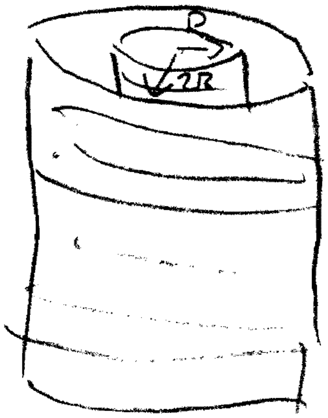
32 7, 9 11, 22 33 36 40 46 55 66
33 7, 9, 11, 17, 20, 24, 37
33 42, 48, 50, 53, 59, 74

32.7)



$$B_{large} = \mu_0 n I_L$$

$$B_{small} = \mu_0 n I_S$$

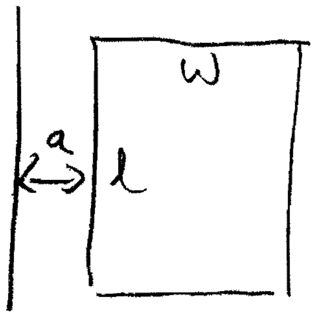
$$\Phi_{small} = \pi R^2 \mu_0 n (I_S + I_L) = L_S I_S + M I_L$$

$$M = \pi R^2 \mu_0 n$$

or $\Phi_L = 4\pi R^2 \mu_0 n I_L + \pi R^2 \mu_0 n I_S = L_L I_L + M I_S$

and we get same result

32.9)



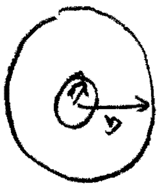
$$\Phi_B = l \int_a^{a+w} B(r)\,dr = \frac{\mu_0 I l}{2\pi} \ln\left(\frac{a+w}{a}\right)$$

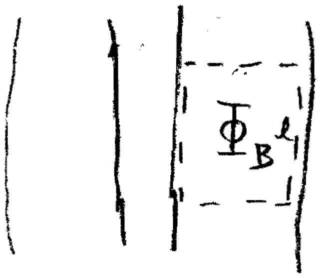
$$M = \frac{\mu_0 l \ln\left(\frac{a+w}{a}\right)}{2\pi}$$

11) $\Phi_B = \mu_0 n I A \Rightarrow L = \mu_0 n A$

$n = 1000/.5\,m \quad A = \pi(.04)^2$

22)



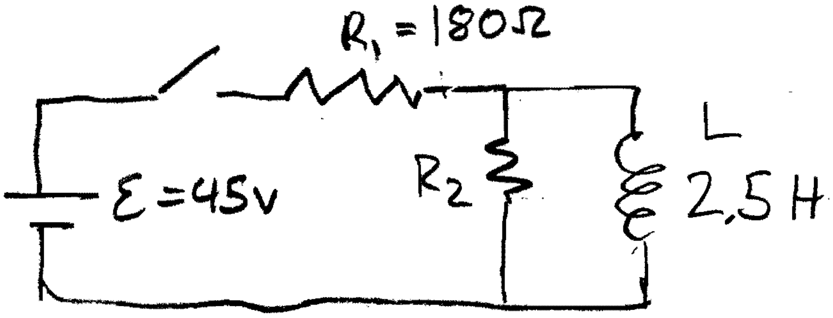


$$\Phi_B = \frac{\mu_0 I\, l}{2\pi} \ln(b/a)$$

$$\Rightarrow L = \frac{\mu_0 l}{2\pi} \ln(b/a)$$

$$\frac{L}{l} = \frac{\mu_0}{2\pi} \ln(b/a)$$

33



There is typo it should say 10V as there is no way to get it that high

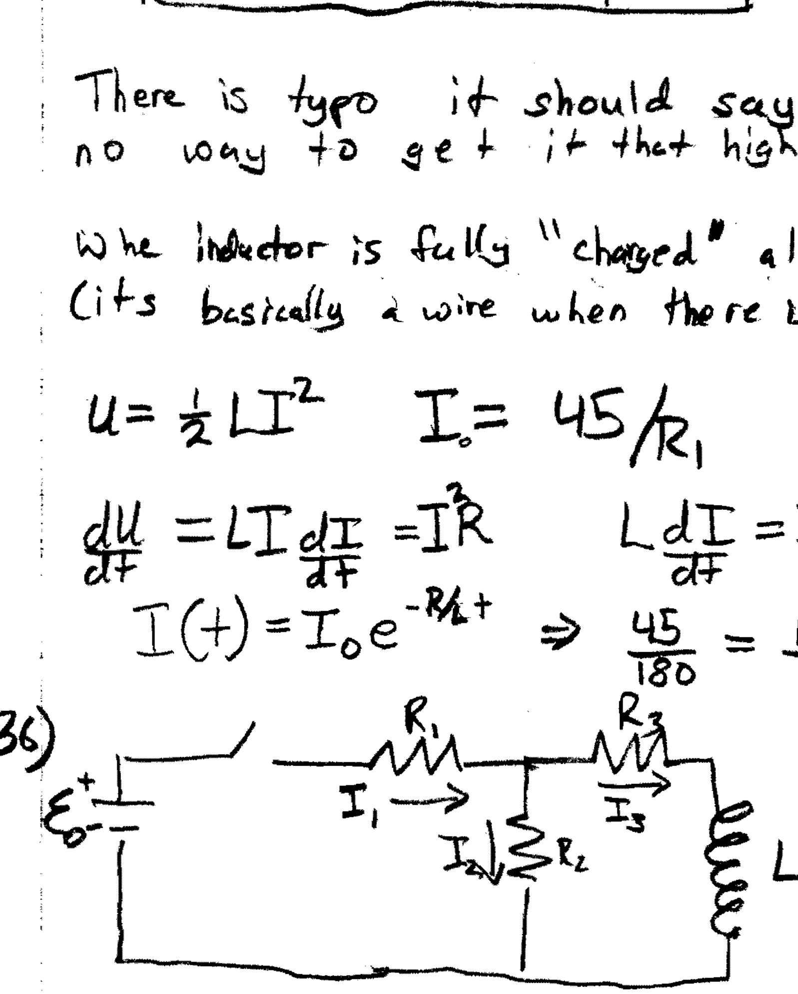
When inductor is fully "charged" all the current goes through it (its basically a wire when there is steady current)

$U = \frac{1}{2}LI^2 \quad I_0 = 45/R_1$

$\frac{dU}{dt} = LI\frac{dI}{dt} = I^2R \qquad L\frac{dI}{dt} = IR \leq 10$

$I(t) = I_0 e^{-R/L\, t} \Rightarrow \frac{45}{180} = \frac{10}{R_2} \quad R_2 = 400\Omega$

36)



$\mathcal{E}_0 = 12 \quad R_1 = 4 \quad R_2 = 8$
$R_3 = 2 \quad L = 2$

a) when switch is closed $\frac{dI}{dt}$ = huge so L acts like an enormous resistor all current goes through R_2

$I_2 = I_1 = \mathcal{E}_0/(R_1 + R_2)$

b) after a long time $\frac{dI}{dt} \to 0$ so the inductor is a wire $I_t = \frac{\mathcal{E}}{R_1 + \frac{1}{\frac{1}{R_2} + \frac{1}{R_3}}} = \frac{\mathcal{E}_0}{4 + 8/5} \quad I_2 = \frac{\mathcal{E}_0 - \frac{\mathcal{E}_0}{4+8/5}4}{8}$

c) $I(t) = I_0 e^{-(R_2+R_3)/L} \quad I_0 = \frac{\mathcal{E}_0 - \frac{\mathcal{E}_0}{4+8/5}4}{2} = -I_2$

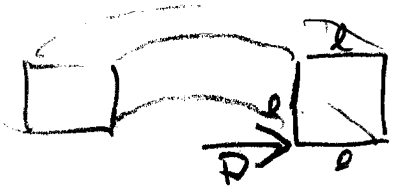
40) $U_1 = \frac{1}{2} L I_1^2$ $\qquad U_2 = \frac{1}{2} L I_2^2$

$$\Delta U = E = \frac{1}{2} L (I_2^2 - I_1^2)$$

46) $u_B = \frac{B^2}{2\mu_0} = \frac{\mu_0^{\cancel{2}} I^2 n^2}{2 \cancel{\mu_0}} = \frac{E_{nergy}}{V}$

$$E = V u_B = l A\, u_B = \frac{\mu_0 \pi r^2 l I^2 n^2}{2} = \frac{\mu_0 \pi r^2 I^2 N^2}{2 l}$$

55) $u_B = \frac{B^2}{2\mu_0} = \left(\frac{\mu_0 N I}{2\pi r}\right)^2 / 2\mu_0$

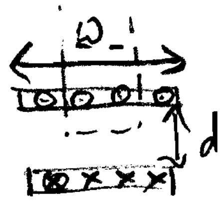


$$U = \int u_B\, dV = \int_R^{R+l} dr \int_0^{2\pi} d\theta \int_0^{l} dz\, u_B(r)$$

$$= \frac{2\pi l\, \mu_0 N^2 I^2}{2 (2\pi)^{\cancel{2}}} \int_R^{R+l} \frac{1}{r^2}\, dr = \frac{l \mu_0 N^2 I^2}{4\pi} \left(\frac{1}{R} - \frac{1}{R+L}\right)$$

(answer in book is wrong)

66



"J" = λ (current per length) = I/w

$$\mu_0 \lambda l = 2 B l \Rightarrow B_{each} = \frac{\mu_0 I}{2w}$$

but there are two so $|B| = \frac{\mu_0 I}{w}$

b) $u_B = \frac{\mu_0 I^2}{2 w^2} \Rightarrow U = w d l\, u_B = \frac{\mu_0 I^2 l d}{2 w}$

c) $\frac{1}{2} L I^2 = \frac{\mu_0 I^2 l d}{2 w} \Rightarrow L = \frac{\mu_0 l d}{w}$