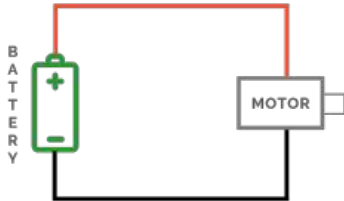
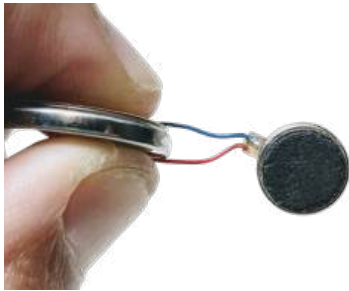


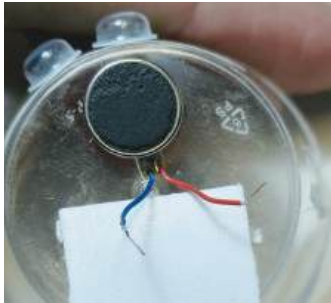
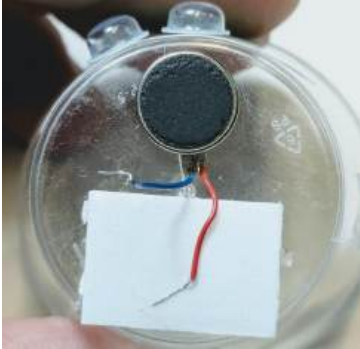
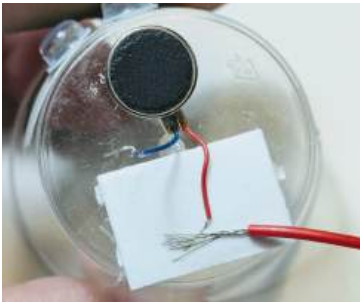
DANCING SHAMROCK

v. 1.00

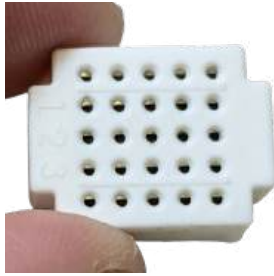
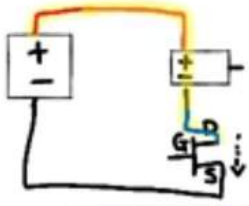
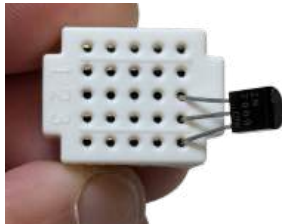
..... LIGHT SENSING BOT



	PARTS	INSTRUCTIONS
STEP 1	1 x Cup 1 x Shamrock Sticker 2 x Googly Eyes	 <u>Build the Body of the Robot:</u> 1. Turn the cup upside down. 2. Stick the shamrock sticker onto the cup. 3. Stick 2 googly eyes to the cup.
STEP 2	1 x Vibration Motor 1 x Coin Cell Battery	  <u>Testing the Vibration Motor:</u> 1. Notice in the circuit diagram that the battery (left) connects the motor (right) using 2 wires. The (+) of the battery connects to the (+) of the motor. The (-) of the battery connects to the (-) of the motor. 2. Build the circuit by touching the metal part of the blue wire (-) to the (-) of the battery and touching the metal part of the red wire (+) to the (+) of the battery. Note that the (+) side of the battery has a (+) on it. The (-) side of the battery is the opposite side. Once done correctly, the motor should vibrate in your hand.

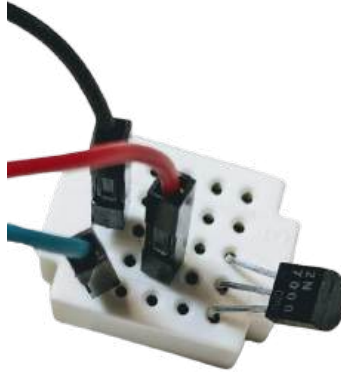
STEP 3		 Remove the paper backing from beneath the vibration motor. Affix the motor to the top of the cup.
STEP 4	1 x Sticky Foam	 1. Remove the paper backing from one side of the sticky foam. 2. Position it next to the motor carefully. 3. Ensure that it does not cover either of the motor wires.
STEP 5		 1. Remove the paper back from the other side of the sticky foam. 2. Stick the red motor wire onto the sticky foam. 3. Make sure that the metal part of the red motor wire is fully on the sticky foam.
STEP 6	1 x Extra Red Wire	 Take the metal strands from the extra red wire and stick them on the sticky foam.

STEP 7	1 x Coin Cell Battery		Take the (+) side of the coin cell battery and place it onto the sticky foam making sure that it makes good contact. Now both the red wire of the motor and the extra red wire are connected to the (+) of the battery!
STEP 8			Confirm your connection by touching the metal part of the blue motor wire to the (-) of the battery. The motor should vibrate!
STEP 9	1 x Transistor		Next we're going to learn about the transistor, which is a switch that you will be able to use to turn your robot toy off and on. There are three legs of a transistor. They are named Gate (G), Drain (D) and Source (S). Electricity flows from the Drain to the Source. The gate controls whether or not electricity flows between the drain and source. Gate = ON -> Electricity Flows Gate = OFF -> No electrically flows To learn more, watch the video at: https://youtu.be/7om5EOOH4EE?si=Ni9y9GsPwNf1-cu-&t=639

STEP 10	1 x Breadboard	 To connect our motor and battery to the transistor, we need a breadboard. When held horizontally, each set of 5 holes on every row are connected together. To connect two wires together, just stick the wire pins into the same row! However, holes that are NOT on the same row are NOT connected. To learn more, watch video here: https://youtu.be/7om5EOOH4EE?si=jvDm6CBSPpxSymLq&t=822
STEP 11		 Now that we know how these items work, let's use the breadboard and transistor to build this updated circuit.
STEP 12		 Stick the transistor onto your breadboard. Make sure that the flat side of the transistor is pointing to the left. Put the three legs on the bottom three rows. • Row 3 = Source (S) • Row 4 = Gate (G) • Row 5 = Drain (D)

STEP 13	1 x Extra Blue Wire		1. Take the metal strands of the extra blue wire and connect them to the metal strands of the blue wire from the motor. 2. Cross and twist the metal strands together to make a good connection.
STEP 14			Connect (-) of the motor (now connected to the extra blue wire) to the Drain (D) of the transistor. Stick the pin of the extra blue wire to a hole in row 5.
STEP 15	1 x Extra Black Wire		<u>Connecting the (-) of Battery to the Source (S):</u> 1. Position the metal strands of the extra black wire on top of the (-) end of the battery. Put a circle sticker on top to secure the connection between the extra black wire and battery. 2. Insert the pin of the extra black wire into a hole in row 3, which is where the Source (S) of the transistor is.

**STEP
16**



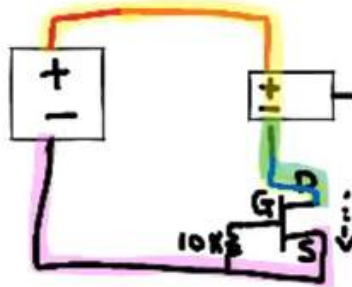
Right now your motor is not moving because the gate is off. This means that there is no flow of electricity between the Drain (D) and source (S).

To open the gate (turn it on), try connecting the (+) of the battery (pin of the extra red wire) to the Gate (G), which is in row 4 of the breadboard.

Once we do it, the gate will turn on, and electricity will flow. Now your motor should vibrate!

After you confirm that the motor vibrates, take the pin of the extra red wire out of the breadboard so that we can continue on with adding our sensor.

**STEP
17**

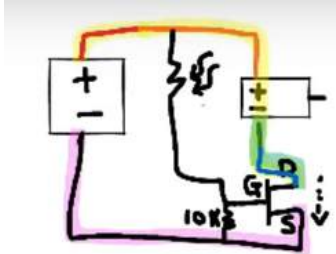


Biasing our Gate to be Off:

Look at the circuit diagram (left) and notice that there is a resistor (squiggly line) between the Gate (G) and Source (S) of the transistor.

This makes sure that the gate is typically off because we are connected the Gate (G) to the (-) of the battery, which is 0 Volts.

STEP 18	1 x 10K Resistor	<u>Making the 10K Resistor Connection:</u> Take your 10K resistor and bend the legs. Stick the legs into Row 3 (Source) and Row 4 (Gate). Note: It doesn't matter which leg of the resistor goes into which row. Watch video: https://youtu.be/7om5EOOH4EE?si=1DdxP9lCz_JpEOff&t=1281 
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STEP 19	1 x Photoresistor	Notice the second resistor (photoresistor) connecting the (+) of the battery to the Gate (G) of the transistor in the circuit diagram (left). This photoresistor changes its value (resistance) as the intensity of light changes. This change in resistance will pull the voltage on the Gate (G) up and down, which will be able to turn it on or off. This will effectively turn your motor off and on depending on light intensity! Watch video: https://youtu.be/7om5EOOH4EE?si=L i3SAGOioRm-4p1z&t=1395  
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STEP 20		<u>Making the Photoresistor Connections:</u> 1. Put one leg (either leg) of the photoresistor into the same row as the Gate (G), which is row 4. 2. Put the other leg of the photoresistor onto row 1, which has nothing on it. Now connect the pin of the extra red wire, which is connected to the (+) of the battery to row 1 as well. Video: https://youtu.be/7om5EOOH4EE?si=yYo1-OXqpA0tOFk2&t=1526 Now your shamrock will dance when it is bright and turn off when it's dim!
STEP 21	1 x Sticky Foam	Use sticky foam to adhere the breadboard onto the side of the shamrock bot.