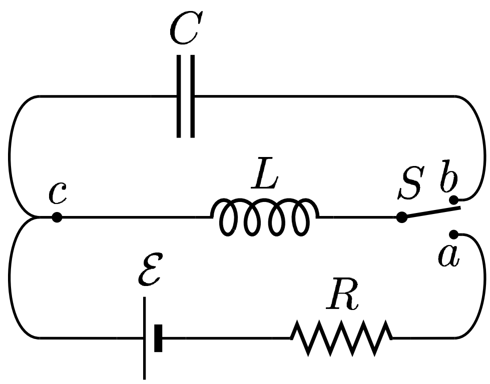
Given: A network containing a battery $\mathcal{E}$, and capacitor C, and resistor R and an inductor L.



Denote the angular frequency of the "LC" circuit by $\omega = \dfrac{1}{\sqrt{(L\,C)}}$.

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 maximum charge Q_{max} and the charge $Q(t)$ on the capacitor C.

A) $Q_{max} = \dfrac{\mathcal{E}\sqrt{L\,C}}{R}$ and $Q = Q_{max}\cos\omega\,t$

B) $Q_{max} = \dfrac{R\sqrt{L\,C}}{\mathcal{E}}$ and $Q = Q_{max}\cos\omega\,t$

C) $Q_{max} = \dfrac{\mathcal{E}\sqrt{L\,C}}{R}$ and $Q = Q_{max}\sin\omega\,t$

D) $Q_{max} = \dfrac{R\sqrt{L\,C}}{\mathcal{E}}$ and $Q = Q_{max}\sin\omega\,t$

$$I_{max} = \omega\,Q_{max} \Longrightarrow Q_{max} = \frac{I_{max}}{\omega} = \frac{\mathcal{E}\sqrt{L\,C}}{R}$$

$Q = Q_{max}\cos(\omega\,t + \delta)$, at $t = 0$, implies that $\delta = \pm\dfrac{\pi}{2}$. Since $\cos\left(\omega\,t - \dfrac{\pi}{2}\right) = \sin\omega t$, we have $Q = Q_{max}\sin\omega\,t$.

Answer **C**.