

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 6: Lecture.

Homework problems to be handed in at the beginning of the Workshop on Wed, Nov 7 : problems 9, 11 and 17 of chapter 21

Wed, Nov 7: In this Workshop please 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 8: Lecture.

Homework problems to be handed in at the beginning of the Workshop on Fri, Nov 9: 12, 14 and 25 of chapter 21.

Fri, Nov 9: In this Workshop please consider questions 10 and 18 on page 990 as well as problems 18, 21 and 23 of chapter 21.

PHYS 212 WORKSHOP

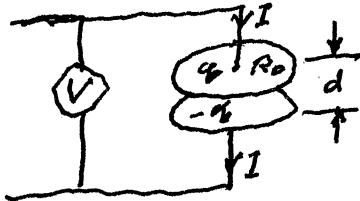
11/7/07

1. Practice using the Ampere-Maxwell law:

$$\oint_{\text{PATH, } \Gamma} \vec{B} \cdot d\vec{\lambda} = \mu_0 I_{\text{CURRENT THROUGH SURFACE}} + \mu_0 \epsilon_0 \frac{d}{dt} \int \vec{E} \cdot d\vec{A}$$

ANY SURFACE WHOSE BOUNDARY IS Γ

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

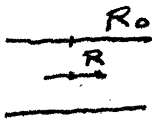


As shown, it is charging so q is increasing and $+q$ is the charge on the upper plate. Remember, $q=CV$ and $C=\epsilon_0\pi R_0^2/d$.

a) 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 \mathbf{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.

