Given: A network containing a battery $\mathcal{E}$, and capacitor $C$, and resistor $R$ and an inductor $L$.

Denote the angular frequency of the “LC” circuit by $\omega = \frac{1}{\sqrt{LC}}$.

The switch $S$ is left at position $a$ for a long period of time. The switch $S$ is then moved from position $a$ to $b$ at $t = 0$.

Find the plate charge on the capacitor $C$.

A) $Q = \mathcal{E} C \sin \omega t$
B) $Q = \mathcal{E} C \cos \omega t$
C) $Q = \frac{\mathcal{E}}{C} \sin \omega t$
D) $Q = \frac{\mathcal{E}}{C} \cos \omega t$
Since the charge is maximum at $t = 0$, $Q = V C$, and $V = \mathcal{E} C$, we have

$$Q = \mathcal{E} C \cos \omega t.$$ 

Answer B.

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