

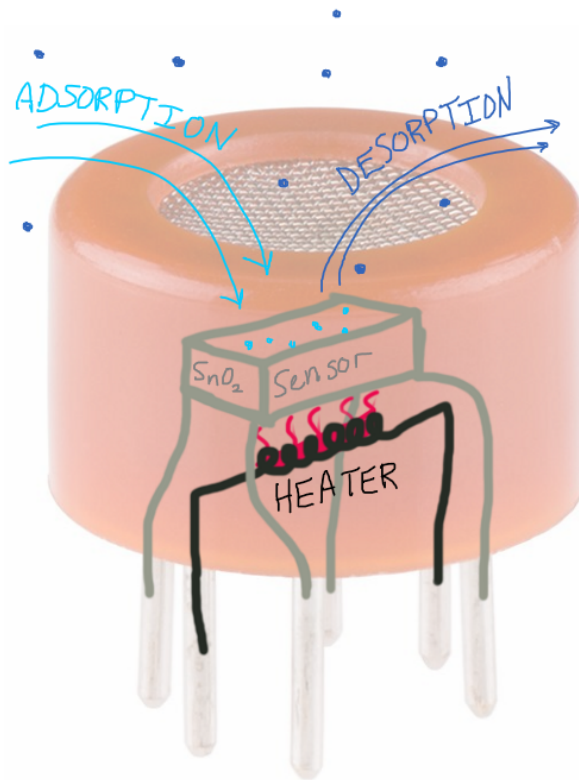
Gas Sensors

How a Gas Sensor Works

Think about a cold glass of water on a humid day, or a mirror after a hot shower. You've probably noticed that water droplets tend to accumulate on both the mirror and the glass. If we heat up the glass (for example with a hair drier) then the water droplets will evaporate.

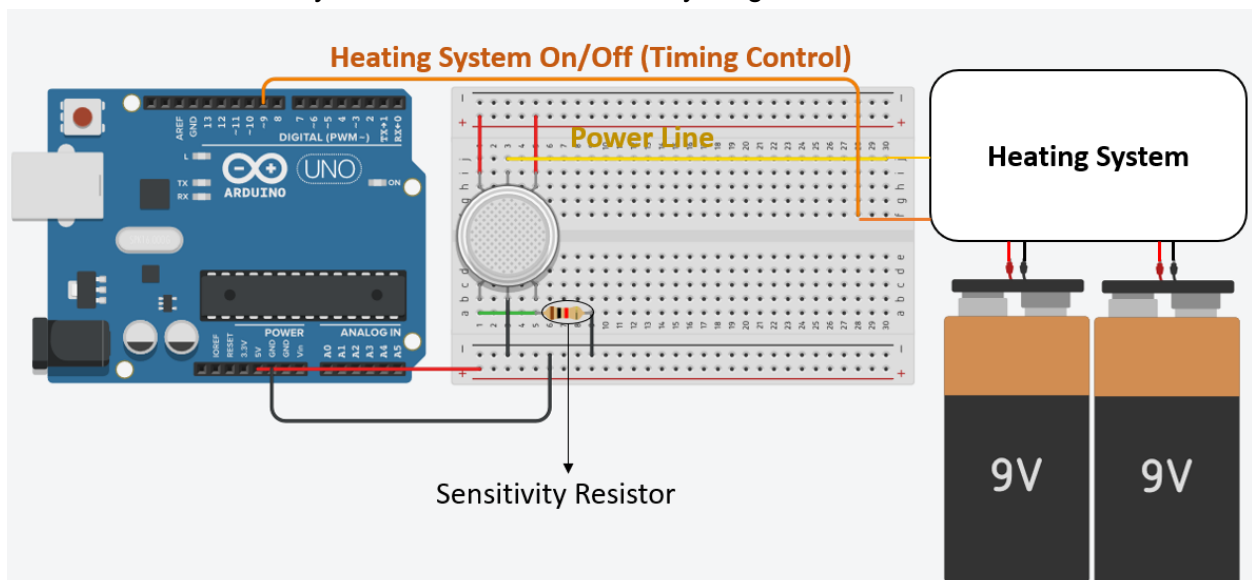


Similarly, the gas sensor is designed to collect (**adsorb**) certain gases when it is cool, and release them (**desorb**) when it is heated up.



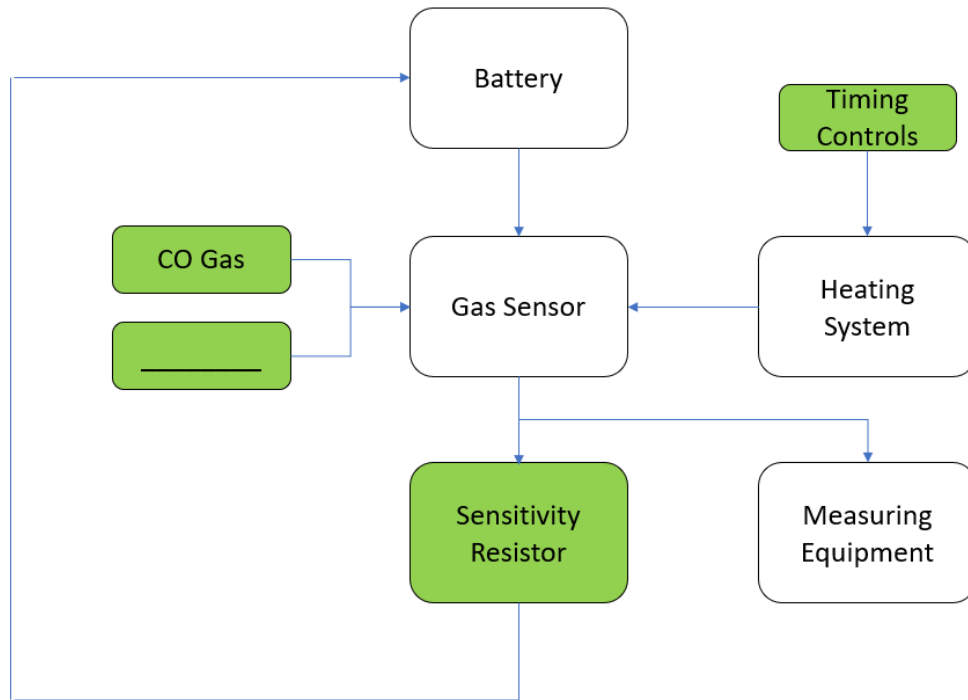
When the gas molecules are **adsorbed** into the sensor, the resistance of the sensor material (in this case, SnO₂, or Tin Oxide) changes, so we can use the sensor resistance to determine the gas concentration in the air. When we want to clean off the sensor for a new measurement, we need to heat it up to desorb the gas.

Below is the circuit that you will need to build to use your gas sensor.



We can apply our **systems perspective** to this circuit to help us understand and design it. The system below represents the circuit above (*take a second to compare the two*). The main sensing circuit consists of the battery, gas sensor, and sensitivity resistor. **The measuring**

equipment (multimeter or Arduino) looks at the voltage between the gas sensor and the sensitivity resistor and uses this to determine what the gas concentration is. The conversion between this measurement and the gas concentration has already been done in the provided code, so you only need to think about the parts in green. These are the parts of the system which affect how well the gas is measured, and they depend on your hypothesis.



The accompanying worksheet and your circuits mentor will guide you through the process of choosing your resistor and writing your timing code - this is what you will need to do to get a working circuit. You will have to determine which of the given resistors (4.7k, 10k, 47k) you want to use to control how sensitive the device is to the gas, and you will have to write code to turn on/off the heater. After that, you will think about any other environmental conditions that might affect your gas sensor as it relates to your hypothesis, and make changes to your circuit or code based on that!