

- LAB:** 1) For this worksheet, you will need data from the [LED, Kirchhoff's laws wksheet](#). Copy the following values from that sheet to this sheet:

V Resistor = _____

V LED = _____

I LED = _____

- 2) Because the LED and resistor are in series, they carry the same current. Enter the value of the resistor current below.

I Resistor = _____

Now you are ready to make power calculations.

- 3) For any device, power is equal to current times voltage:

$$P = VI$$

Calculate the power dissipated by the resistor and LED:

P Resistor = _____

P LED = _____

- 4) The 9 V battery supplies the power for both the resistor and the LED. If the circuit runs for one hour, determine how many Joules of energy the battery will supply.

U Battery (1 hr) = _____

- 5) Using a smaller resistor in the circuit would cause more current to flow in the LED. The voltage drop across the LED would remain almost unchanged, however. If the maximum current the LED can carry before overheating is about 20 mA, what is the maximum power the LED can dissipate?

P LED max = _____

- 6) As a consequence of Ohm's law, power for a resistor may be expressed in terms of only current and the resistor value.

$$P = I^2R$$

The resistance needed to cause 20 mA to flow through the LED is approximately $330\ \Omega$ in our circuit. Calculate the power that the resistor would dissipate.

P Resistor = _____

Is this power value greater than the previously calculated P Resistor or less than the previously calculated P Resistor? In other words, if we want a brighter LED, must we waste more power in the resistor?

Is this power value greater than the 0.5 W rating for the resistor? In other words, will the resistor start to smoke?

