

Homework #3 hints

Part a and b:

The key point is to find out how much charge is on the plate. Given V , if you find Q , the capacity C is obvious. If you can find out the electric field between the inner and outer wall, you would be about to figure out Q .

The best way to do this is doing it as a reversed question, if you know Q , assume it is vacuum between the walls, what would be the electric field between the wall? You may want to use Gaussian's Law. Then, with the E you find, what would be the voltage between the two walls? By building up an expression of V in terms of Q , you will be able to obtain the capacity. An important factor you may want to pay attention is: is the electric field uniform between the walls? Please do not get this part wrong.

Part c:

Similar as above part, if you have the relation between Q and V in hand, you may express the electric energy in forms of V and as a function of how high the water level is. Assume the electric energy is written as $f(y)$, where h is how high the water level is,

$\partial f / \partial h = - mg$ will give you where the balance point is. (please note that the mass of water inside m is also a function of h .) therefore, $\partial f / \partial h = - mg$ is an equation including h , so that you can solve for it.