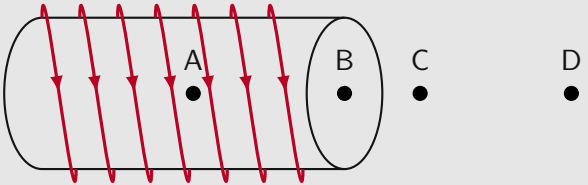
Announcements

- Homework
  - HW10 posted and due on Friday at midnight!
  - I'm aiming to get HW9 graded tomorrow if I can
  - I'll grade HW10 on Saturday
- Exam 2
  - Don't forget Exam 2 is next Monday!
  - In-class portion similar to Exam 1
  - Also a small take-home portion due on Wednesday
  - I'm working on objectives for you to study from
- Read at least the start of Chapter 6.3 for Friday

Q1

Suppose a small current loop with magnetic moment pointing to the right is placed at various locations near the end of a large solenoid. At which point is the magnitude of the net force on the dipole greatest? You may or may not find it useful to recall that:

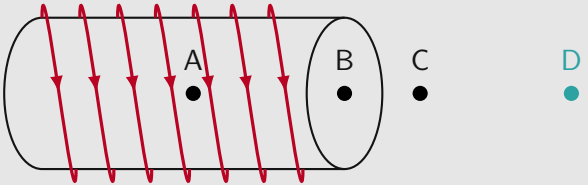
$$\vec{F} = \nabla(\vec{\mathbf{m}} \cdot \vec{\mathbf{B}})$$



Q1

Suppose a small current loop with magnetic moment pointing to the right is placed at various locations near the end of a large solenoid. At which point is the magnitude of the net force on the dipole greatest? You may or may not find it useful to recall that:

$$\vec{F} = \nabla(\vec{\mathbf{m}} \cdot \vec{\mathbf{B}})$$



Q2

Consider a paramagnetic material placed in a uniform external magnetic field $\vec{\mathbf{B}}$. The total magnetic field just outside the material is now. . .

A. smaller than
B. larger than
C. the same as

. . . it was before the material was placed.

Q2

Consider a paramagnetic material placed in a uniform external magnetic field $\vec{\mathbf{B}}$. The total magnetic field just outside the material is now. . .

A. smaller than

B. larger than

C. the same as

. . . it was before the material was placed.

Q3

In our model for diamagnetism, let the angular momentum associated with an orbiting electron point in the $+\hat{\boldsymbol{z}}$ direction.
What is the direction of the magnetic moment?

A. $+\hat{\boldsymbol{z}}$
B. $-\hat{\boldsymbol{z}}$
C. $+\hat{\boldsymbol{x}}$
D. $-\hat{\boldsymbol{x}}$

Q3

In our model for diamagnetism, let the angular momentum associated with an orbiting electron point in the $+\hat{\boldsymbol{z}}$ direction.
What is the direction of the magnetic moment?

A. $+\hat{\boldsymbol{z}}$
B. $-\hat{\boldsymbol{z}}$
C. $+\hat{\boldsymbol{x}}$
D. $-\hat{\boldsymbol{x}}$

Q4

In our model for diamagnetism, the electron travels around the "loop" in a time of

$$T = \frac{2\pi R}{v}$$

What is the magnitude of the magnetic dipole moment for this configuration?

A. evR
B. $\frac{evR}{2}$
C. evR^2
D. $\frac{evR^2}{2}$

Q4

In our model for diamagnetism, the electron travels around the "loop" in a time of

$$T = \frac{2\pi R}{v}$$

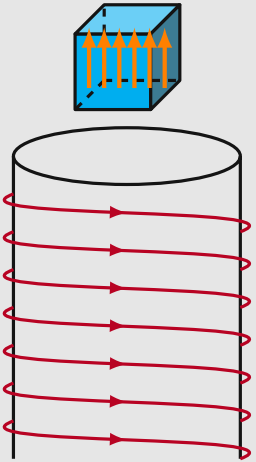
What is the magnitude of the magnetic dipole moment for this configuration?

A. evR
B. $\frac{evR}{2}$
C. evR^2
D. $\frac{evR^2}{2}$

Q5

A small chunk of material is placed just above a solenoid. It magnetizes, weakly, as shown by the arrows inside. What kind of material is the cube made of?

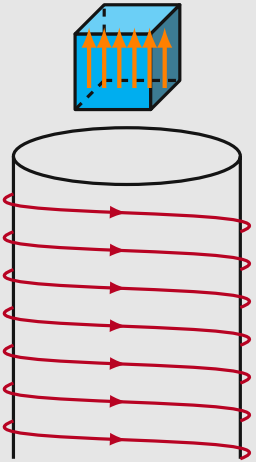
A. Diamagnetic
B. Paramagnetic
C. Ferromagnetic
D. Biomagnetic



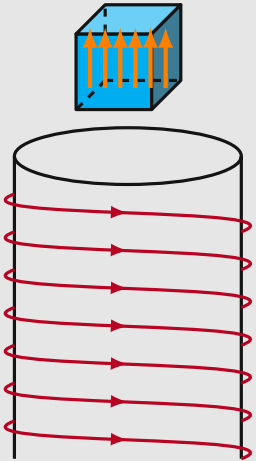
Q5

A small chunk of material is placed just above a solenoid. It magnetizes, weakly, as shown by the arrows inside. What kind of material is the cube made of?

A. Diamagnetic
B. Paramagnetic
C. Ferromagnetic
D. Biomagnetic



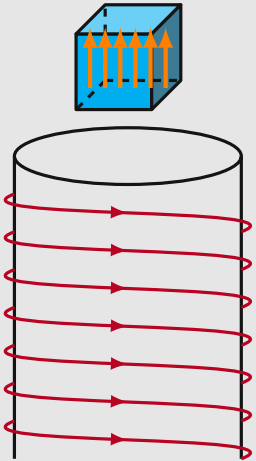
Q6



Considering the same chunk of material, what force will it feel due to the magnetic field?

A. Downwards
B. Upwards
C. Out of the page
D. No force will be felt

Q6



Considering the same chunk of material, what force will it feel due to the magnetic field?

A. Downwards
B. Upwards
C. Out of the page
D. No force will be felt