



A **switch** is an element used to modify the behavior of the circuit (Figure 3.3). If the switch is pressed, its resistance is 0, and current can flow across the switch. If the switch is not pressed, its resistance is infinite, and no current will flow. In reality, the ON-resistance of a switch is less than 0.1Ω , but this is so close to zero, we can assume the ideal value of 0 in most cases. Similarly, the OFF-resistance is actually greater than $100\text{M}\Omega$, but this is so close to infinity that we can again assume the ideal value of infinity. The classic electrical circuit involves a battery, a light bulb (modeled in this circuit as a 100Ω resistor), and a switch.

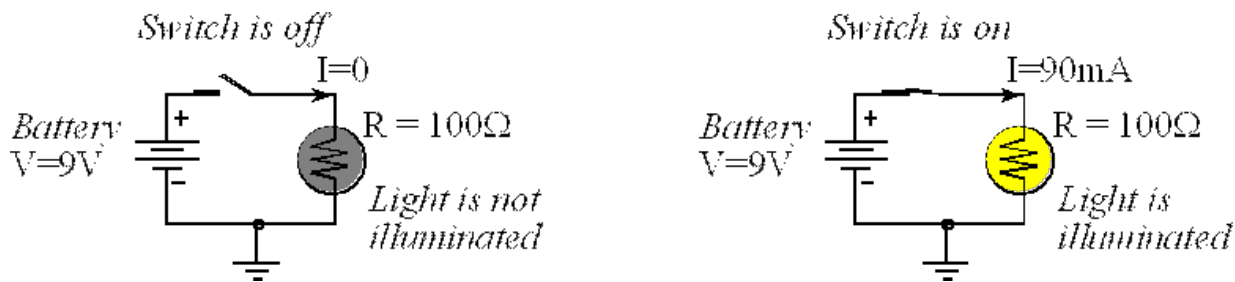


Figure 3.3. When the switch is open, no current can flow, and the bulb does not emit light. When the switch is closed, 90 mA of current will flow, and the bulb emits light.

CHECKPOINT 3.8

If the switch is on, how much power is being dissipated in the bulb?

Hide Answer

Power is $I^2 \cdot R = (0.09\text{A}) \cdot (0.09\text{A}) \cdot 100\Omega = 0.81\text{W}$.

CHECKPOINT 3.9

If the battery has 1000 joules stored in it, how long will the light be illuminated, assuming the voltage is constant?

Hide Answer

Energy is power*time, so $1000\text{J} = 0.81\text{W} \cdot t(\text{in sec})$, so $t = 1000/0.81 = 1234$ sec, which is about 20 minutes.





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