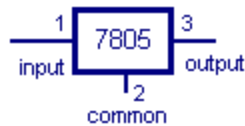


Applying Electronics - Labs 1 : Voltage Regulator

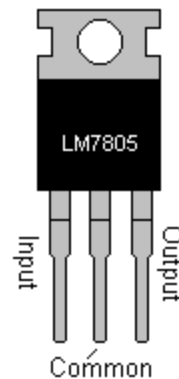
A Voltage Regulator (also called a "regulator") has only three legs and appears to be a comparatively simple device but it is actually a very complex integrated circuit. A regulator converts varying input voltage and produces a constant "regulated" output voltage. Voltage regulators are available in a variety of outputs, typically 5 volts, 9 volts and 12 volts. The last two digits in the name indicate the output voltage.



Symbol for a Voltage Regulator.



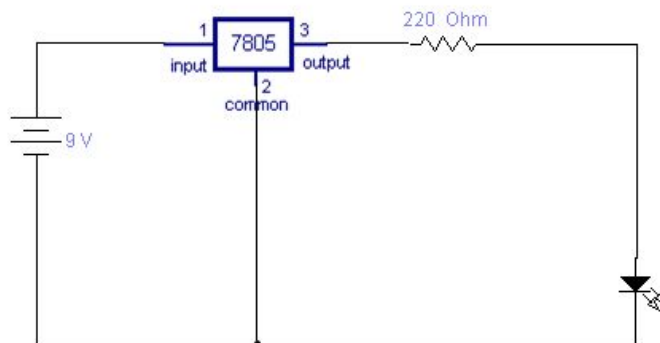
A LM7805 Regulator



This device looks like a Transistor, however it is actually a complex Integrated Circuit.

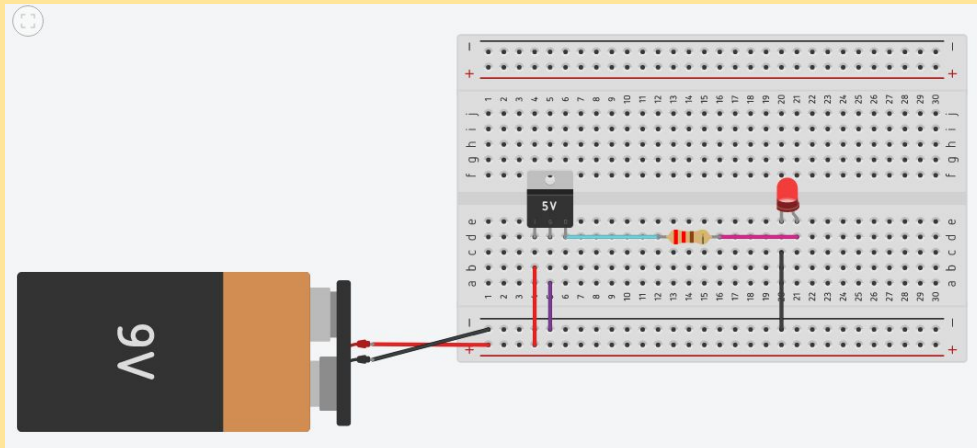
Voltage regulators are simple and useful. There are only two important drawbacks to them: First, the input voltage must be higher than the output voltage. For example, you cannot give a 7805 only 2 or 3 volts and expect it to give you 5 volts in return. Generally, the input voltage must be at least 2 volts higher than the desired output voltage, so a 7805 would require about 7 volts to work properly. The other problem: The excess voltage is dissipated as heat. At low voltages (such as using a 9-volt battery with a 7805), this is not a problem. At higher voltages, however, it becomes a very real problem and you must have some way of controlling the temperature so you don't melt your regulator. This is why most voltage regulators have a metal plate with a hole in it. That plate is intended for attaching a heat sink to.

Lab1 : Wire this circuit in TinkerCad. To find the voltage regulator component, type in LM7805. To change the value of a resistor, simply click on it and edit the value in the properties box that appears.



Take a screenshot of your circuit in Tinkercad working with the LED on. You will need to click on Start Simulation first. Paste your picture below in the yellow box below.

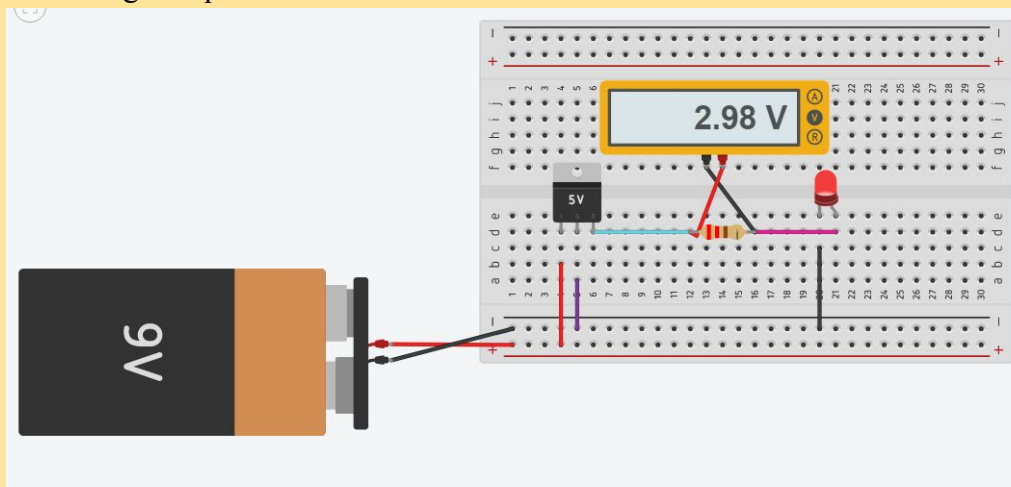
Lab 1: Paste a picture of your working circuit here:



Questions: (Use the virtual multimeter to answer questions 1 and 2). Provide all answers in the yellow boxes.

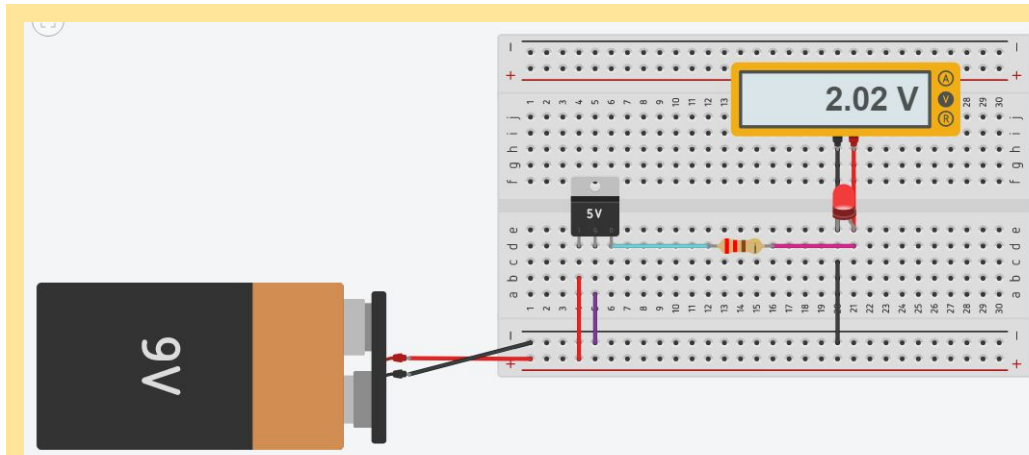
1. What is the voltage drop across the 220 Ohm resistor?

The voltage drop across the 220 Ohm resistor is 2.98V



2. What is the voltage drop across the LED?

The voltage drop across the LED is 2.02V



3. Use Ohm's Law to solve for the current flowing through the resistor: (show your work below)

Current flowing through the resistor.

$$I = V/R$$

$$I = 2.98/220$$

$$I = 0.013\text{A or } 13\text{mA}$$

Therefore the total current through the resistor is 13 mA

4. What is the current flowing through the LED? How do you know?

The current flowing through the LED is also 13mA. I know this because according to Kirchoff's law the current flowing in a series circuit through all the components is the same.