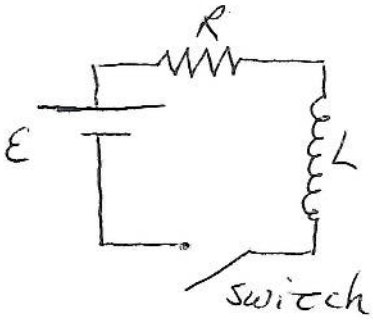
PHY 1304 Fall 2008 Quiz #5 Name: Key

1) A circuit has a 12 V emf, a 10 ohm resistor and a 0.1 H inductor, as shown. When the switch is closed, how long will it take for the current thru the resistor to reach 99% of its peak value? [10 pts]



$$I = I_{max}\left(1 - e^{-t/\tau}\right) \qquad \tau = \frac{L}{R} = \frac{0.1}{10} = 0.01$$

$$0.99\, I_{max} = I_{max}\left(1 - e^{-t/\tau}\right)$$

$$0.99 = 1 - e^{-t/0.01}$$

$$t = -0.01 \times \ln(0.01)$$

$$\boxed{t = 0.046\ s}$$

2) What is the natural frequency of a circuit containing only a 5 mF charged capacitor and a 10 mH inductor? [6 pts]

$$\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{(10\times10^{-3})\cdot(5\times10^{-3})}}$$

$$\boxed{\omega = 141.42\ rad/s}$$