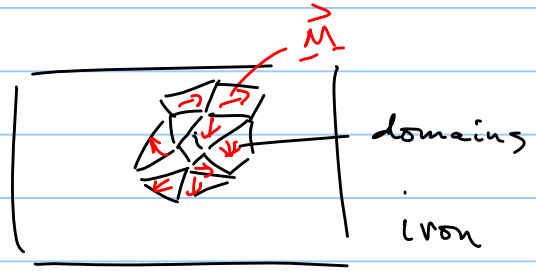
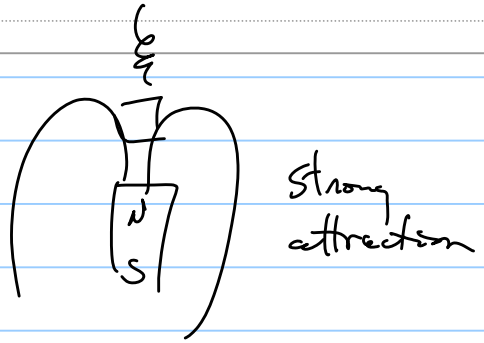
Last lecture

Note Title 5/3/2006

Ferromagnetism





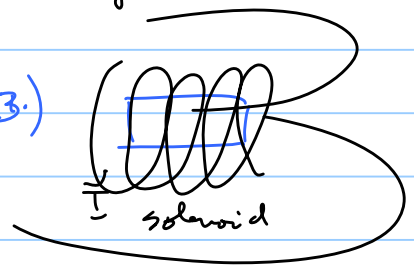
Strong attraction

inside each domain all iron mag dipoles point in same direction

Change domain structure

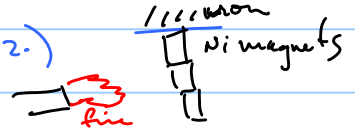
1) mechanical impact
2) temp $T >$ curie temp domains go away
3) apply B

3.)



align domains or ac field will randomize domains

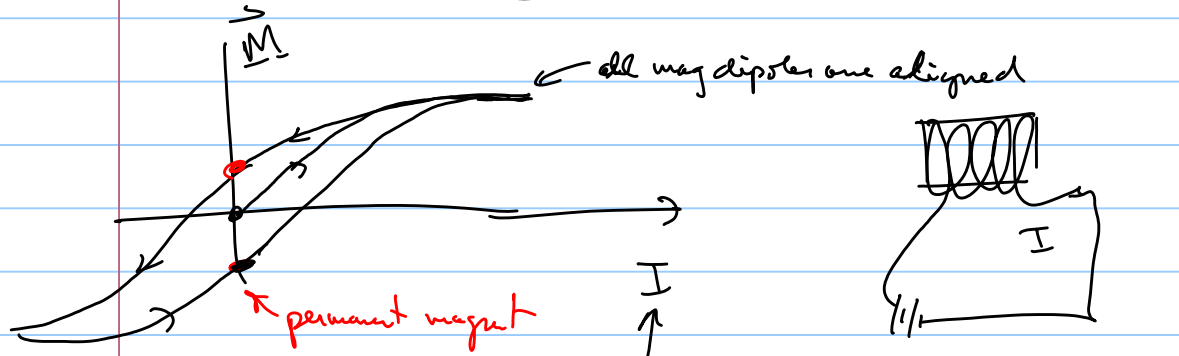
2.)



fall down when $T >$ curie temp

i) iron rod

impact domains randomized

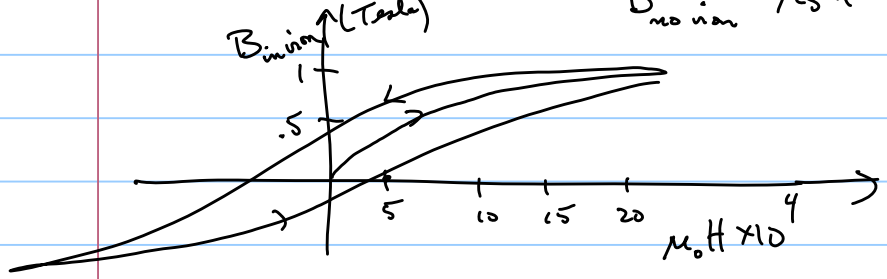


change to B in vac (in in solenoid)

$\vec{\nabla} \times \vec{H} = \vec{J}_f$

$H = \frac{B}{\mu_0} - M$ so if there were no iron inside

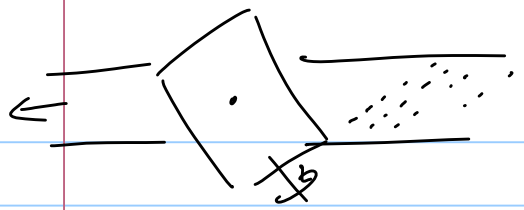
$B_{\text{no iron}} = \mu_0 H$

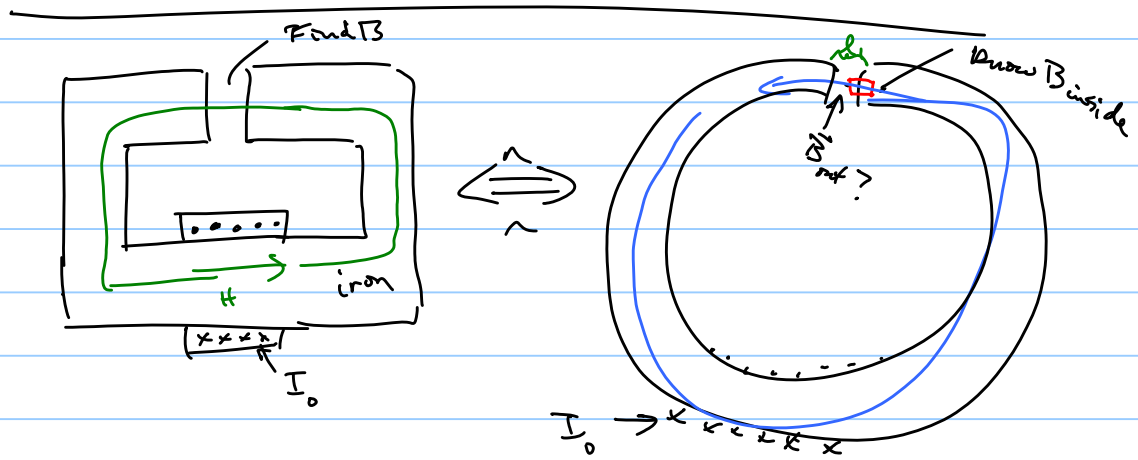


$5 = \mu_0 H \times 10^{-4}$ T

$\mu_0 H = 5 \times 10^{-4}$ T

UCR scotch tape put iron filing on it.





$\vec{\nabla} \cdot \vec{B} = 0$

$\int \vec{\nabla} \cdot \vec{B} \, d\tau = \oint \vec{B} \cdot da = 0$ $\quad B_{air} A_{area} - B_{iron} A = 0$

$\vec{\nabla} \cdot \vec{H} = J_{free}$

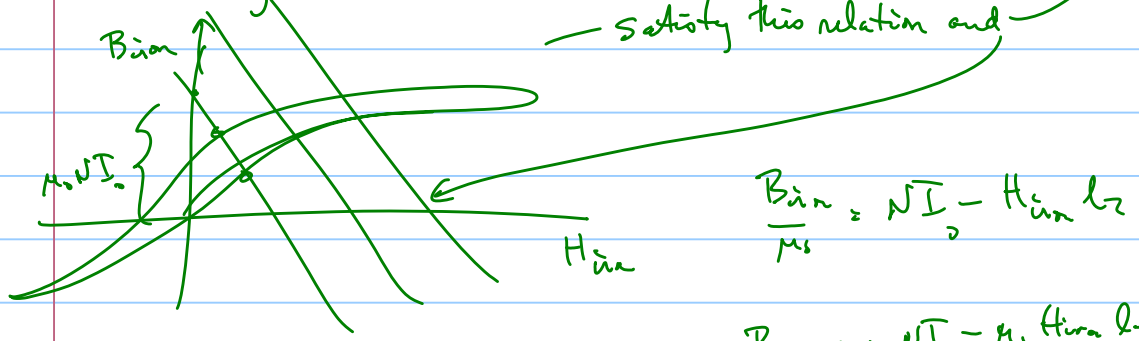
$B_{air} \approx B_{iron}$

$\oint \vec{H} \cdot d\vec{l} = NI_0 = H_{air} l_1 + H_{iron} l_2$

↑ # turns

$H_{iron} l_2 + \frac{B_{iron}}{\mu_0} = NI_0$

2 unknowns H_{iron}, B_{iron} but relation between them is mag curve — satisfy this relation and



$$\frac{B_{iron}}{\mu_0} = N I_0 - H_{iron} l_2$$

$$B_{iron} = \mu_0 N I_0 - \mu_0 H_{iron} l_2$$