

NYU Physics 2 — Problem Set 10

Due by Friday 2002 April 12 at 1pm at Irene Port's office in Meyer 424.

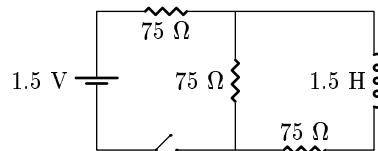
Problem 1

What is the approximate self-inductance L and resistance R of a gold ring 1 cm in diameter, made of 1 mm diameter wire? Don't try to get exact answers, just get an approximate result, correct to order-of-magnitude. State your assumptions. If a pulse of magnetic field starts a current in the ring, how long does the current take to decay to zero?

Problem 2

Compute the self-inductance L of the toroidal solenoid described in Problem set 9, with N turns of wire, inner radius a , outer radius b and height h . Show your work. Once you have the general expression, evaluate your answer for $a = 4$ cm, $b = 8$ cm, $h = 4$ cm, and $N = 10^4$.

Problem 3



The switch in the circuit shown is left open for a very long time. At time $t = 0$, the switch is closed. Obtain an equation for the current I_L in the inductor as a function of time t for $t > 0$. Draw a graph of I_L against t , clearly labeling the minimum and maximum currents and the exponential timescale. A very long time later, at $t = t_1$, the switch is opened again. Obtain an equation for the current I_L in the inductor as a function of time t for $t > t_1$. Draw another graph. Be sure to show your work and keep your units.