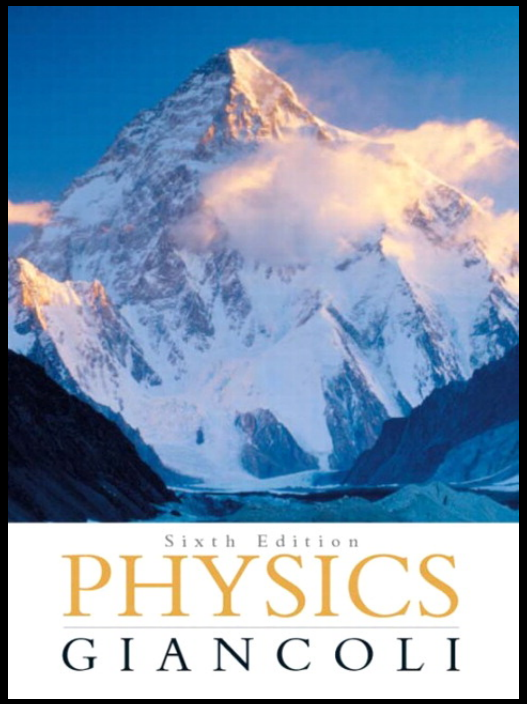

ConcepTest PowerPoints

Chapter 18

Physics: Principles with Applications, 6th edition

Giancoli

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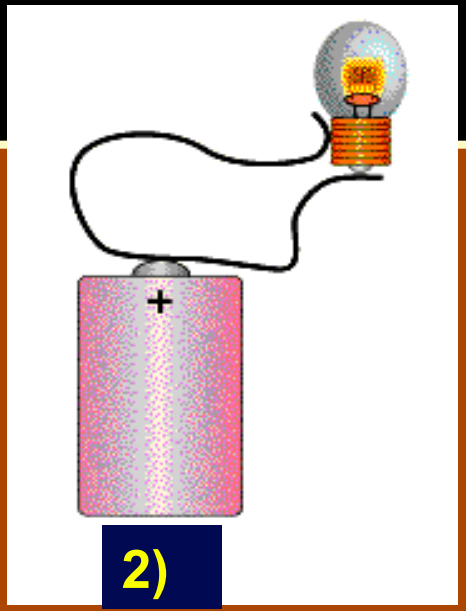
ConcepTest 18.1 Connect the Battery

Which is the correct way to light the lightbulb with the battery?

4) all are correct

5) none are correct



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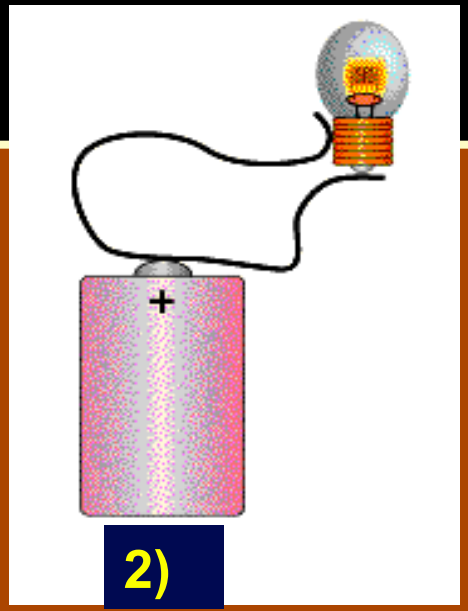

Current can only flow if there is a **continuous connection** from the negative terminal through the bulb to the positive terminal. This is only the case for Fig. (3).

ConcepTest 18.2 Ohm's Law

You double the *voltage* across a certain conductor and you observe the *current* increases three times. What can you conclude?

1) Ohm's law is obeyed since the current still increases when V increases
2) Ohm's law is not obeyed
3) This has nothing to do with Ohm's law

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2) Ohm's law is not obeyed
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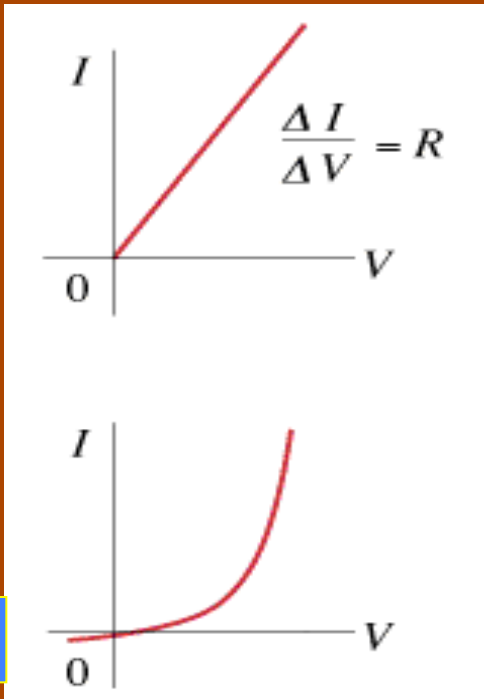
Ohm's law, $V = I R$, states that the relationship between voltage and current is **linear**. Thus for a conductor that obeys Ohm's Law, the current must double when you double the voltage.



Follow-up: Where could this situation occur?

ConcepTest 18.3a Wires I

Two wires, *A* and *B*, are made of the same metal and have equal length, but the resistance of wire *A* is four times the resistance of wire *B*. How do their diameters compare?

1) $d_A = 4\, d_B$
2) $d_A = 2\, d_B$
3) $d_A = d_B$
4) $d_A = 1/2\, d_B$
5) $d_A = 1/4\, d_B$

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The resistance of wire *A* is greater because its **area is less** than wire *B*. Since **area** is related to **radius** (or diameter) **squared**, the diameter of *A* must be two times less than *B*.

$$R = \rho \frac{L}{A}$$

ConcepTest 18.3b Wires II

A wire of resistance *R* is stretched uniformly (keeping its volume constant) until it is twice its original length. What happens to the resistance?

1) it decreases by a factor 4
2) it decreases by a factor 2
3) it stays the same
4) it increases by a factor 2
5) it increases by a factor 4

ConcepTest 18.3b Wires II

A wire of resistance *R* is stretched uniformly (keeping its volume constant) until it is twice its original length. What happens to the resistance?

1) it decreases by a factor 4
2) it decreases by a factor 2
3) it stays the same
4) it increases by a factor 2
5) it increases by a factor 4

Keeping the volume (= area x length) constant means that if the length is **doubled**, the area is **halved**.

Since $R = \rho \frac{L}{A}$, this increases the resistance by **four**.

ConcepTest 18.4 Dimmer

When you rotate the knob of a light dimmer, what is being changed in the electric circuit?

1) the power
2) the current
3) the voltage
4) both (1) and (2)
5) both (2) and (3)

ConcepTest 18.4 Dimmer

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1) the power
2) the current
3) the voltage
4) both (1) and (2)
5) both (2) and (3)

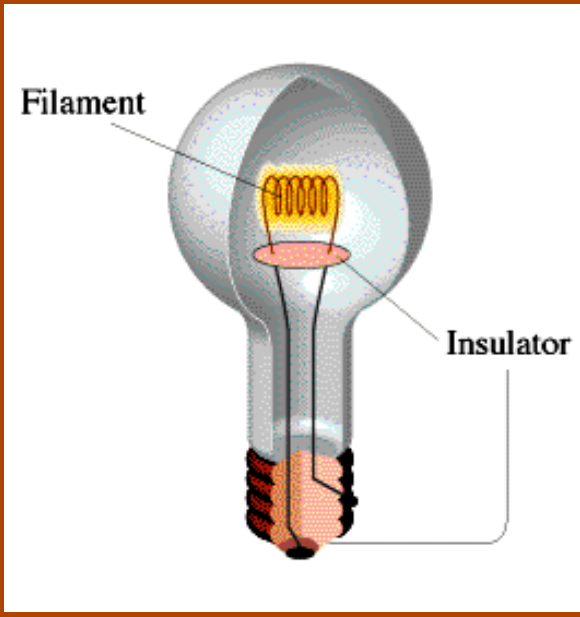
The voltage is provided at 120 V from the outside. The light dimmer **increases the resistance** and therefore **decreases the current** that flows through the lightbulb.

Follow-up: Why does the voltage not change?

ConcepTest 18.5a Lightbulbs

Two lightbulbs operate at 120 V, but one has a power rating of 25 W while the other has a power rating of 100 W. Which one has the least resistance?

1) the 25 W bulb
2) the 100 W bulb
3) both have the same
4) this has nothing to do with resistance



ConcepTest 18.5a Lightbulbs

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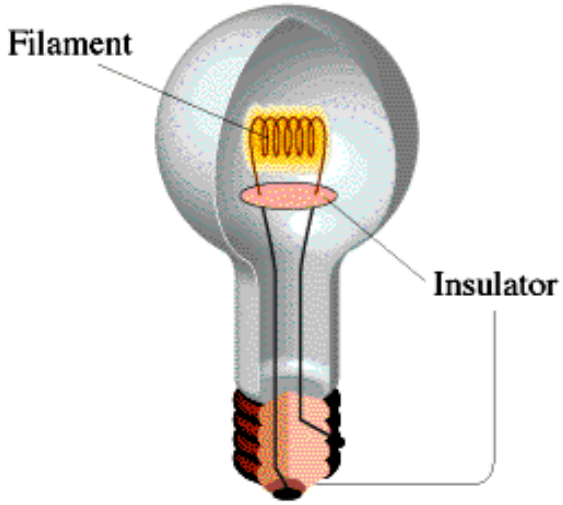
1) the 25 W bulb
2) the 100 W bulb
3) both have the same
4) this has nothing to do with resistance

Since $P = V^2 / R$ the bulb with the lower power rating has to have the higher resistance.



Follow-up: Which one carries the greater current?

ConcepTest 18.5b Space Heaters I

Two space heaters in your living room are operated at 120 V. Heater 1 has twice the resistance of heater 2. Which one will give off more heat?

1) heater 1
2) heater 2
3) both equally

ConcepTest 18.5b Space Heaters I

Two space heaters in your living room are operated at 120 V. Heater 1 has twice the resistance of heater 2. Which one will give off more heat?

1) heater 1
2) heater 2
3) both equally

Using $P = V^2 / R$, the heater with the smaller resistance will have the larger power output. Thus, heater 2 will give off more heat.

Follow-up: Which one carries the greater current?