Kinetic Energy Lab Sequence

1. Find a generator.
2. Find a way to turn, crank, etc your generator.
3. Turn the generator and measure **open circuit voltage (OCV).**
   3.1. Multimeter in DC volts (for DC motor) or AC volts (for stepper)
4. Turn the generator and measure **short circuit current (SCC).**
   4.1. Multimeter in DC current (for DC motor) or AC current (for stepper)
   4.2. Note, the multimeter works differently in current vs other modes. In current mode it is a series part of the circuit, so when we use it to measure current here we are "short circuiting" the current.
5. Calculate the **upper limit power** for your generator,
   5.1. Multiply SCC in amps x OCV in volts to get power in watts
   5.2. This will be an outside case: the highest voltage your generator will generate is in OCV; the highest current in SCC; any real-world application will be some intermediate value for both.
6. Connect an LED to your generator.
   6.1. Does it light up? Check the polarity. For a stepper, LEDs in opposite phases can light up, because the steppers produce AC. You might be able to see this - if your smart phone has a slow-motion video feature, record the LEDs and you may see alternate flashing.
   6.2. Does it blow up? Add resistors.
   6.3. How many in series can you light up?
7. Rectify the output.
   7.1. Use the bridge rectifier component so that your stepper's AC is DC; or so your DC motor outputs the same polarity no matter which way it is turned.
   7.2. Add an LED circuit after the rectifier. Make sure to use an appropriate resistor from now on.
8. Smooth the output.
   8.1. Add a capacitor after the rectifier. Try various sizes from 1uF to 10,000uF or even bigger.
9. Add a switch.
   9.1. If you put a switch or button between the LED and the capacitor, you can charge the capacitor and then discharge it (lighting the LED) when you choose.
10. Build the VU meter circuit.
    10.1. Use a series of LEDs and diodes to make a circuit that progressively lights up the higher the voltage is.