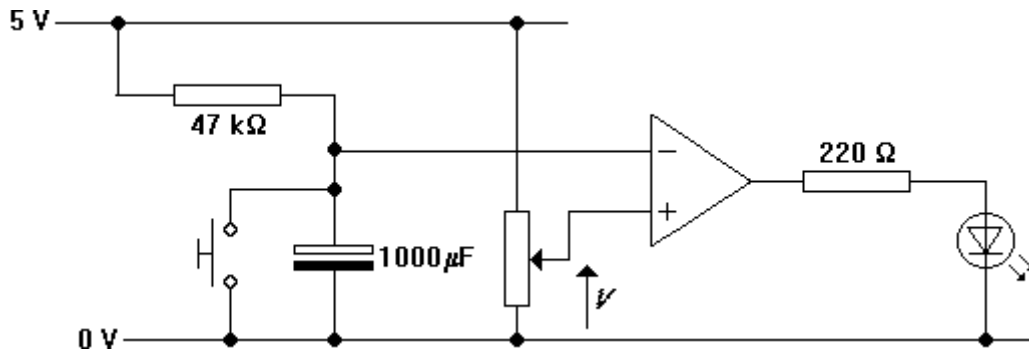


Measuring time delays

You are going to find out how good the formula $t = \tau \ln(V_0/V)$ is at predicting time delays.

1. Assemble the circuit shown below.



2. Measure V with a voltmeter. Set V to 1.0 V. Press the switch briefly. If all is well, the LED should glow for about 10 s.
3. Set V to 4.0 V. Use a stopwatch to measure the time for which the LED glows when the switch is briefly pressed.
4. Repeat step 3 for $V = 2.0$ V, 1.0 V and 0.5 V in turn.
5. Use the formula $t = \tau \ln(V_0/V)$ to calculate what the results should have been for each value of V .
6. Use the formula $V = V_0 e^{-t/\tau}$ to calculate the value of V required for the LED to glow for exactly 60 seconds after the switch has been released. Set V to that value and measure the time for which the LED actually glows.