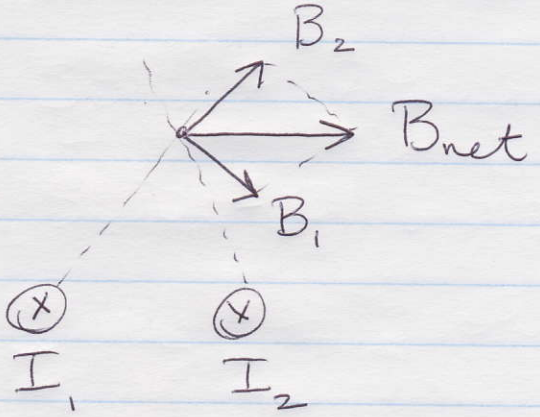
Physics 210 - Solutions to Week 10 Multiple Choice

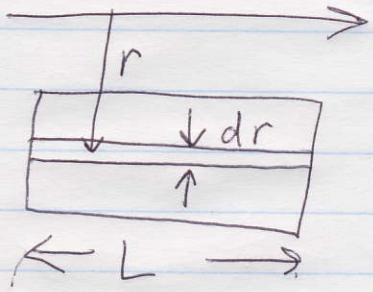
1.



2. $\mathcal{E} = -NA\cos\theta \frac{dB}{dt} = -40(\pi(4cm)^2)\cdot 1 \cdot 50 \cdot 10\pi \cos 1.0\pi$

$= 315mV$

3.



$$\Phi = \int B\cdot dA = \int_d^D \frac{\mu_0 I}{2\pi r} L\cdot dr$$

$$= \frac{\mu_0 L I}{2\pi} \ln\frac{D}{d}$$

$$\mathcal{E} = -N\frac{d\Phi}{dt} = -\frac{\mu_0 L}{2\pi}\ln\frac{D}{d}\frac{dI}{dt}$$

$= 2\times10^{-7}\cdot 1.5 \ln 6 \; 100\cdot = 5.38\times10^{-5}V$

$$I = \frac{\mathcal{E}}{R} = 27mA$$

4. $A = w\,l \qquad \frac{dA}{dt} = w\frac{dl}{dt} + l\frac{dw}{dt}$

at $t = 4s$ $\quad w = 40\,cm - 2\,cm/s \times 4s = 32\,cm$
$l = 60\,cm + 2\,cm/s \times 4s = 68\,cm$

$$\left.\frac{dA}{dt}\right|_{4s} = 32\,cm\,(20\,cm/s) + 68\,cm\,(-20\,cm/s)$$

$$\mathcal{E} = -B\frac{dA}{dt} = 3.6\,mV$$

5. $\mathcal{E} = -NA\frac{d}{dt}B = -NA\frac{d}{dt}(\mu_0 n I)$

$$\mathcal{E} = -NA\mu_0 n\frac{dI}{dt} = 1.0\,V$$

6. $F = BIl \qquad \mathcal{E} = Blv = IR \Rightarrow B = \frac{IR}{lv}$

$$F = \frac{IR}{lv}\cdot Il$$

$$\Rightarrow I^2 = \frac{Fv}{R} \Rightarrow I = 0.32A$$

7. $\mathcal{E} = Blv = (\mu_0 I/2\pi a)\cdot lv = 15\,mV$

8. $\mathcal{E} = \frac{B\omega l^2}{2} \Rightarrow V_A - V_P = \frac{B\omega}{2}\left(\frac{l}{2}\right)^2 = -8\,mV$