Physics 212 Eleventh week assignment:

Reading: Study sections 1 through 3 of Chapter 21. Read (for the first time) sections 4 and 5 of chapter 21.

Tues, Nov 7: Lecture.

Homework problems to be handed in at the beginning of the Workshop on Wed, Nov 8 : problems 9, 11 and 17 of chapter 21

Wed, Nov 8: In this Workshop you will first consider the exercise on the Ampere-Maxwell equation given on the other side of this sheet. Then consider problems 7 and 13 of chapter 21.

Thurs, Nov 9: Lecture.

Homework problems to be handed in at the beginning of the Workshop on Fri, Nov 10: 12, 14 and 25 of chapter 21.

Fri, Nov 10: In this Workshop you will consider questions10 and 18 on page 990 as well as problems 18, 21 and 23 of chapter 21.

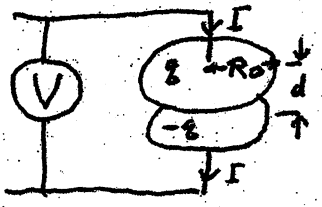
Practice using the Ampere-Maxwell law:

$$\oint_{\text{PATH},\Gamma} \underline{B}\cdot d\underline{\ell} = \mu_0 I + \mu_0\varepsilon_0 \frac{d}{dt}\int \underline{E}\cdot d\underline{A}$$

I: CURRENT THROUGH SURFACE

$\int \underline{E}\cdot d\underline{A}$: ANY SURFACE WHOSE BOUNDARY IS Γ

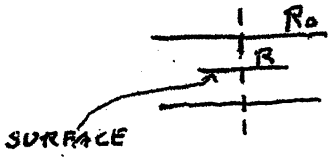
Consider two circular capacitor plates of radius R_0 and spaced by a distance d:



As shown, it is charging so q is increasing and +q is the charge on the upper plate. Remember, q=CV and $C=\varepsilon_0\pi R_0^2/d$.

a) As in lecture, show that the magnetic field in between the plates at a distance R from the center is $B = \frac{\mu_0 I}{2\pi R}\left(\frac{R}{R_0}\right)^2$

What is the direction of B? For part a) use the circular surface of radius R and take Γ to be the circle enclosing this surface:



b) Derive the same result by using a surface S which looks like a tin can with a circular hole cut out from the bottom. Note that both I and changing electric fields pierce this new surface.