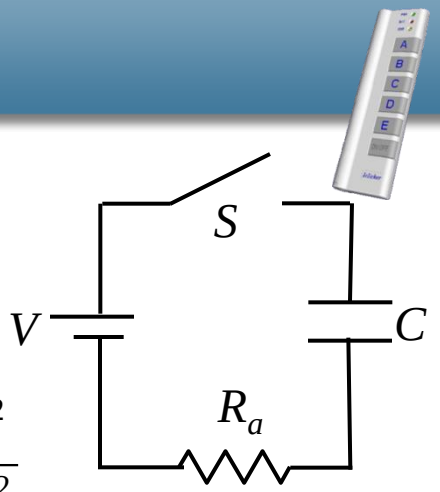
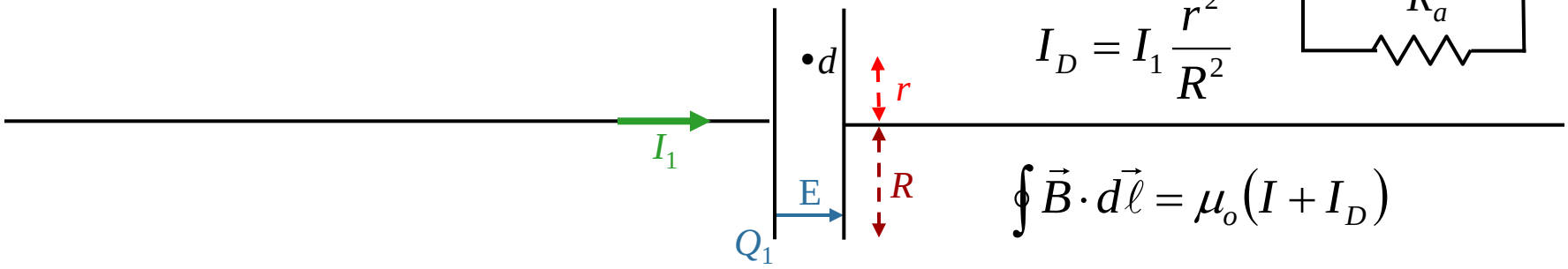
Calculation

Switch S has been open a long time when at $t = 0$, it is closed. Capacitor C has circular plates of radius R. At time $t = t_1$, a current I_1 flows in the circuit and the capacitor carries charge Q_1.





$$I_D = I_1 \frac{r^2}{R^2}$$

$$\oint \vec{B} \cdot d\vec{\ell} = \mu_o (I + I_D)$$

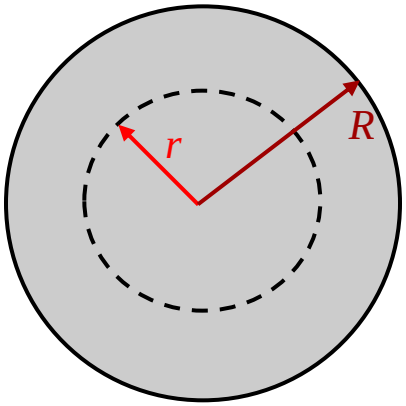
What is the magnitude of the B field at radius r ?

A) $B = \dfrac{\mu_0 I_1}{2\pi R}$

B) $B = \dfrac{\mu_0 I_1}{2\pi r}$

C) $B = \dfrac{\mu_0 I_1}{2\pi} \dfrac{R}{r^2}$

D) $B = \dfrac{\mu_0 I_1}{2\pi} \dfrac{r}{R^2}$



Ampere's Law: $\oint \vec{B} \cdot d\vec{\ell} = \mu_o (I + I_D)$

$$\rightarrow B \cdot 2\pi r = \mu_0 \left(0 + I_1 \frac{r^2}{R^2} \right)$$

$$\rightarrow B = \frac{\mu_0 I_1}{2\pi} \frac{r}{R^2}$$