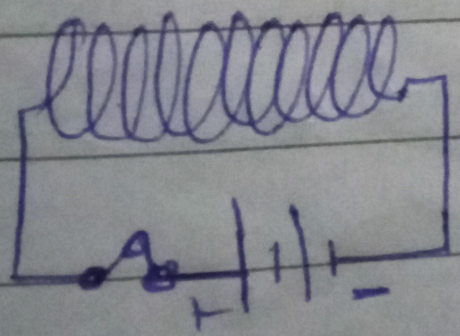
devices in the circuit.

Energy stored in an inductor:-

"In case of capacitor energy is stored in electric field between two plates
In case of inductor energy is stored in magnetic field."



$y = x^x$

Explanation:

- Consider a coil connected to battery when a switch in series. When a switch is ON current rises from zero to maximum value. As a result emf is induced in opposite direction

- Work done by a battery moving charge Δq

$$\Delta W = \Delta q \varepsilon_L$$

ε_L = magnitude of induced emf

$$\varepsilon_L = 2 \frac{\Delta I}{\Delta t}$$

- $$\Delta W = \frac{\Delta q}{\Delta t} L \Delta I$$

where

$\frac{\Delta q}{\Delta t}$ = average current $= 0 + \frac{1}{2} = \frac{1}{2} I$

ΔI = Change in current $= I_f - I_i = I - 0 = I$

$$W = \frac{1}{2} L I^2$$

$$\boxed{W = \frac{1}{2} L I^2}$$

Energy in term of magnetic field

$$N\Phi = LI$$

$$L = \frac{N\Phi}{I}$$

$$= \frac{NBA}{I}$$

$$= \frac{N(N\mu_0 n I)A}{I}$$

$$L = N \mu_0 n A$$

$$L = n l \mu_0 n A$$

$$L = n^2 l \mu_0 A$$

Now putting values.

$$U_m = \frac{1}{2} (\mu_0 n^2 A l) \left(\frac{B}{\mu_0 n}\right)^2$$

$$= \frac{1}{2} \frac{B^2}{\mu_0} A l$$

Energy density = $\frac{\text{Energy}}{\text{volume}}$

$\frac{U_m}{Al}$

$= \frac{\frac{1}{2}\frac{B^2}{\mu_0} Al}{Al}$

$U_m = \frac{1}{2}\frac{B^2}{\mu_0}$

OHM's law: