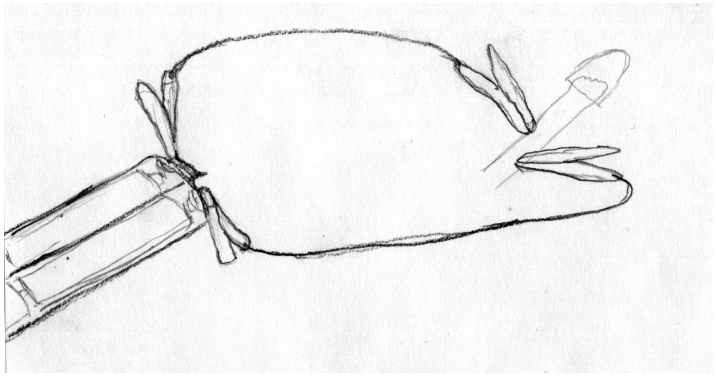
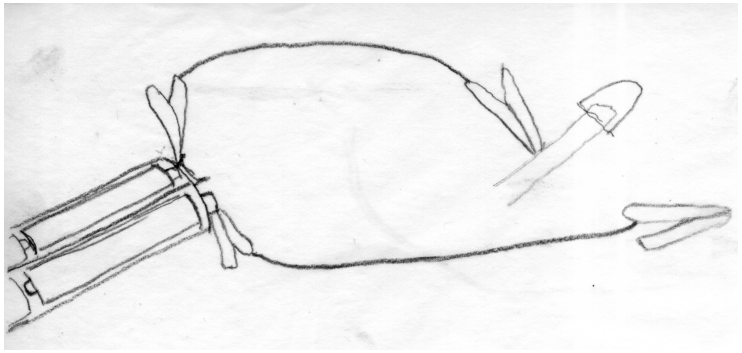
Introduction to Sensors

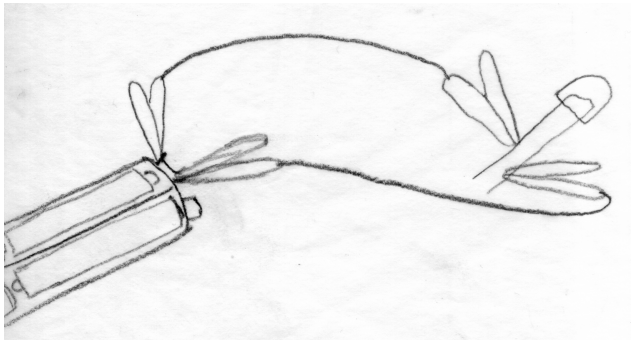
Christalee Bieber & Daniel Bergey, The Hacktory



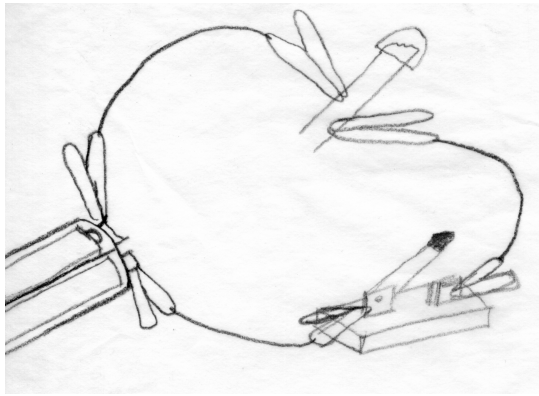
(a) closed circuit



(b) open circuit



(c) grounded circuit

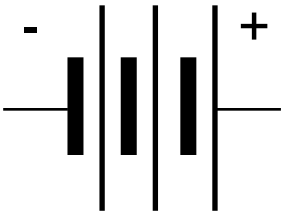


(d) switched circuit

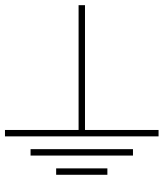
Figure 1: Try assembling each of these. Which ones light up, and why?

Circuit Diagram Symbols

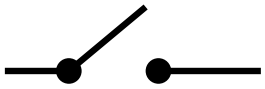
Christalee Bieber & Daniel Bergey, The Hacktory



(a) V, voltage

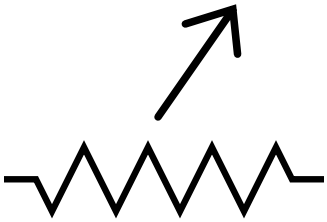


(b) G, ground

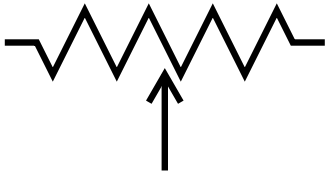


(c) switch

(d) R, resistor



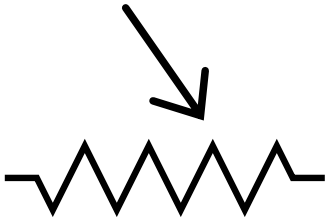
(e) lightbulb



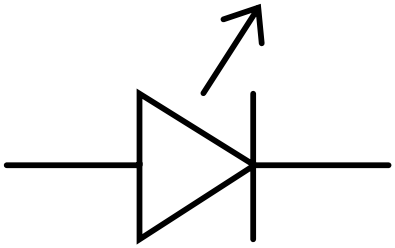
(f) potentiometer

(g) variable resistor

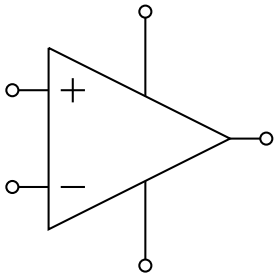
(h) thermistor



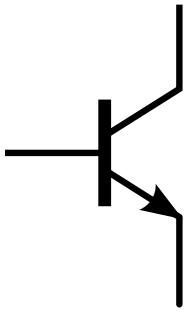
(i) photoresistor



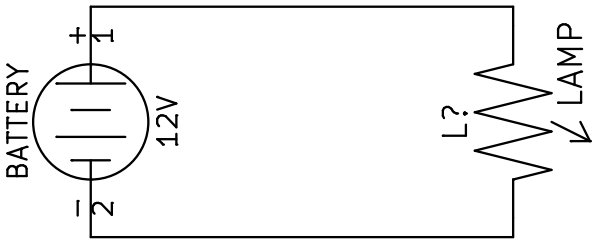
(j) LED, light-emitting diode



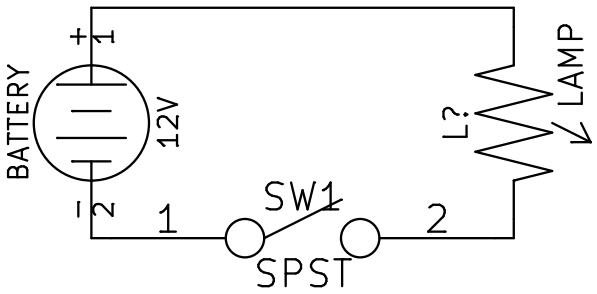
(k) op-amp



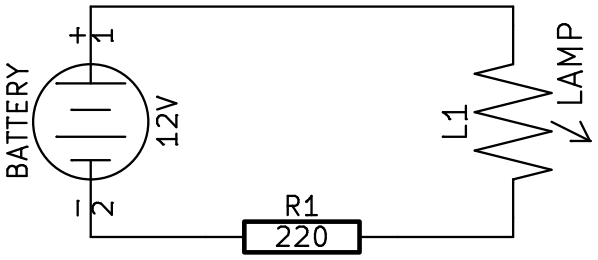
(l) transistor



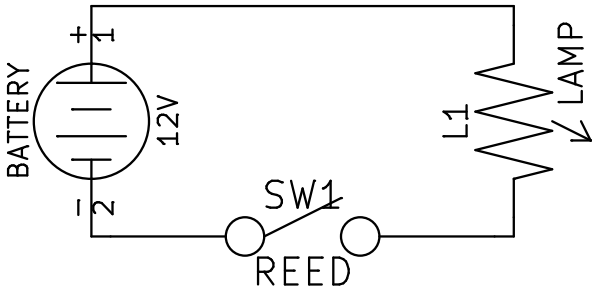
(a) closed circuit



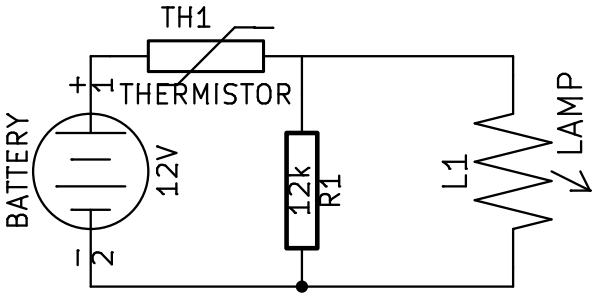
(b) switched circuit



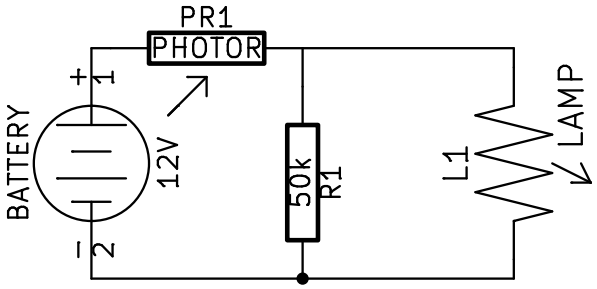
(c) resistor circuit



(d) reed switch circuit

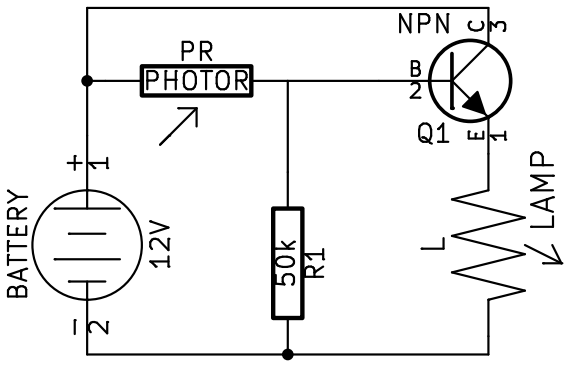


(e) thermistor circuit

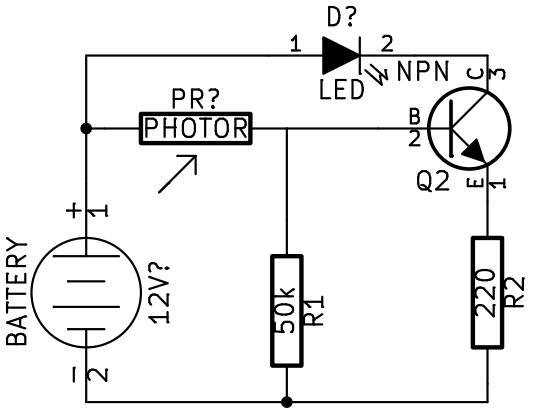


(f) photoresistor circuit

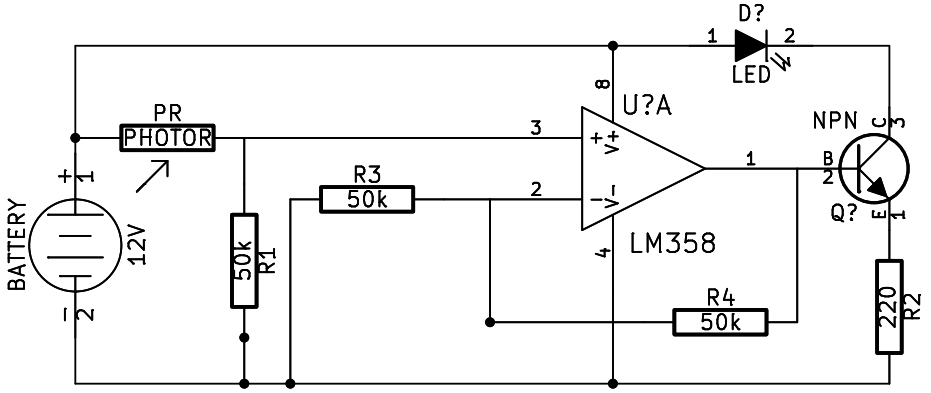
Figure 2: Simple sensor circuits. The last two don't light up - why?



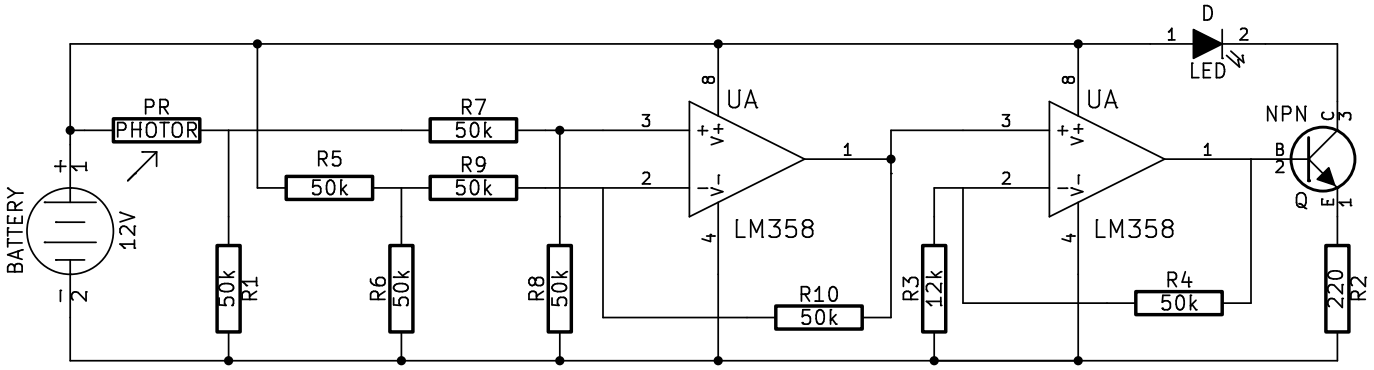
(a) voltage follower circuit to dim an incandescent bulb



(b) current source circuit to dim an LED



(c) 2x voltage gain circuit with an op-amp. (All resistors are 50kΩ.)



(d) Differential input circuit, to allow better detection of the sensor signal. R_2 and R_3 determine the signal gain, $G = 1 + \frac{R_3}{R_2}$. To limit current through the LED, $R_4 = 220\Omega$.

Figure 3: Sensor circuits using transistors and op-amps.