# Quiz 8
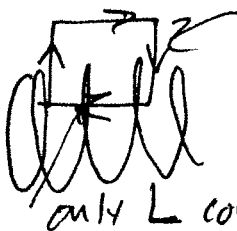
Phys 296: Summer, 2015
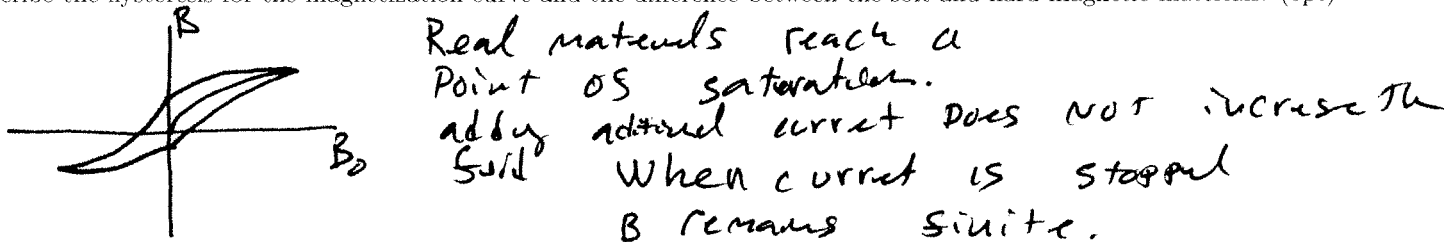
1. Derive the formula for the magnetic field inside a current-carrying solenoid. Use Ampere's Law. $\int B \cdot dl = \mu_0 I$ (5pt)

amperian Loop

multiple Loops

$\int B dl = \mu_0 I \implies BL = \mu_0 I N$

$n = \frac{N}{L}$

only L contributes

so $B = \mu_0 I \frac{N}{L} \implies \mu_0 I n$

2. Define the relative permeability constant and classify three basic types of magnetic materials based on the magnitude of the relative permeability constant.(5pt).

$B = k B_0$ so $k = \frac{B}{B_0}$ only for small $B_0$

dia magnetic; $k < 1$
Para magnetic; $k > 1$

Ferromagnetic $-\infty < k < \infty$

3. Describe the hysteresis for the magnetization curve and the difference between the soft and hard magnetic materials. (5pt)

Real materials reach a
Point of saturation.
adding additional current Does Not increase the
field. When current is stopped
B remains finite.

4. If the current through of a current-carrying solenoid is 10mA what is the magnetic field through the solenoid? What is the direction of the field? [1](5pt)

Since from (1) $B = \mu_0 n I$

$B = \mu_0 (10)(10mA)$

The component of the field we can "see" is in the direction Normal to the solenoid Loops.

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[1]Think carefully about this. (vectors)