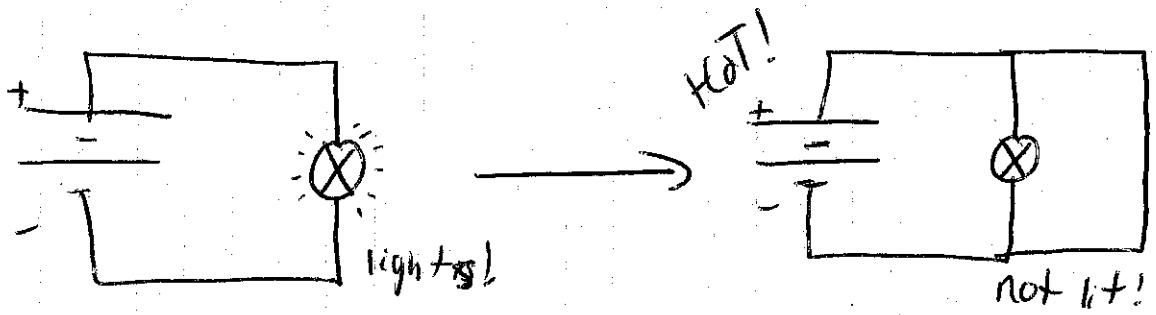
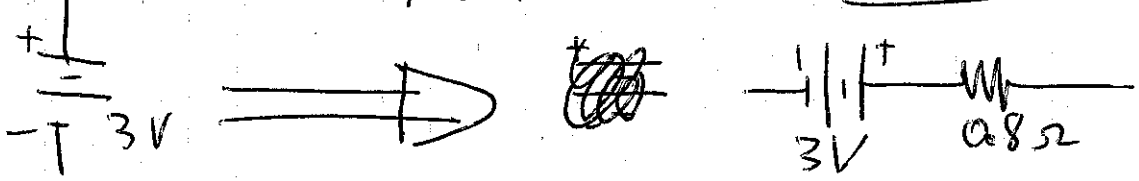
In previous pods, we saw that an extra wire can cause a light bulb to shut off and a battery to overheat.



In this pod, we will quantitatively analyze this situation.

In order to properly complete this, we need the following information:

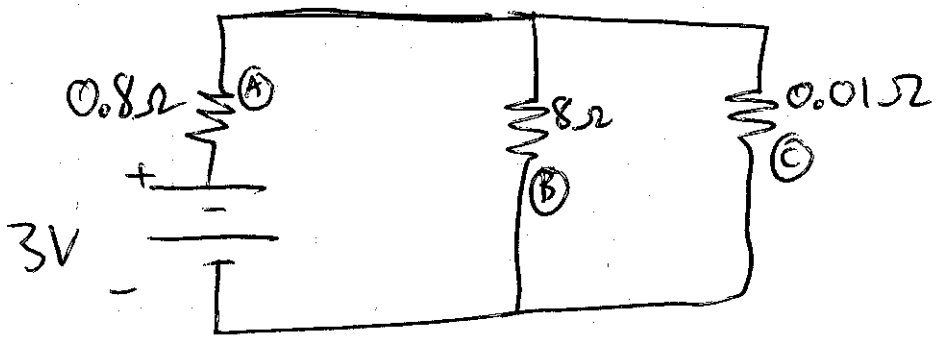
- a tiny light bulb has a resistance of about 8 Ohms [light bulbs are actually non-ohmic resistors but for this assignment we will pretend they are
- Two AA batteries have an <u>internal</u> resistance of about 0.8 Ohms. This means the battery should be represented with a <u>resistor</u> →



- we will assume that a small length of wire has a resistance of about 0.01 Ω.

Including all this information, our circuits will look like this.

short circuit

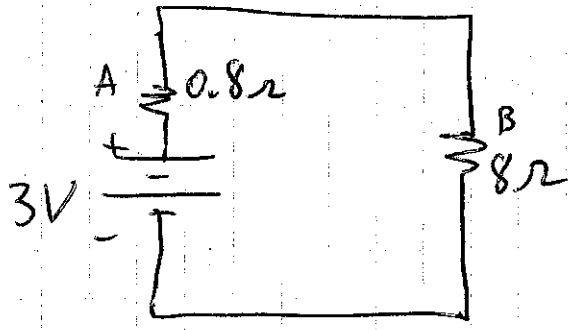


- Resistor (A) is the internal resistence of the battery. any power dissapated by resistor (A) will be heat dissipated by the battery
- Resistor (B) represents the light bulb, any power dissipated by resistor (B) will be heat + light emmiting from the bulb.

(4) Consider the correctly constructed circuit below:

A - internal resistance of battery

B - light bulb



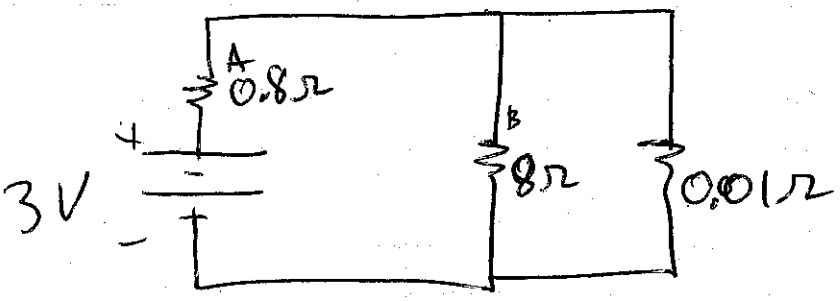
~~(2) Solve the incorrectly constructed circuit~~

~~Find the~~

What is the power dissipated by the internal resistance of the battery (A)?

What is the power dissipated by the light bulb (B)?

(2) Consider the incorrectly constructed circuit below:



What is the power dissipated by the internal resistance of the battery (A)?

What is the power dissipated by the light bulb (B)?

(3) The power of resistor A represents heat dissipated by the battery.
- Did this value increase or decrease when the extra wire was added?
- By what factor did it change?

(4) The power of resistor B represents the brightness of the light bulb.
- Did this value increase or decrease when the extra wire was added?
- By what factor did it change?

(5) We observe that, in real life, the extra wire makes the light bulb shut off and the battery overheat.

~~Is this~~ A

Is this qualitative analysis consistent with our observations?