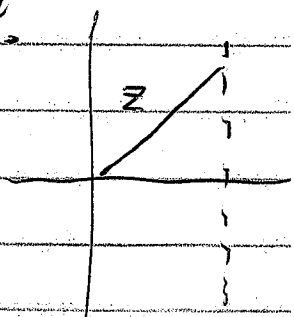
Phys 2426 2015-10-22 Lec 17

Exam 2 Th 10/29

AC Voltage pushes AC Current.

$V_{rms} = Z I_{rms}$

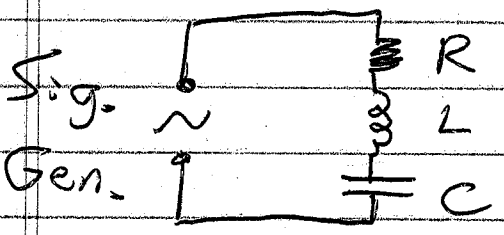
Z Impedance

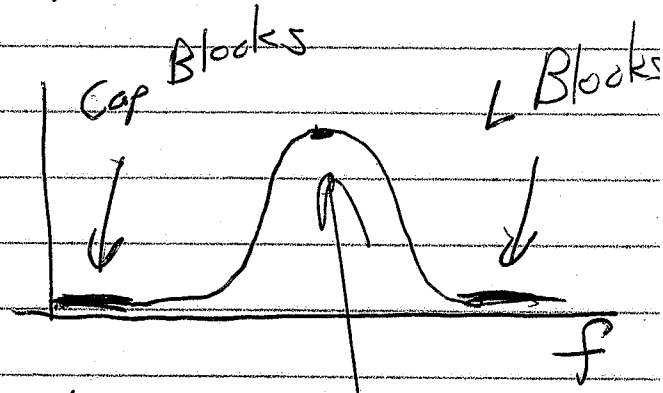


Series Impedance $Z = \sqrt{R^2 + (X_L - X_C)^2}$

$X_L = 2\pi f L$ Inductor blocks high-f

$X_C = \frac{1}{2\pi f C}$ Capacitor blocks low-f





What is f_0? $X_L = X_C$

$2\pi f L = \frac{1}{2\pi f C}$

$(2\pi f)^2 = \frac{1}{LC} \rightarrow f_0 = \frac{1}{2\pi\sqrt{LC}}$

(2)

$f_6 = \frac{1}{2\pi\sqrt{LC}}$

Ex: $L = 2$ nH

$f_1 = 93.7$ MHz $\qquad f_2 = 106.5$ MHz

$2\pi f L = \frac{1}{2\pi f C}$

$C = \frac{1}{(2\pi f)^2 L}$

$C_1 = 1.44 \times 10^{-9}$ F $= 1.44$ nF $\qquad C_2 = 1.12 \times 10^{-9}$ F $= 1.12$ nF

$L = \frac{\mu N^2 A}{\ell} \qquad C = \frac{\varepsilon A}{d}$

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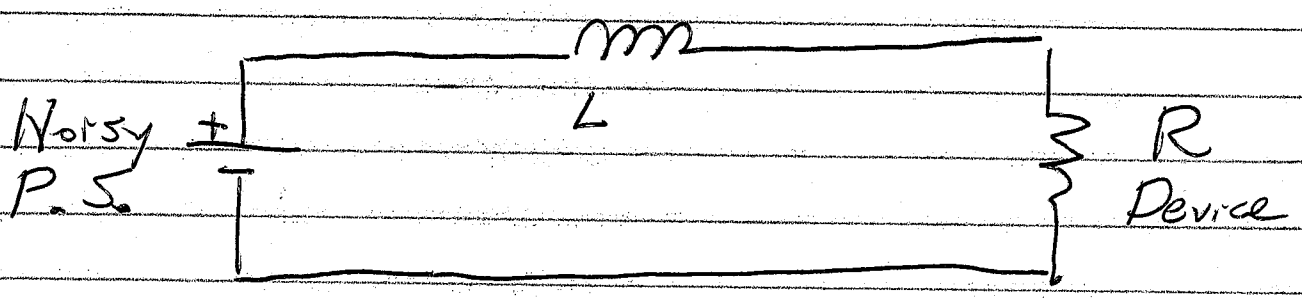
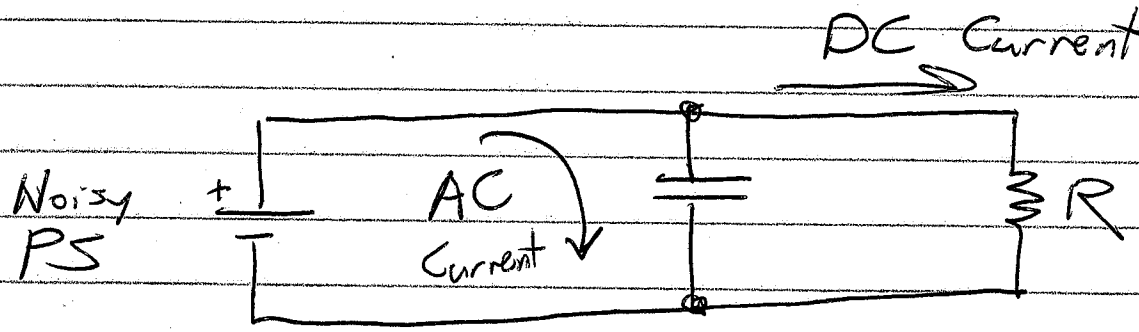
Filters	Low-f	High-f
Inductor	Passes	Blocks
Capacitor	Blocks	Passes



Some const V_{dc}

Some high-f V_{rms}.

L Passes DC I, blocks AC.



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$B = 22\ mT$

Energy = 730 eV = energy of electron after 730V electrons

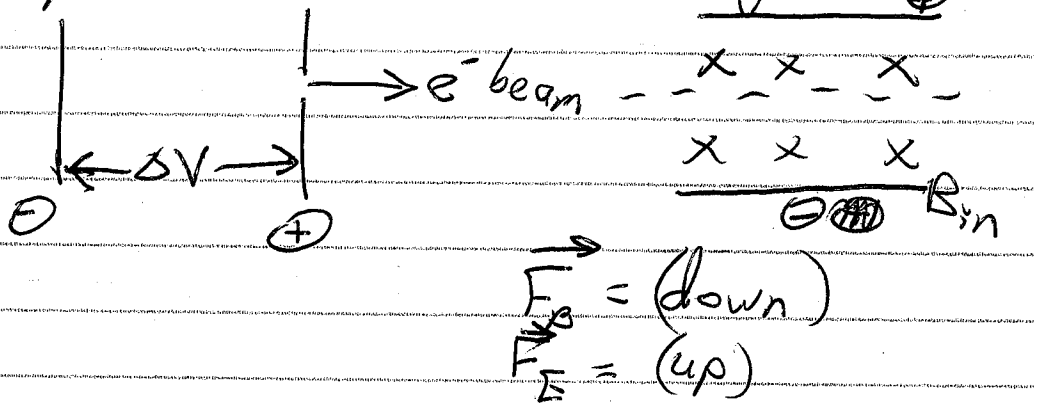
$E = ?$ for velocity selector

$F_E = F_B$ $\qquad$ $\Delta PE = \Delta KE$

$qE = qvB$ $\qquad$ $q\Delta V = \frac{1}{2}mv^2$

e $\qquad$ $(1.6\times10^{-19}\ C)(730\ V) = \frac{1}{2}m_e v^2$

Applied voltage accelerates electron to a velocity. Passes thru velocity selector, if E is right.



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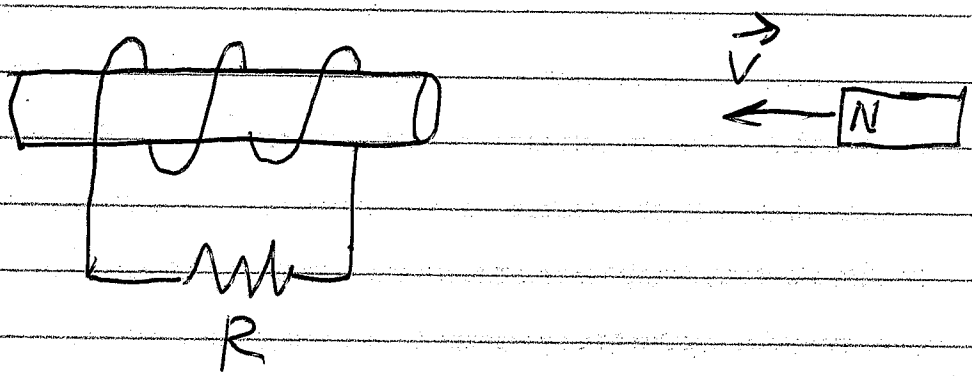

As the magnet arrives:
- B was zero.
- B will point Left.
- Coil opposes change.
- Induced B points right.
- B_{ind} caused by I going rightward thru R.

As the magnet leaves
- B was pointing Left.
- B is decreasing.
- Coil opposes change.
- B_{ind} points Left
- Caused by I going left thru R.