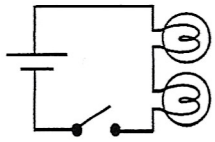
Name: _____

Period: _____

Types of Circuits and Ohm's Law

Types of Circuits

Series circuits have all only one path for the electricity to flow.

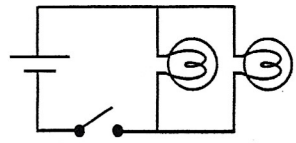


Two lightbulbs in series. Each light is dependent on the other.

If any part of a series circuit is broken, the circuit fails. If either light is unscrewed both lights will turn off.

The branches (paths) of a parallel circuit are independent. If either light is unscrewed, the other will remain on.

Parallel circuits have multiple paths for the electricity to flow.



Two lightbulbs in parallel. Each light is independent of each other.

Your house is wired in parallel, so that each light and appliance can be turned on and off independently.

Ohm's Law

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

Resistance (in *ohms*)

Current equals the voltage divided by the resistance.

Also, $V = IR$ and $R = V/I$

Abbreviations:

A - Amps - current

v - volts - voltage

Ω - ohms - resistance

Increasing voltage increases current.

Increasing resistance decreases current.

Decreasing voltage decreases current.

Decreasing resistance increases current.

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

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

Ex. How strong a battery produces 2 A through a 3 Ω resistor?

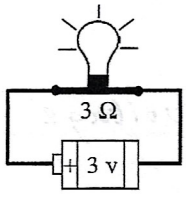
V = ? v R = 3 Ω I = 2 A	$I = \frac{V}{R}$ So, V = IR = (2A)(3Ω) = 6 v

Current

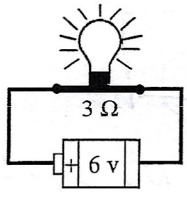
Current is moving electrons, moving charge.

Increasing current causes more electricity to move through a device.

Increasing electricity through a device causes it to work faster (in a motor) or be brighter (in a lightbulb).



Using Ohm's Law: I = V/R
I = 3v/3Ω
I = 1 A



Using Ohm's Law: I = V/R
I = 6v/3Ω
I = 2 A

More current = brighter light.

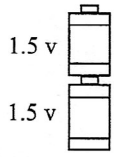
Voltage

Voltage is electrical potential: how much work a battery can do.

Voltage is linked to energy:
1 volt of voltage = 1 joule of energy per coulomb of charge

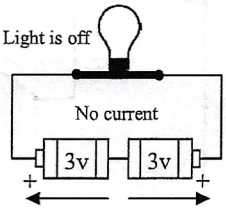
To increase voltage you could use a stronger battery OR add batteries.

9 volts



3 volts total

More voltage is like a stronger pump, giving more force and more current.



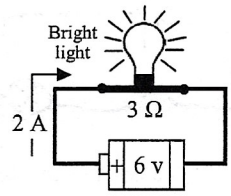
0 volts total

The lightbulb doesn't light here, because the two batteries are pushing *opposite directions*. To add together, batteries must be facing the same direction.

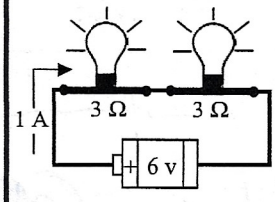
Resistance

Resistance slows down current. Think of resistance like a dam holding back water.

Adding devices in a circuit increases resistance.



I = V/R
= 6v/3Ω = 2 A
The light is bright because the 6 volts only have one light to run.



I = V/R
= 6v/6Ω = 1 A
Both lights are dimmer because the 6 volts have two lights to run.

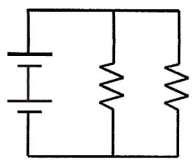
More resistance = less current
Less current = less light

Name: _____

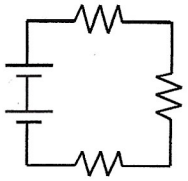
Period: _____

1. I = A	4 newtons
2. V = V	4 amps
3. R = Ω	4 joules
4. E = J	4 watts
5. P = W	4 ohms (Ω)
6. F = N	4 volts

Label the diagrams as parallel or series circuits.



A. ||



B. series

The units for current is Ampere; the abbreviation is A.

The units of voltage is Volt; the abbreviation is V.

The units of resistance is Ohm; the abbreviation is Ω.

Series or Parallel Circuits?

S Only one path for the electricity.

S Dependent paths.

P How your house is wired.

P Independent current paths.

P Can turn off one light without others turning off.

S If you turn off one light, all the lights turn off.

P More than one path for the electricity to flow.

If you increase voltage, the current will increases or decreases? ↑

If you decrease resistance, the current will increase or decrease? ↑

If the current increases, the resistance increased or decreased? ↓

If voltage is decreased, the current will increase or decrease? ↓

If the current decreases, the voltage increased or decreased? ↓

If there is more current will a light bulb be brighter or dimmer? ↑

How much current goes through a circuit with a 12 v battery and a 3 Ω resistor?

4 A

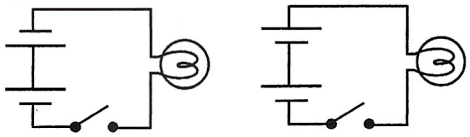
Find the current in circuit with 6 v battery and 2 resistor:

3 A

How much voltage gives 5 amps of current through a 3 Ω light bulb?

15 V

Will the lights turn on or not? And why?

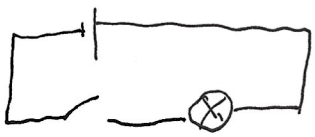


No

Yes

In the Lab

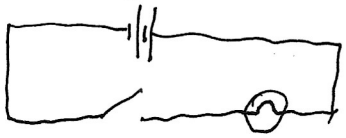
Circuit 1: battery; light bulb; switch. Draw diagram:



What happens if you unscrew the light bulb?

No light

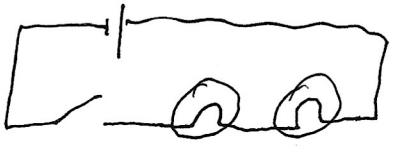
Circuit 3: 2 batteries; light bulb; switch. Draw diagram:



How does the light's brightness compare to circuit 1 and why?

↑ More voltage

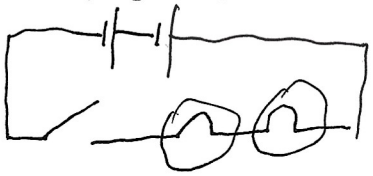
Circuit 2: battery; 2 light bulbs; switch. Draw diagram:



How does the light's brightness compare to circuit 1 and why?

↓ More resistance
Less current

Circuit 4: 2 batteries; 2 light bulbs; switch. Draw diagram:



What happens if you unscrew a light bulb? No Light

Is this a series or parallel circuit? S