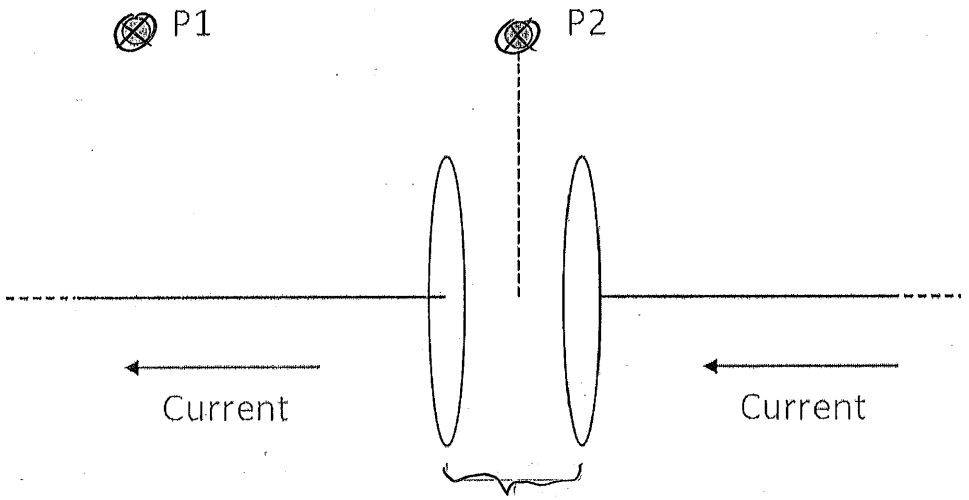
NAME: Solution	Quiz #9: Phys142

A current of 0.5 A charges a parallel plate capacitor whose plates are circular with a radius of a=10.0 cm and whose plate separation is 1.0 mm. Recall that the capacitance of a parallel plate capacitor is $C = \frac{\varepsilon_0 A}{d}$, and capacitance is generally defined as $C = \frac{Q}{\Delta V}$. The diagram is shown below where the wires connected to the capacitor are assumed to be infinitely long and straight.



(a) [5 pts] What is the rate of change of the electric field as a function of time between the plates?

Gauss's law: $\Phi_E = EA = \frac{q_{enc}}{\epsilon_0}$; if A is entire area of plates, then $q_{enc} = q$; $\Rightarrow \frac{d\Phi}{dt} = \frac{1}{\epsilon_0}\frac{dq}{dt}$; A is const., change in charge with time is current ; $\Rightarrow A\frac{dE}{dt} = \frac{I}{\epsilon_0}$

$\Rightarrow \frac{dE}{dt} = \frac{I}{A\epsilon_0} = \frac{0.5\,A}{(\pi(0.10\,m)^2)(8.85\times10^{-12})} = 1.80\times10^{12}\,A/s$

(b) [3 pts] What is the direction of the B-field at point P1 and P2? Draw your answer on the diagram. on picture

(c) [2 pts] Is the B-field at point P2 changing in time? Explain.

No B is constant, because B is proportional to displacement current ($\epsilon_0 \frac{d\Phi}{dt}$), which is dependent on the current in the wire, I, which is constant.