

Answers Week 9

9-1 (i) The elementary generators of \underline{B} must be magnetic dipoles whose "size" is close to ZERO.

(ii) \underline{B} field lines form closed loops, there is no "beginning" or end.

9-3 Non-Coulomb \underline{E} - field lines also form closed loops surrounding the region where the flux of \underline{B} is changing with time so total flux of $\underline{E}_{Non-Coulomb}$ through any closed surface will be zero.

9-5 $\varepsilon = -0.5V$, bottom end of rod is positive because we need a clockwise "current" to oppose the increase in flux of \underline{B} out of page. We do not need to apply a force to move the rod.

9-7 Suppose flip time is Δt , ε *m f* in coil due to flip will be

$$\varepsilon = -\frac{2\pi r^2 B}{\Delta t}, \text{ causing current } i = -\frac{2\pi r^2 B}{\Delta t R} = \frac{\Delta Q}{\Delta t}$$

$$\text{So } \Delta Q = \frac{2\pi r^2 B}{R}$$

FLUX "UP" IS REDUCING SO FLOW OF CHARGE will be counter clockwise

9-9 To make a generator, rotate coil at angular velocity ω about y-axis. If so, flux of \underline{B} through coil will vary with time and generate an ε *m f* given by

$$\varepsilon = -\frac{\Delta\phi_B}{\Delta t} = \omega AB\text{Sin}(\omega t)$$

for a single turn coil of area A.

$$9-11 \quad L = -\frac{\varepsilon}{\left(\frac{\Delta i}{\Delta t}\right)} \rightarrow \frac{\text{Volt}}{\text{Amp}} \times \text{Time}$$

$$R = \frac{\text{Volt}}{\text{Amp}}$$

$$\text{So } \frac{L}{R} \rightarrow \text{Time}$$

9-13 When there is a current in an Inductor, there is a \underline{B} - field inside it. The energy $U_B = \frac{1}{2}LI^2$ gets stored in this \underline{B} - field.

9-15 $\tau = 10^{-4} s.$

Time for current to reach 90 percent of $\frac{\mathcal{E}}{R}$ will be $t = 2.3 \times 10^{-4} s.$