Name: _____

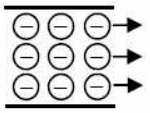
Period: _____

Current, Voltage, and Resistance

4.3

Current

Current flows through closed circuits. Current is the amount charges that flow each second . In a wire current never changes. Current can only change if there is a junction: a split or a join.



A lot of current.

More current means more electrons flowing, which is more electricity flowing (like more water flowing).

Very little current.

Electrical current is measured in Amps, which is coulombs/sec (just like gallons per sec).

Devices that use more energy, use more current.

A light bulb is brighter when it has more current going thru it.

More current

Less current

A device that uses more energy uses more current. A louder radio pulls (uses) more amps.

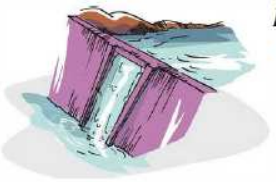
Voltage

Voltage pushes electricity. More voltage = more current.

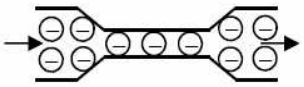
*Water falls due to gravitational potential energy (Ep). Likewise, current moves because of electrical potential energy given to electrons by **voltage**. **There must be a change (difference) of voltage for current to move.***

Resistance

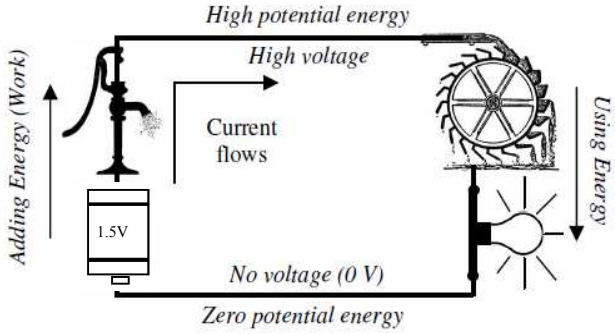
Resistance slows down electricity. More resistance = less current.



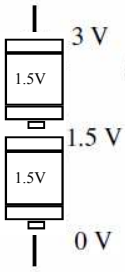
Dams hold back water. Resistors hold back electrons. Both reduce current.



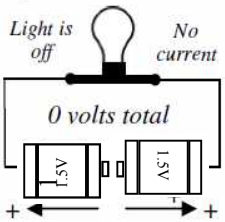
Voltage pumps electricity, doing work to give potential electric energy (Ep) to the electrons. **Batteries give voltage.** The resistors use all of the electrical potential energy. This is why **the voltage always equals 0 volts** just before it reenters the battery.

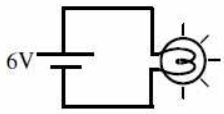


Just as a waterwheel slows down the falling water, resistors use the electrical potential energy to do work (something useful). Anything that uses electricity has resistance: light bulbs, speakers, etc. Regardless of the amount of resistance, all the voltage is always used up in any circuit.

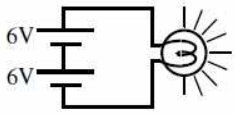


Batteries can add together, (increasing voltage) or subtract (canceling each other out) if they are put in the circuit wrong.





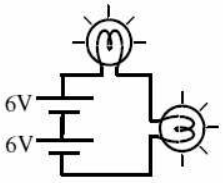
With the same resistance (1 bulb), more voltage (2 batteries) causes more current (brighter).



Increasing voltage increases current.
Increasing resistance decreases current.
Decreasing voltage decreases current.
Decreasing resistance increases current.

Resistors use up voltage.

With the same voltage (2 batteries), more resistance (2 bulbs) = less current (dimmer bulbs).



Ohm's Law

Ohm's Law can tell us the current, voltage, or resistance if the other two of them are known.

Current (in *amps [A]*) → $I = \frac{V}{R}$ ← Voltage (in *volts [V]*)

Resistance (in *ohms [Ω]*)

Current equals the voltage divided by the resistance.

Current is dependent on voltage and resistance.

Current can never change voltage or current, but both voltage and resistance can change current.

Ex. How much current does a 12 V battery push through a 3 Ω resistor?

V = 12 v
R = 3 Ω
I = ?

$I = \frac{V}{R} = \frac{12\text{ v}}{3\ \Omega} = 4\text{A}$

All sections marked with a ⚡ are considered essential concepts and must be completed to receive full credit on WS.

1. Voltage	A. Units for voltage.
2. Current	B. Restricts electricity flowing in a circuit.
3. Resistance	C. Units for current.
4. Amps	D. Pushes electrons thru a circuit.
5. Ohms (Ω)	E. Units for Resistance.
6. Volts	F. Amount of electricity flowing in a circuit.

Which has more current flowing thru it?

A loud radio or a quiet radio?

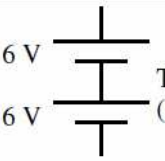
A dim light bulb or a bright light bulb?

A fast toy car or a slow toy car?

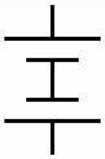
A cold wire or a hot wire?

Voltage (V), Current (I), or Resistance (R)?

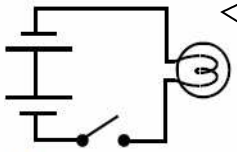
A _____ If you increase resistance what decreases?
B. _____ If you increases voltage what increases?
C. _____ If the current decreased what increased?
D. _____ If current increased what increased?
E. _____ If current increased what decreased?
F. _____ If resistance is decreased, what increases?
G. _____ More batteries will increase these two quantities.



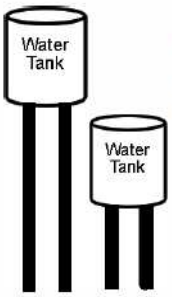
Total voltage (V_T) =



Total voltage (V_T) =

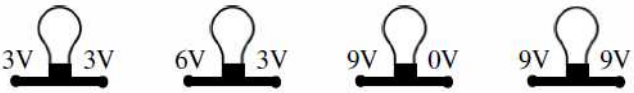


When the switch is closed will the light turn on? Why or why not?



Which of these two water towers would give the most voltage to a water circuit?

Which light bulbs will light? (All are in closed circuits.)
If it does light, draw an arrow to show the direction of current.



With the same resistance, which battery will cause more current to flow: a 12V or a 24V battery?

Voltage give what kind of energy to electricity?

How much potential energy does water have after it falls to the ground?

How much voltage does a circuit have just before going back thru the batteries?

Voltage (V), Current (I), or Resistance (R)?

A) ___ Flowing electrons.
B) ___ Pushes electricity in circuits.
C) ___ Like a water pump.
D) ___ Measured in Ohms.
E) ___ Measured in Amps.
F) ___ A battery gives this.
G) ___ Measured in volts.
H) ____ Restricts the flow of current.
I) ____ Does work in an electric circuit.
J) ____ Gives electric energy.
K) ____ 12 ohms
L) ____ 36 volts.
M) ____ 5 amps.

Which will have more resistance: an insulator or a conductor?

Which resistor is the better conductor: 150Ω or 600Ω?

Which resistor is the better insulator: 24Ω or 6Ω?

How much current does a 9V battery push thru a 3Ω resistor?

Given Equation Rearrange Calculate

A 4 Ω resistor has 3A running thru it. Find the battery's voltage.

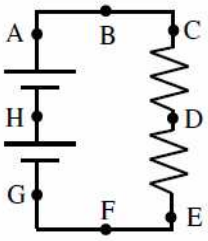
Given Equation Rearrange Calculate

An 18V battery produces 2A in the circuit. How much resistance is in the circuit?

Given Equation Rearrange Calculate

Add (A) or reduce (R) voltage?

Resistors? Wires? Batteries?



High, Medium, or Low voltage?

Point A _____ Point E _____
Point D _____ Point H _____
Point F _____ Point B _____
Point C _____ Point G _____

A bird lands on a 20,000 volt wire. Both feet are touching.

A) What voltage is the bird's left foot?

B) What voltage is the bird's right foot?

C) What is the ***difference of voltage*** between the bird's feet?

D) So, why can a bird land on an electrical wire and not get electrocuted?