Chapter 29 - Electromagnetic Induction

Physics 207

1a) $F = \dfrac{B^2\ell^2 v}{R}$

2a) From a to b

2b) $v_t = \dfrac{Rmg\tan\phi}{B^2\ell^2\cos\phi}$

2c) $I_t = \dfrac{mg\tan\phi}{\ell B}$

2d) $P = \dfrac{m^2g^2R\tan^2\phi}{\ell^2B^2}$

2e) $P = \dfrac{m^2g^2R\tan^2\phi}{\ell^2B^2}$

2f) Conservation of Energy

3a) $\vec{\tau} = -\left(\dfrac{mg\ell}{2}\cos\phi - \left(\dfrac{B^2\ell^4\omega\sin^2\phi}{R}\right)\right)\hat{\imath}$

3b) $\alpha = \dfrac{6g}{5\ell}\cos\phi - \dfrac{12B^2\ell^4\omega}{5mR}\sin^2\phi$

4a $\vec{F}_{right} = 0$

$\vec{F}_{top} = \dfrac{B^2hvx}{R}\hat{\jmath}$

$\vec{F}_{left} = -\dfrac{B^2h^2v}{R}\hat{\imath}$

$\vec{F}_{bottom} = -\dfrac{B^2hvx}{R}\hat{\jmath}$

4b) $\vec{F}_{total} = -\dfrac{B^2h^2v}{R}\hat{\imath}$

5) $\mathcal{E} = B_0\pi R^2\alpha_0 t\sin\left(\dfrac{1}{2}\alpha_0 t^2\right)$

6a) Inside: $E = 1.18\times10^{-3}r$

Outside: $E = 7.54\times10^{-8}\dfrac{1}{r}$

The E are in the same direction

6b) $E = \dfrac{bB}{R}(r_0 + bt)$ for $t \le \dfrac{R-r_0}{b}$

$E = 0$ for $t > \dfrac{R-r_0}{b}$