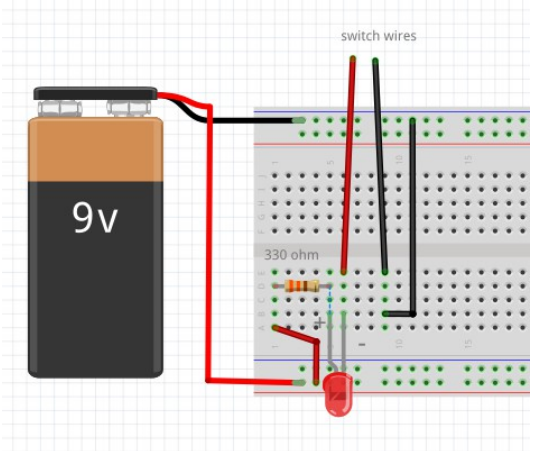
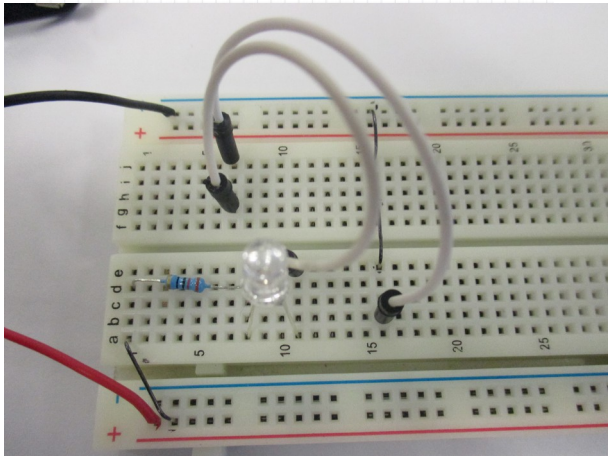
Basic Circuit and Transistor Circuit Measurements





You will make a new slide show, the title will be;

Basic Circuit and Transistor Circuit Measurements

- Follow the instructions on these slides to build your breadboard circuits, make the measurements and answer the questions
- You will take photos of your own breadboard and insert these in your slides
- You can work together to make measurements using the multimeter, but you must use your **own photos and answers** in your slides
- You can copy/paste the questions from these slides into your own slides (do not include the instructions given in these slides though)
- You will use the information you gain for your first assessment

Build the basic circuit on your breadboard using the Fritzing layout and the breadboard photo shown here as a guide (use a multimeter set to Ω to measure the resistor value)

- two hook-up wires are used for the switch, to enable the circuit to remain on the switch wires can be plugged into a common row as shown

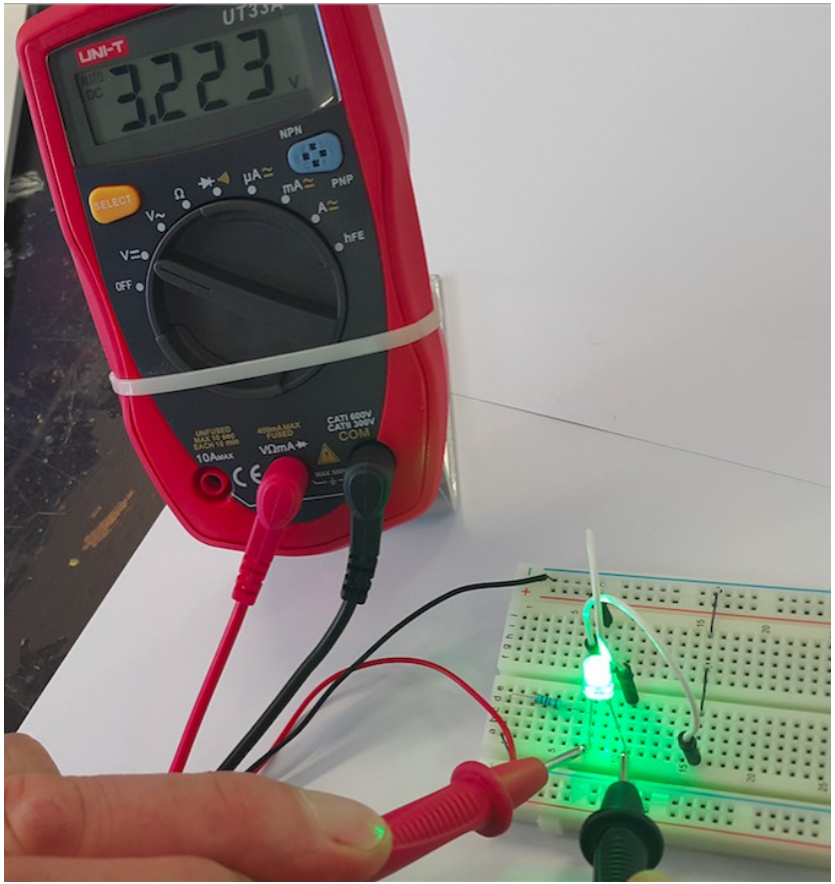
photo of your breadboard with the basic circuit here

Task 1:
Take a photo of your working breadboard and insert it into your slides

With your switch wires connected together and LED on, set your multimeter to measure voltage **(DC -)**

Measure the voltage across the LED
Voltage =
Measure the voltage across the 330 ohm resistor
Voltage =
Measure the voltage across the +ve and -ve rails (the battery voltage)
Voltage =
Add the voltage of the LED and resistor together
Voltage total =

Deduct the voltage total of the led/resistor from the battery voltage
The total voltage of the led/resistor should equal the battery voltage (within a few millivolts) does it?
If not, give a brief explanation of why this may be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3.223
V
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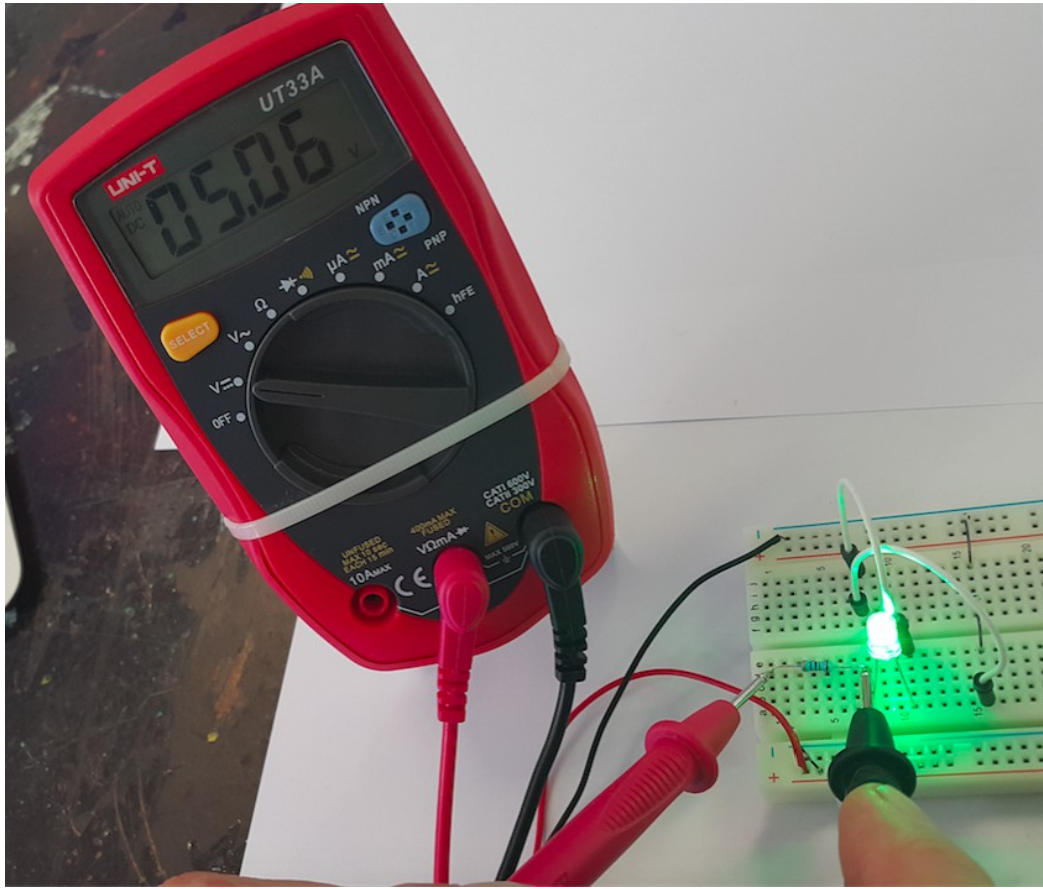
hFE
COM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05.06
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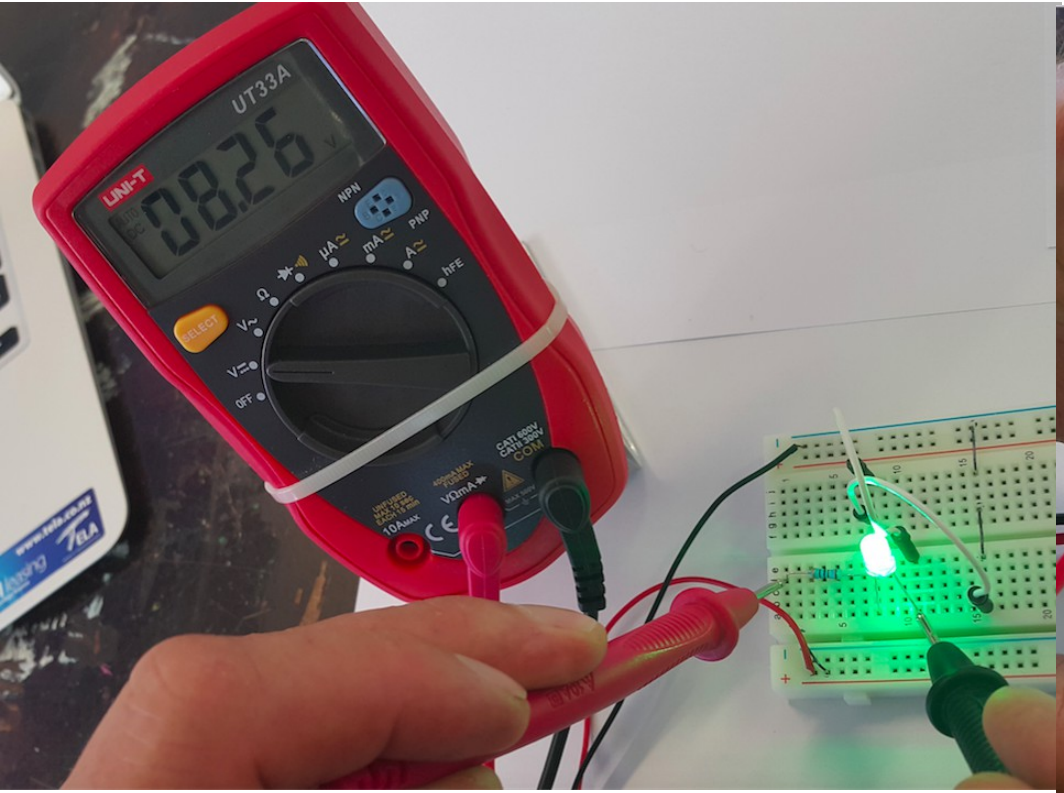
NPN
PNP
OFF
hFE
COM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PNP
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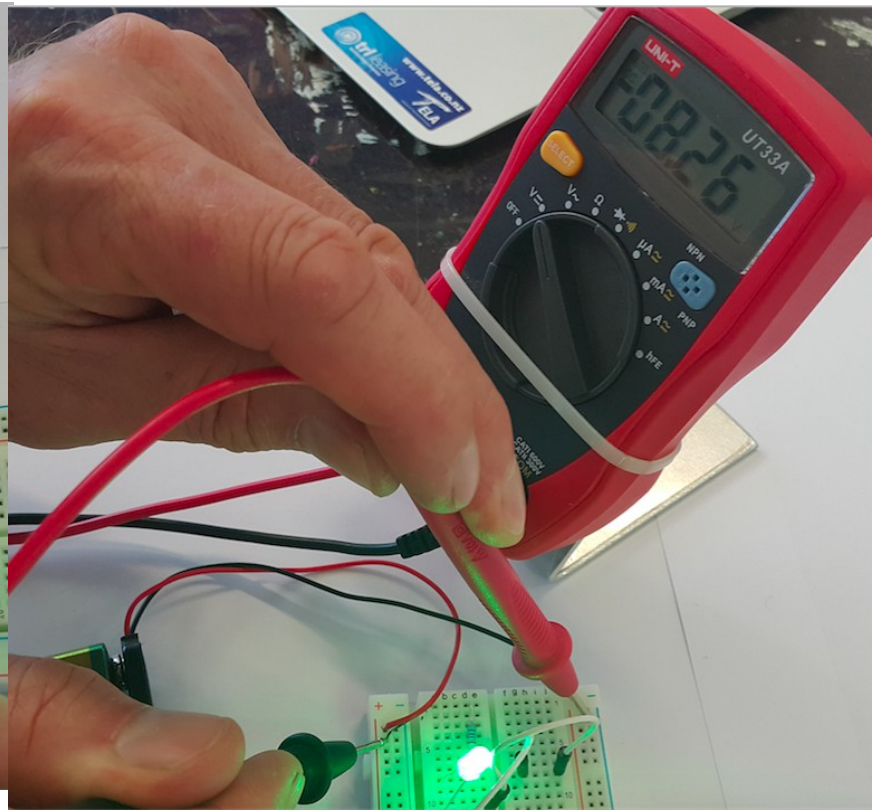
10Amax
COM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UT33A
0826
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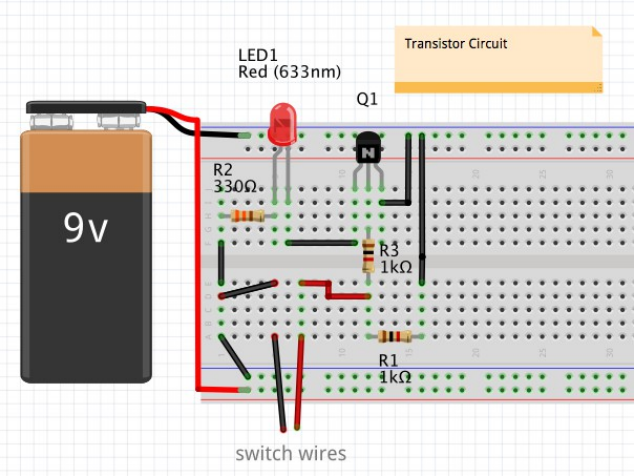
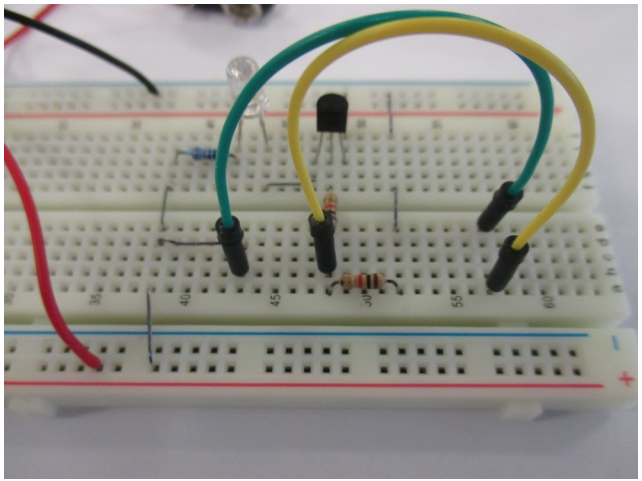
PNP





Transistor Circuit.

There are two types of transistor, NPN and PNP. In out projects we will only use NPN type. Transistors are used in two ways, as a switch to turn components on/off and as an amplifier to enable components to receive a larger current.

Voltage (volts/millivolts) is the amount of energy available to power the circuit. **Current** (amps/milliamps) is the measurement of the amount of energy flowing through the circuit.

Task 2:

- Build the transistor circuit on your breadboard using the Fritzing layout and the breadboard photo shown here as a guide (use a multimeter set to Ω to measure the resistor values)
- Use connector links made from 47K resistors to construct the breadboard neatly, two hook-up wires are used for the switch, to enable the circuit to remain on, the switch wires can be plugged into a common row as shown

Add a new slide, title - **Transistor Circuit**
When it is working, take a photo of your transistor circuit on your breadboard, add this to your slide (similar to the photo shown on the left)

Photo of your breadboard placed here

Use a multimeter to make the measurements then answer the questions by inserting the question then adding the answer below the question:

1. Turn the transistor **ON** using the switch wires, set your multimeter to measure Voltage (DC -)
2. Turn the transistor **OFF** by disconnecting the switch wires
3. Measure the voltage between the BASE and EMITTER legs
   Voltage =
4. Turn the transistor **ON** by connecting the switch wires

Q/ What is the level of voltage needed to turn the transistor on?

Voltage =

Q/ Why is a 1k resistor placed inline with the base leg of the transistor?

Task 3:

- Carefully lift the lead of the 1K resistor connected to the transistor base leg out of the breadboard (the LED will go off)
- Set the multimeter dial to measure **mA** (milliamps)
- Connect the red multimeter lead to the 1k resistor lead that is now out of the breadboard (fingers can be used to do this) connect the black meter lead to the transistor base leg (the LED should be on now)

Q/ What is the current reading in milliamps?

After noting the reading, re-insert the 1k resistor lead next to the base leg (the LED should now be on)

Remove the breadboard connection between the transistor EMITTER leg and the negative rail (the LED will go off)

With the meter set to measure **mA**, place the red lead onto the EMITTER leg and the black lead to the negative rail on the breadboard, note the reading on the meter

Insert the readings on the meter to the questions below;

Q/ What is the reading in milliamps between the 1K resistor and the transistor base?

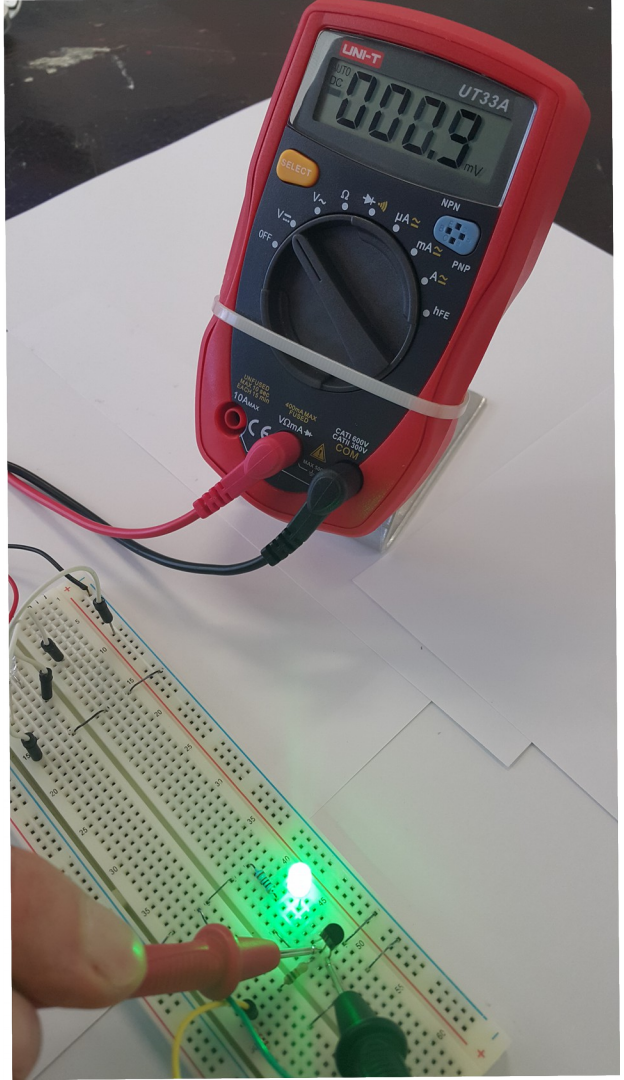
(this is the BASE CURRENT) =

Q/ What is the reading in milliamps between the transistor EMITTER and the negative rail

(this is the EMITTER CURRENT) =

Divide the BASE CURRENT into the EMITTER CURRENT, this will give you and ratio (example, if the base current is 10 and the emitter current is 100 the ratio will be 10) How much has the transistor amplified the current at the base leg compared to the current at the emitter leg?

This ratio is called the TRANSISTOR GAIN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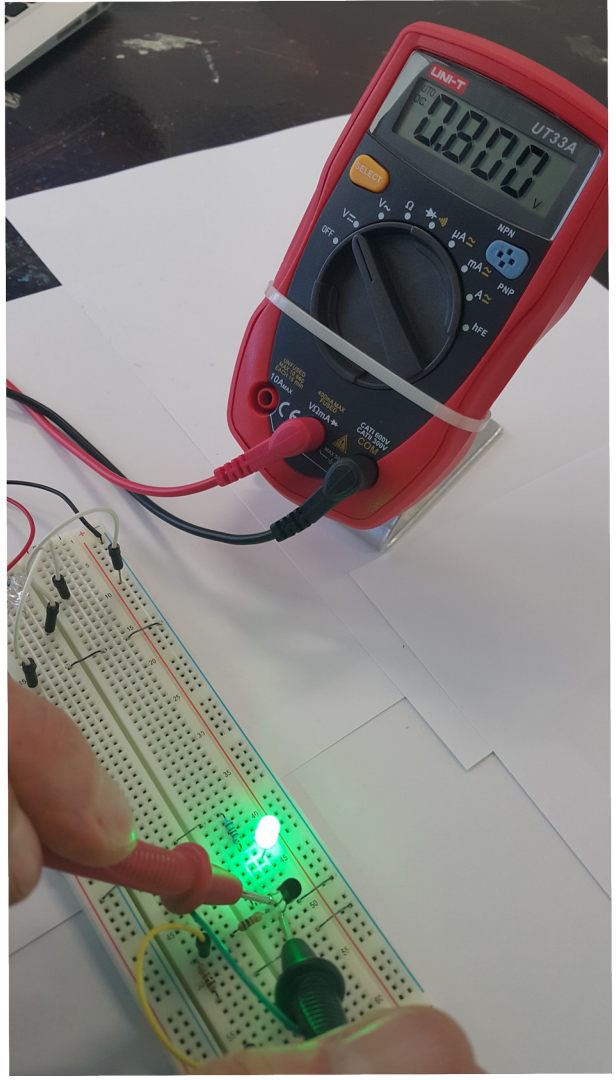
UT33A
000.9
mV
SELECT
NPN
PNP
OFF
hFE
10A
VΩmA
COM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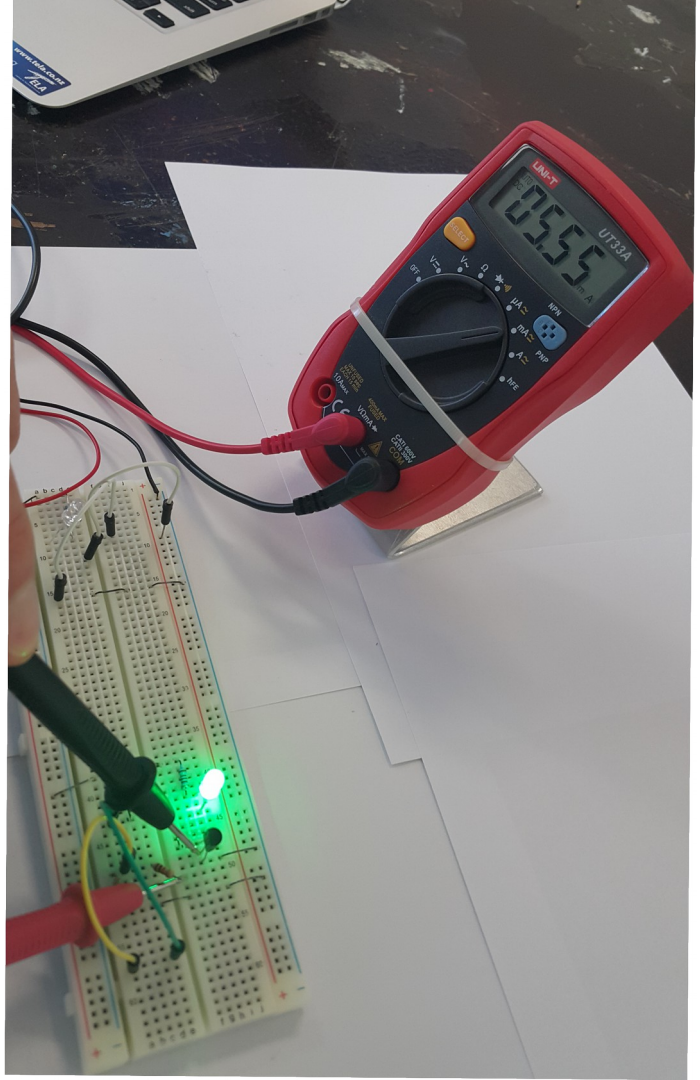
UT33A
0.820
V
SELECT
NPN
PNP
OFF
hFE
10A
VΩmA
COM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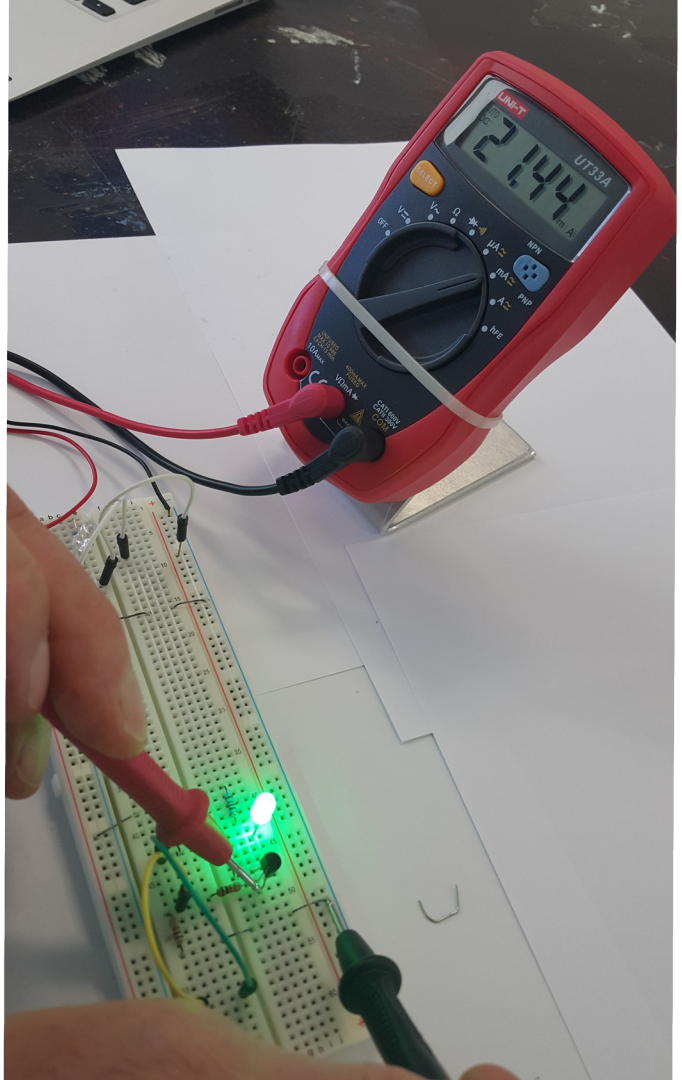
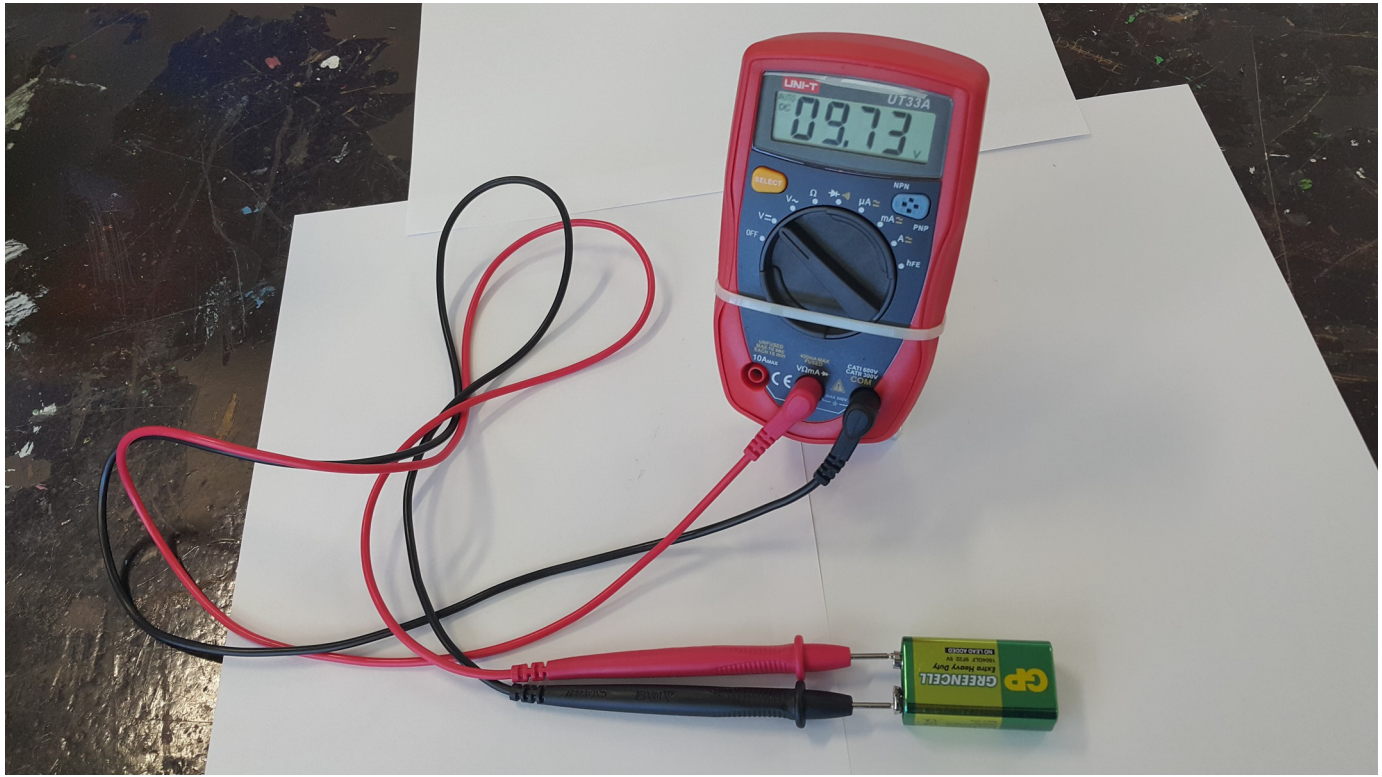
UT33A

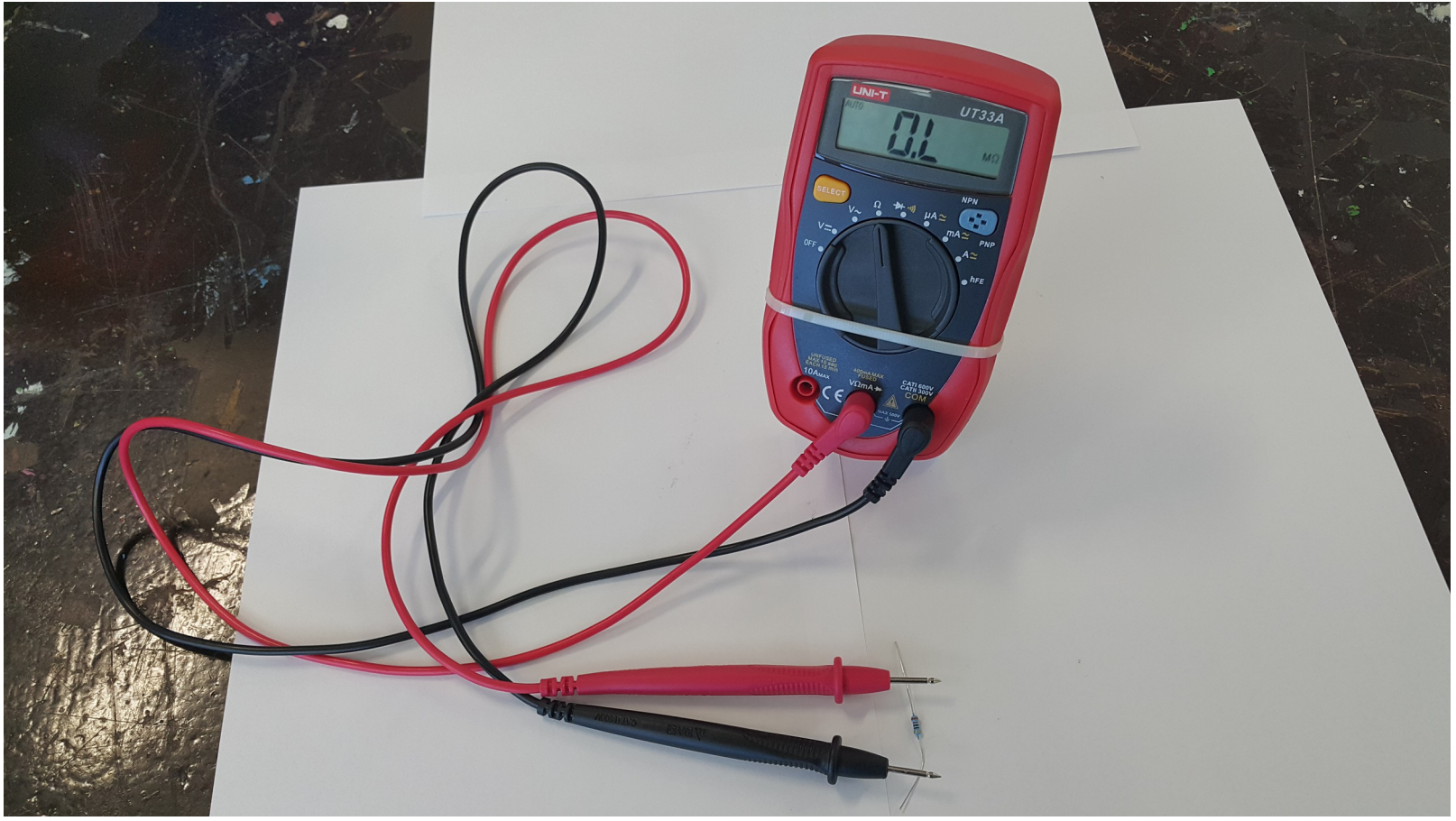

UNI-T
UT33A

Using the multimeter

1- Measuring voltage across a battery



2- Measuring Resistance



3- Measuring Continuity Circuit