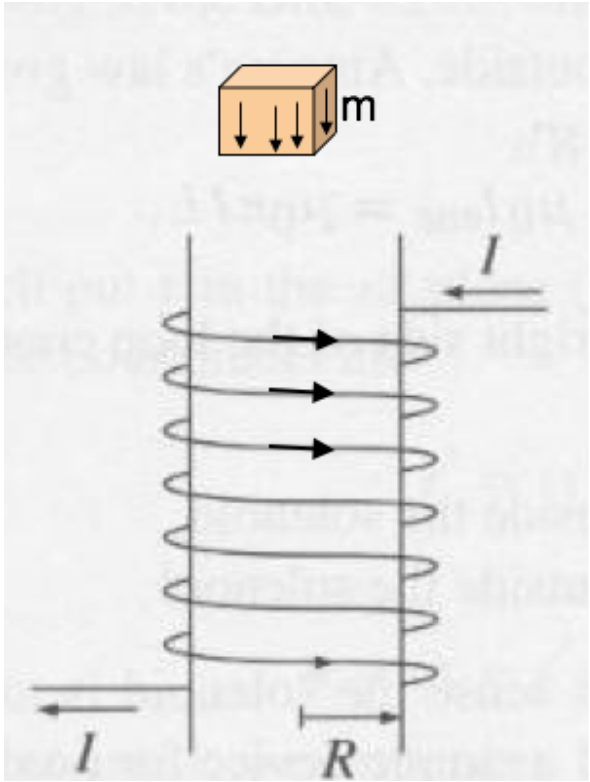
A small chunk of material (the “tan cube”) is placed above a solenoid. It magnetizes, weakly, as shown by small arrows inside. What kind of material must the cube be?

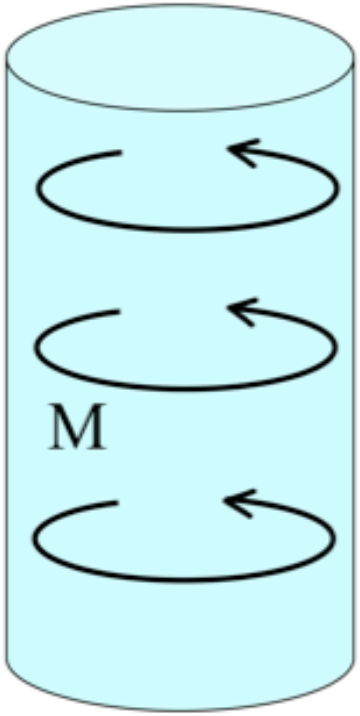
A. Dielectric
B. Conductor
C. Diamagnetic
D. Paramagnetic
E. Ferromagnetic



FINAL EXAM

- A few true/false questions conceptual questions
- Determine bound charge, $\mathbf{E}$, $\mathbf{D}$, $\mathbf{P}$ for some material with χ_e, and explain where the bound charge is.
- Setup magnetic vector potential and field calculations. Compare the appraoches.
- Determine the $\mathbf{B}$ for some $\mathbf{J}$ using Ampere's Law.
- Determine bound currents, $\mathbf{B}$, and $\mathbf{H}$ for some material with a "simple" free current, and explain properties of the bound currents

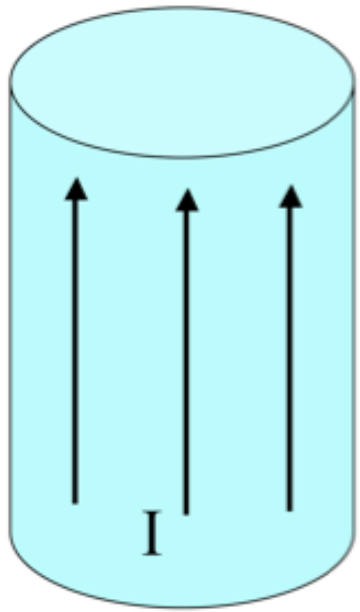
A solid cylinder has uniform magnetization $\mathbf{M}$ throughout the volume in the ϕ direction as shown. In which direction does the bound surface current flow on the (curved) sides?



A. There is no bound surface current.
B. The current flows in the $\pm\phi$ direction.
C. The current flows in the $\pm s$ direction.
D. The current flows in the $\pm z$ direction.
E. The direction is more complicated.

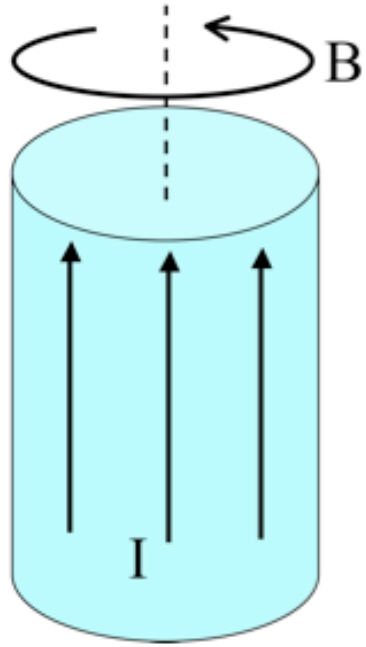
A very long aluminum (paramagnetic!) rod carries a uniformly distributed current I along the $+z$ direction. What is the direction of the bound volume current?

A. $\mathbf{J}_B$ points parallel to I
B. $\mathbf{J}_B$ points anti-parallel to I
C. It's zero!
D. Other/not sure



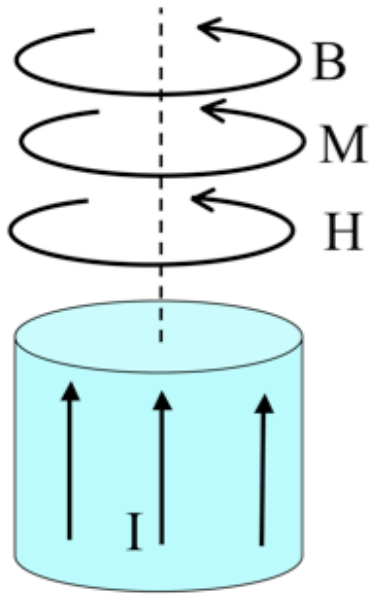
A very long aluminum (paramagnetic!) rod carries a uniformly distributed current I along the $+z$ direction. We know $\mathbf{B}$ will be CCW as viewed from above. (Right?) What about $\mathbf{H}$ and $\mathbf{M}$ inside the cylinder?

A. Both are CCW
B. Both are CW
C. $\mathbf{H}$ is CCW, but $\mathbf{M}$ is CW
D. $\mathbf{H}$ is CW, $\mathbf{M}$ is CCW
E. ???



A very long aluminum (paramagnetic!) rod carries a uniformly distributed current I along the $+z$ direction. What is the direction of the bound volume current?

A. $\mathbf{J}_B$ points parallel to I
B. $\mathbf{J}_B$ points anti-parallel to I
C. It's zero!
D. Other/not sure



A very long aluminum (paramagnetic!) rod carries a uniformly distributed current I along the $+z$ direction. What is the direction of the bound surface current?

A. $\mathbf{K}_B$ points parallel to I
B. $\mathbf{K}_B$ points anti-parallel to I
C. Other/not sure