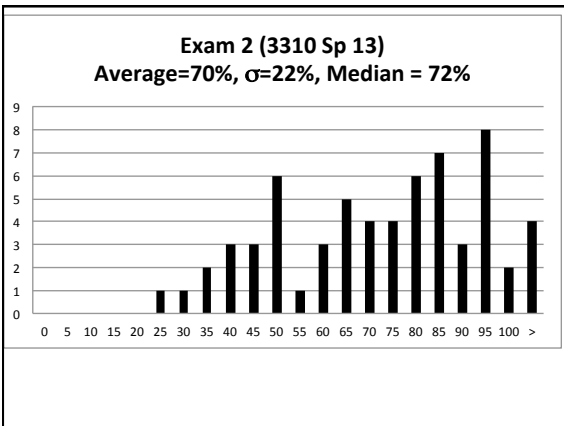
A) Yes, it could be empty space (with currents somewhere off to the sides creating it)

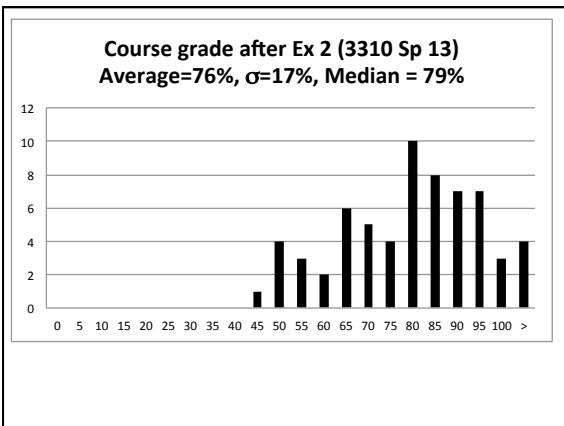
B) No, there must be static charges (ρ) in there.

C) No, there must be a current density (J) in the plane of the page in this (boxed) region

D) No, there must be a current density (J) perpendicular to the plane of the page in this region.

E) Other/???





5.17
a **ONLY CLICK AFTER YOU FINISH p.2, part iib:**
If the arrows represent a B field (note that $|B|$ is the same everywhere), is there a nonzero \mathbf{J} (perpendicular to the page) in the dashed region?

A. Yes
B. No
C. Need more information to decide

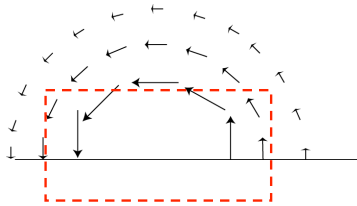
An electron is moving in a straight line with constant speed v . What approach would you choose to calculate the B-field generated by this electron?

A) Biot-Savart
B) Ampere's law
C) Either of the above.
D) Neither of the above.

5.17
b If the arrows represent a B field (note that $|B|$ is the same everywhere), is there a nonzero \mathbf{J} (perpendicular to the page) in the dashed region?

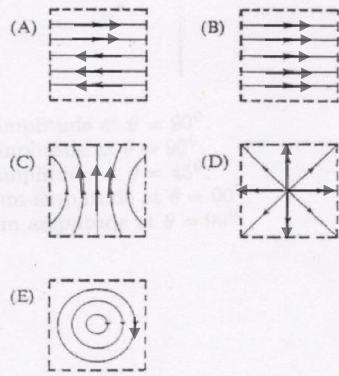
A. Yes
B. No
C. Need more information to decide

5.17
c If the arrows represent a B field, is there a **J** (perpendicular to the page) in the dashed region?



- A. Yes
- B. No
- C. Need more information to decide

5.18
Pick a sketch showing B field lines that violate one of Maxwell's equations within the region bounded by dashed lines.



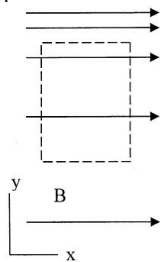
(What currents would be needed to generate the others?)

5.19 The magnetic field in a certain region is given by

$$\vec{B}(x,y) = Cy\hat{x}$$

(C is a positive constant) Consider the imaginary loop shown. What can you say about the electric current passing through the loop?

- A. must be zero
- B. must be nonzero
- C. Not enough info



5.22

What is $\oint \vec{B} \cdot d\vec{l}$ around this purple (dashed) Amperian loop?

A) $\mu_0 (|I_2| + |I_1|)$ B) $\mu_0 (|I_2| - |I_1|)$
 C) $\mu_0 (|I_2| + |I_1| \sin\theta)$ D) $\mu_0 (|I_2| - |I_1| \sin\theta)$
 E) Something else!

5.20

A solenoid has a total of N windings over a distance of L meters. We "idealize" by treating this as a surface current running around the surface. What is K ?

A) I B) NI C) I/L D) $I N/L$
 E) Something else...

MD11-3

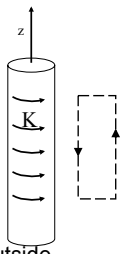
An infinite solenoid with surface current density K is oriented along the z -axis. Apply Ampere's Law to the rectangular imaginary loop in the yz plane shown. What does this tell you about B_z , the z -component of the \mathbf{B} -field outside the solenoid?

A) B_z is constant outside
 B) B_z is zero outside
 C) B_z is not constant outside
 D) It tells you nothing about B_z

MD11-3

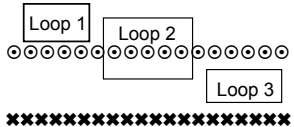
An infinite solenoid with surface current density K is oriented along the z -axis. Apply Ampere's Law to the rectangular imaginary loop in the yz plane shown.

We can safely assume that $B(s \rightarrow \infty) = 0$. What does this tell you about the \mathbf{B} -field outside the solenoid?



A) $|B|$ is a small non-zero constant outside
 B) $|B|$ is zero outside
 C) $|B|$ is not constant outside
 D) We still don't know anything about $|B|$

5.23

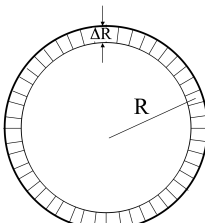


In the case of the infinite solenoid we used loop 1 to argue that the \mathbf{B} -field outside is zero. Then we used loop 2 to find the \mathbf{B} -field inside. What would loop 3 show?

a) The \mathbf{B} -field inside is zero
 b) It does not tell us anything about the \mathbf{B} -field
 c) Something else

5.21
a

A thin toroid has (average) radius R and a total of N windings with current I . We "idealize" this as a surface current running around the surface. What is K , approximately?

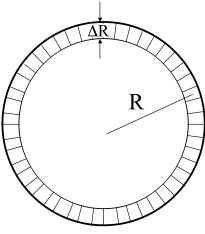


A) I/R B) $I/(2 \pi R)$
 C) NI/R D) $NI/(2 \pi R)$
 E) Something else

5.21b

What direction do you expect the B field to point?

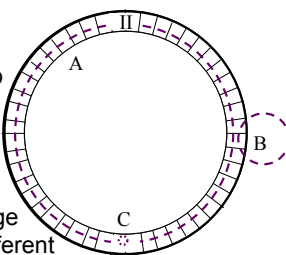
A) Azimuthally
 B) Radially
 C) In the z direction (perp. to page)
 D) Loops around the rim
 E) Mix of the above...



5.21c

What Amperian loop would you draw to find B "inside" the Torus (region II)

A) Large "azimuthal" loop
 B) Smallish loop from region II to outside (where B=0)
 C) Small loop in region II
 D) Like A, but perp to page
 E) Something entirely different



5.21d

Two long coaxial solenoids each carry current I but in opposite directions. The inner solenoid (radius a) has n_1 turns per unit length, and the outer one (radius b) has n_2 .

Find B (i) inside the solenoid, (ii) between them, and (iii) outside both.

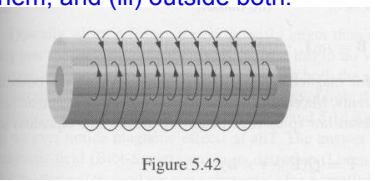


Figure 5.42
