Additional electronic components - Switches and Resistive Elements (PRELAB)

In this activity we will explore the function of a switch and alternative resistive elements, a potentiometer and photoresistor.
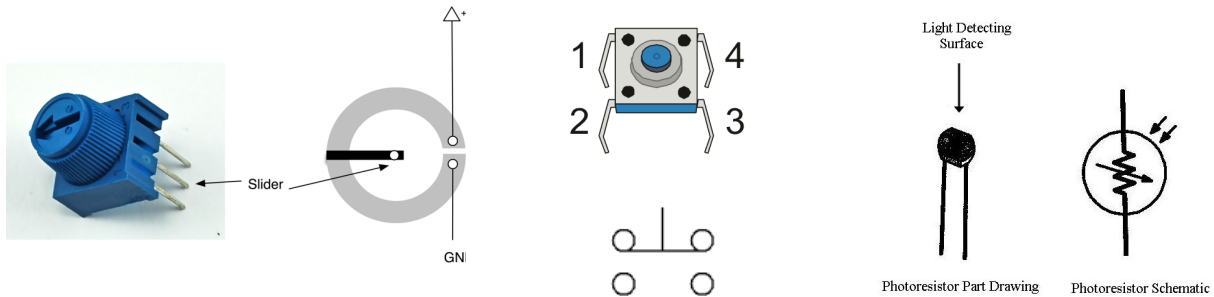

Figure 1: Potentiometer Source: https://learn.adafruit.com/system/assets/assets/000/002/250/medium800/learn_arduino_pot.png?1396780987

Figure 2: Push button switch Source: https://havingfunwithboebots.files.wordpress.com/2011/11/pushbutton1.png

Figure 3: Photoresistor Source: http://www.bu.edu/gk12/morteza/images/photoresistorpartdrawing.JPG

A. Potentiometer - Build the circuit below (Figure 4) in TinkerCAD by placing a 1 kΩ resistor, an LED, and a potentiometer in series. Note that the potentiometer (pot) has three pins, as shown in Figure 1; when connected with 5 V across the outer two pins, the middle pin outputs a voltage between 0 – 5 V, depending on the position of the potentiometer knob. To wire in a potentiometer to your circuit, simply connect the middle pin of the pot to one of the outside pins. **Optional to have the other outside pin go to ground if you wish.*
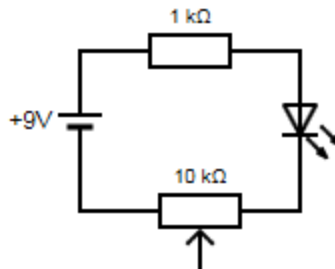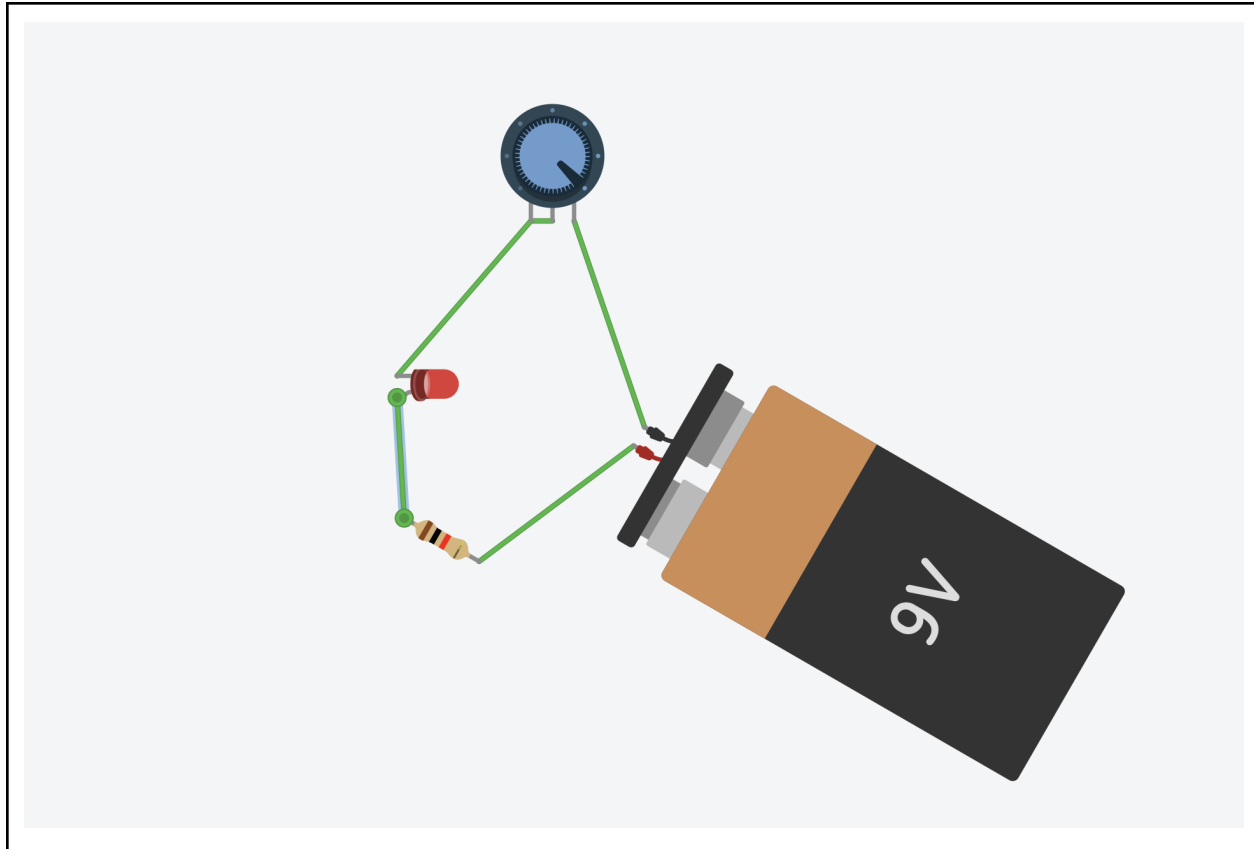

Figure 4: Potentiometer circuit

a. How does the rotational position of the potentiometer affect the LED?

The brightness of the LED

b. Take a screenshot or other screen capture and insert the image below

B. <u>Switch</u> - Our push button switches in ENGR 1L have either 2 or 4 legs, though in actuality, even the 4 legged variety only has two legs from a circuit standpoint - legs 1&4 are connected and legs 2&3 are connected (see Figure 2). Our button is 'normally open' which means that when you press it, it completes the circuit. To complete this part, integrate a switch into your circuit from part A (still in TinkerCAD) and use it to light the LED with a button press. Note that you'll need to 'start the simulation' to be able to interact with the pushbutton!

    a. Draw the new schematic (including the switch) using proper schematic symbols (see Appendix at end of this document for help if needed!) and insert below. You may use software or write on paper and take a photo.
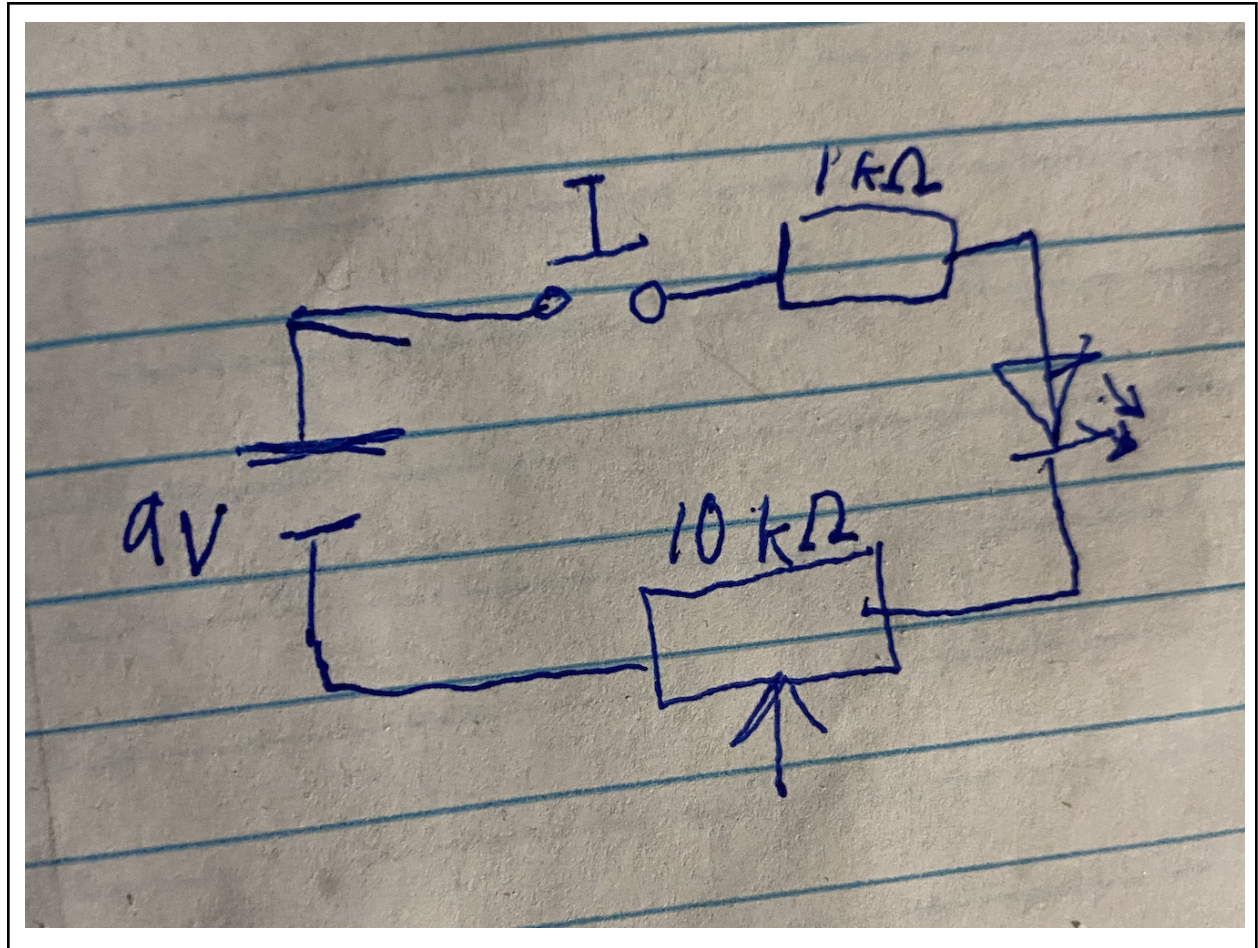
b. Take a screenshot or other screen capture and insert the image below
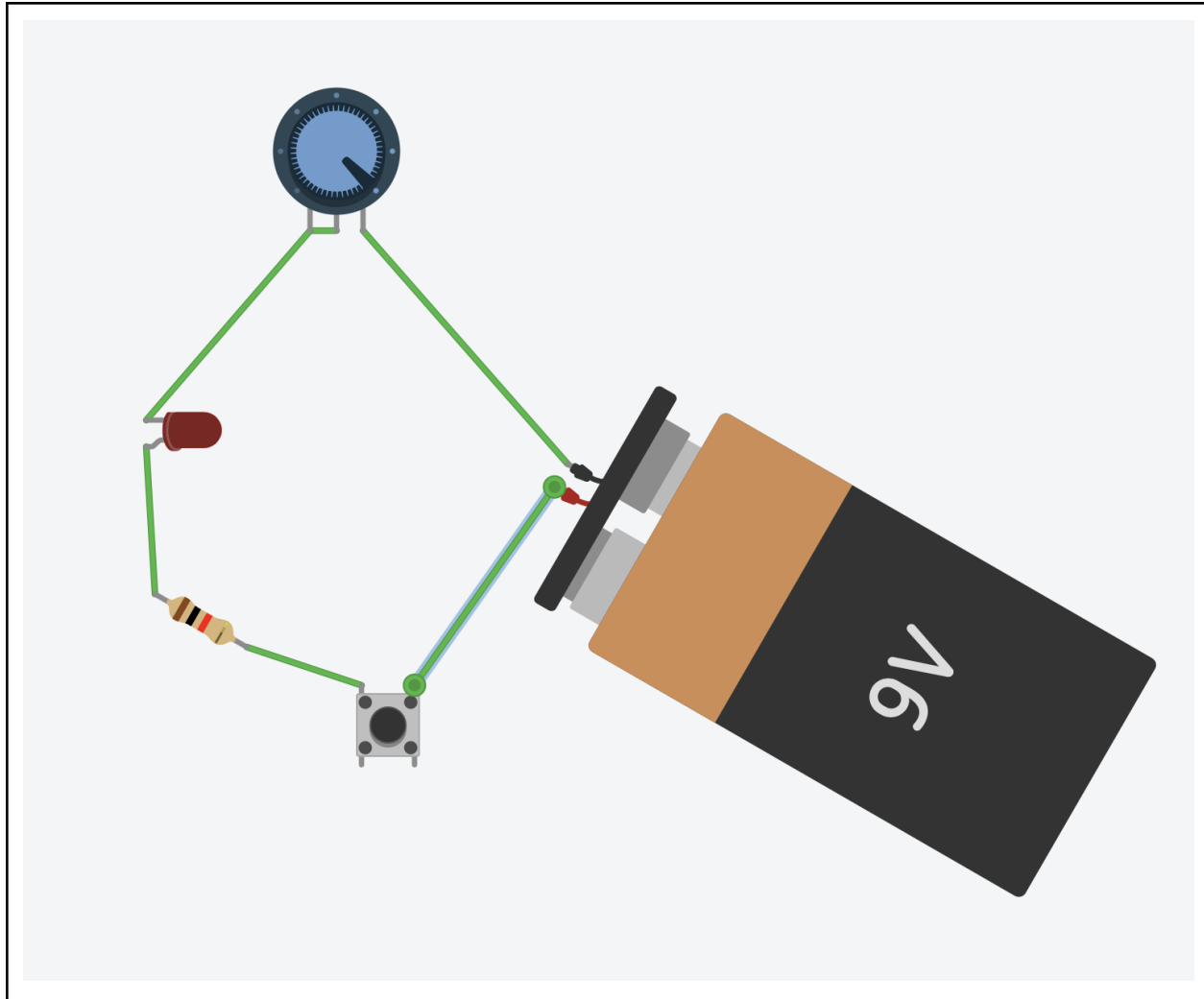
C. <u>Photoresistor</u> - Opto-electronic components, such as the photoresistor, are commonly used as input devices and often sense the presence (or absence) of objects. However, opto-electronics also act as variable resistors as the resistance value changes with the amount of light hitting the device. White or bright light is low resistance (~1 kΩ) while black or dark is high resistance (~200 kΩ). In this case, we will use the photoresistor to turn on and off an LED by covering the photoresistor.
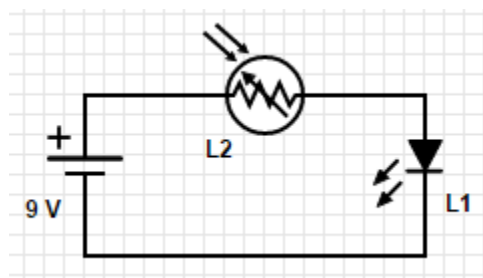

Figure 5: Photoresistor circuit

      a. Build the simple circuit (Figure 5) on a breadboard in TinkerCAD. Cover and uncover the photoresistor (after starting the simulation). What happens? Why does this happen?

> As more sunlight strikes the photoresistor the brighter the LED becomes because the resistance decreases.

      b. Take a screenshot or other screen capture and insert the image below
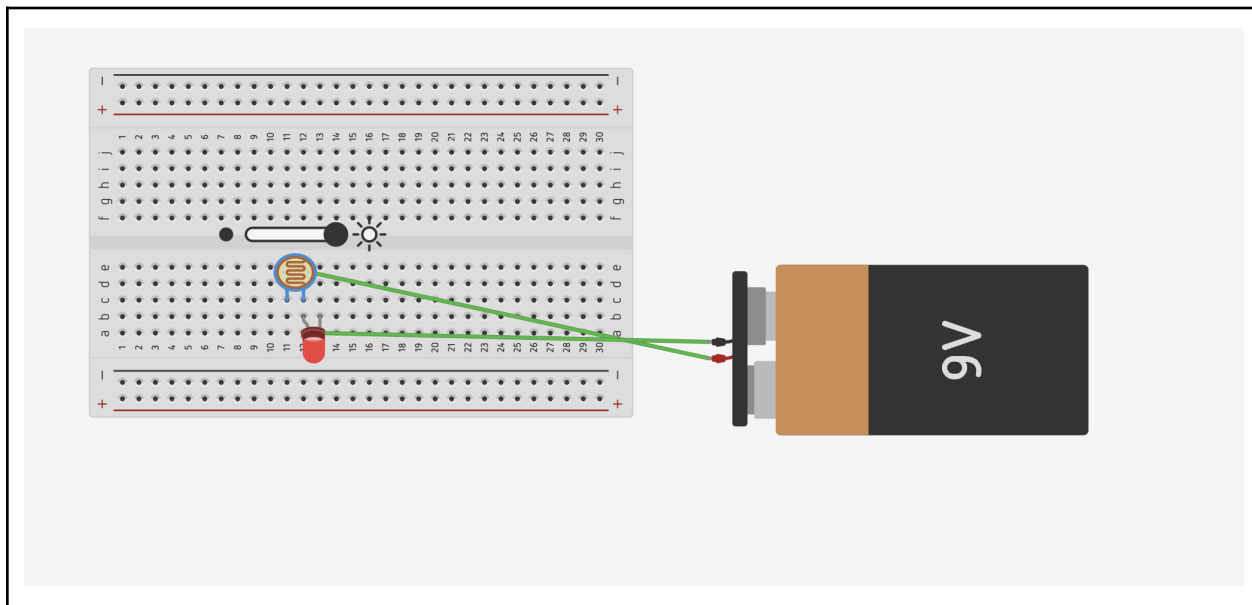
APPENDIX: ELECTRONIC SCHEMATIC HELP
How to make an electronic schematic (helpful videos):
- ~5 min - https://www.youtube.com/watch?v=_HZ-EQ8Hc8E
- ~12 min - https://www.youtube.com/watch?v=oIRsMBVuSS4