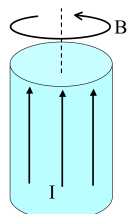


6.8 A very long rod carries a uniformly distributed current  $I$  along the  $+z$  direction. Compare the B-field OUTSIDE when the rod is a paramagnet (e.g. Al) to the B-field outside when the rod is a diamagnet (e.g. Cu)

- B outside the paramagnetic rod is ...
- A) Slightly smaller than...
  - B) The same as...
  - C) Slightly larger than...

B outside the diamagnetic rod




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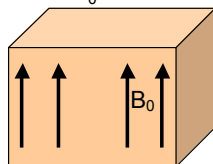
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6.10 A large chunk of paramagnetic material ( $\chi_m > 0$ ) has a uniform field  $B_0$  throughout its bulk, and thus a uniform  $H_0 = ??$




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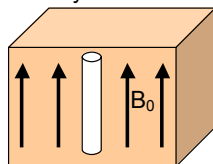
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6.10 A large chunk of paramagnetic material ( $\chi_m > 0$ ) has a uniform field  $B_0$  throughout its bulk, and thus a uniform  $H_0 = B_0/\mu = B_0/\mu_0(1+\chi_M)$ . We then cut out a cylindrical hole (very skinny, very tall!)



What is  $M$  at the center of that hole?

- A)  $\chi_M H_0$
- B) little more than  $\chi_M H_0$
- C) Little less than  $\chi_M H_0$
- D) Zero
- E) ??? (it depends/not sure)

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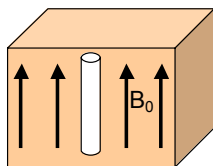
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6.10 A large chunk of paramagnetic material ( $\chi_m > 0$ ) has a uniform field  $B_0$  throughout its interior. We cut out a cylindrical hole (very skinny, very tall!)



What is  $B$  at the center of that hole?  
 A)  $B_0$    B) more than  $B_0$    C) less than  $B_0$   
 D) ??

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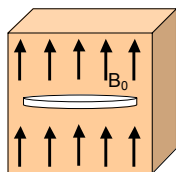
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6.10  
 b A large chunk of paramagnetic material ( $\chi_m > 0$ ) has a uniform field  $B_0$  throughout its interior. We cut out a wafer-like hole (very wide, very short!)



What is  $B$  at the center of that hole?  
 A)  $B_0$    B) more than  $B_0$    C) less than  $B_0$   
 D) ??

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A sphere (with a spherical cavity inside it) is made of a material with very large positive  $\chi_m$ . It is placed in a region of uniform  $B$  field. Which figure best shows the resulting  $B$  field lines?

A

B

C

D

E) None of these can be even remotely correct

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Mu-metal (75% nickel, 15% iron, plus copper and molybdenum) acts as a sort of "magnetic shield"...  
 (there is no perfect "Faraday cage" effect for magnetism - why not)

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A superconducting ring sits above a strong permanent magnet (N side up). If you drop the ring, which way will current flow (as viewed from above), and what kind of force will the ring feel?

- A) CW/repulsive
- B) CW/attractive
- C) CCW/repulsive
- D) CCW/attractive
- E) No net current will flow/no net force

To think about/discuss:  
 Remember Lenz' law? What does it say about this situation?  
 What will the resulting *motion* of the ring look like?  
 What if you dropped a magnet onto the ring, instead of dropping the ring onto the magnet?  
[web.mit.edu/8.02t/www/802TEAL3D/visualizations/faraday/index.htm](http://web.mit.edu/8.02t/www/802TEAL3D/visualizations/faraday/index.htm)

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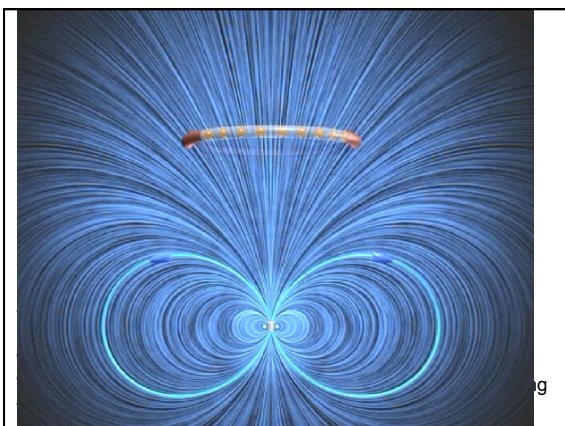
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