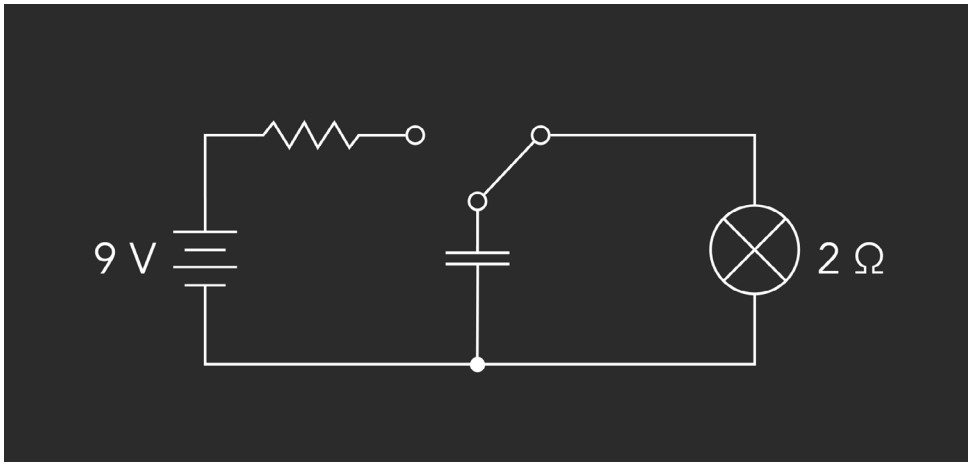
Challenge

Challenge: Charge and discharge a capacitor to generate a “camera” flash.

Circuit Description

- When the switch is connected to the left side, the current will flow from the 9 V battery through the resistor to charge the capacitor.
- When the switch is connected to the right side, the current will flow from the charged capacitor through the light bulb to create a brief flash of light.



Goal 1: Select a resistor value that will charge the capacitor as quickly as possible while preventing the circuit from ever drawing more than 15 mA of current from the 9 V battery.

Goal 2: Select a capacitor value that will store enough charge to output ≥ 3 V across a 2 Ω light bulb for ≥ 2 millisecond.

1. $R = \frac{V}{I} = \frac{9V}{15mA} = 600\Omega \rightarrow \boxed{680\Omega}$

2. $\tau = RC = 2\Omega \cdot C = 2mS \Rightarrow C = \frac{2mS}{2\Omega} = \boxed{1{,}000\mu F}$