

Part 5 Electricity

Name: _____

Part 5 Lesson 1 Electricity

Define electricity? _____

_____ : A form of energy resulting from the existence of charged particles (such as electrons or protons).

Electrons are _____ charged

Protons (nucleus) are _____ charged

Take away (strip) electrons then the atom becomes more _____ charged.

An atom that gains a negative electron, it becomes a _____ ion

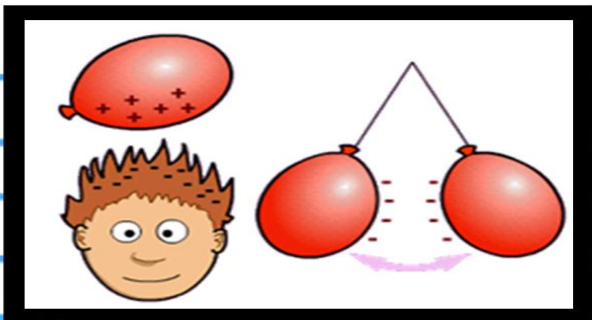
Annoying Tape! What happened? Please describe below

Lightning is a big spark that occurs when _____ move from one place to another quickly because of the unequal distribution of electrons.

Electric Fields: The “funky” electrostatic area near any electrically-charged object.

Static Electricity: The _____ of positive and negative charges.

What is happening below?



A _____ generator is an electrostatic generator which uses a moving belt to accumulate electric charge on a hollow metal globe on the top of an insulated column. It creates high electric potentials. It produces very high voltage direct current (DC) electricity at low current levels.

Coulombs Law: Any two charged objects will create a force on each other. _____ charges will produce an attractive force while _____ charges will produce a repulsive force.

- The greater the charges, the greater the force. The greater the _____ between them, the _____ the force.



A _____ cage is a metallic enclosure that prevents the entry or escape of an electromagnetic field.

- For best performance, the cage should be directly connected to an earth ground.

Part 5 Lesson 2 Conductors, Batteries, AC/DC Current

Current: A flow of _____, or individual negative charges.

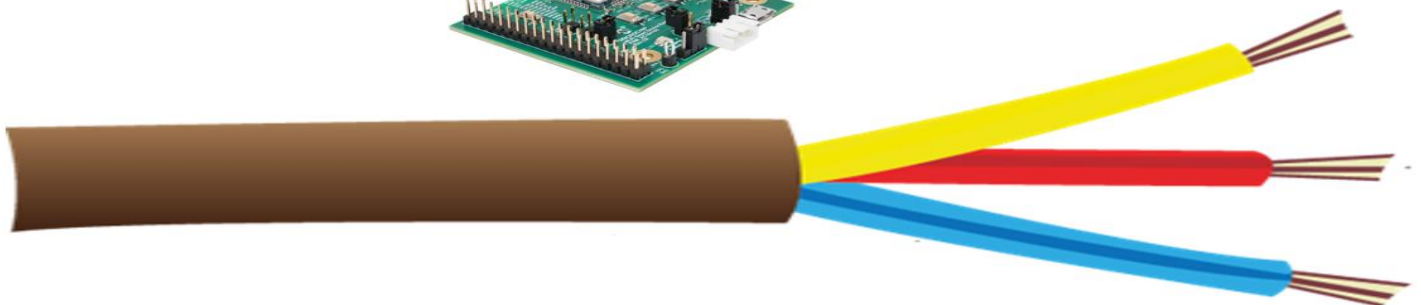
Conductors, Insulators, Semi-conductors: How _____ energy is transferred through the object by the moving charge.

Conductor: Electrons flow _____,

Semi-conductor: Conductivity between conductor and insulator (_____ use).

Insulator: Electrons _____ flow easily

Please use the visual to describe conductors and insulators



How does a battery work?



There are two main kinds of electric current, _____ current (DC) and _____ current (AC).

(DC) Direct Current is a flow of charge always in _____ direction. (Batteries)

(AC) - Alternating Current is a flow of charge back and forth, changing its _____ many times in one second.

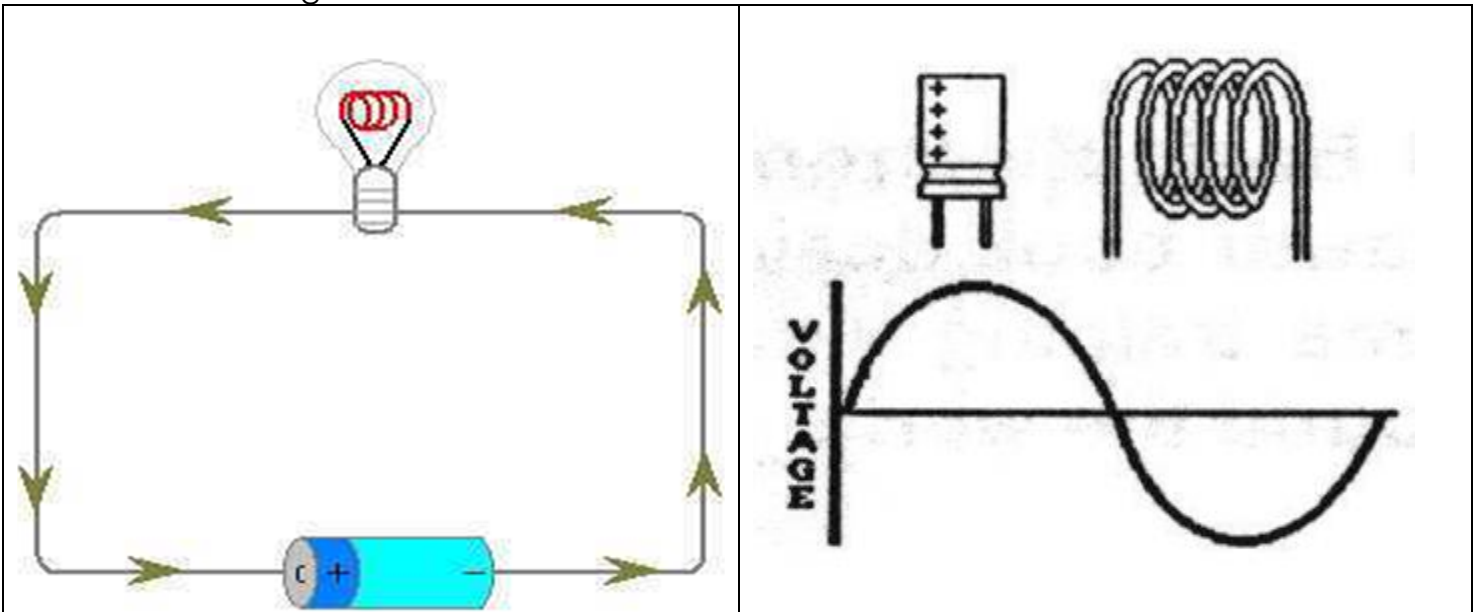
(Plugs and outlets / household)

Advantages of AC

Voltage can be raised or _____.

More efficient over long _____.

Which is Alternating Current and which is Direct Current?



Part 5 Lesson 3 Amps, Volts, Watts, Ohms / Resistance

Volt: A measure of the force or pressure under which electricity _____.

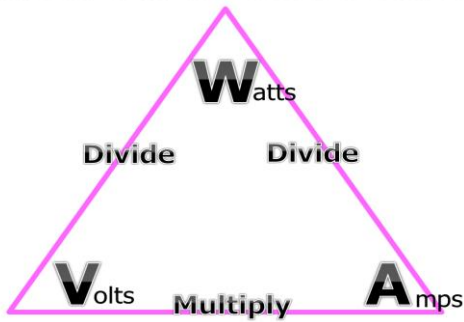
Ampere: A measure of how much _____ moves through a wire in one second.

Watt: The amount of electricity consumed _____.

A Watt is calculated by multiplying volts times amps. Most household electrical usage is billed in kilowatt hours, or the amount of hours times 1,000 watts.

Question? We have a small computer server with a sticker that shows 2.5 amps. Given a normal 120 Volt, 60 hz power source and the ampere reading from equipment... How many watts does it require?

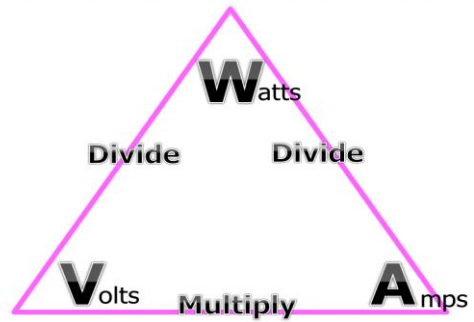
Electrical Current Conversion Triad



Answer with work=

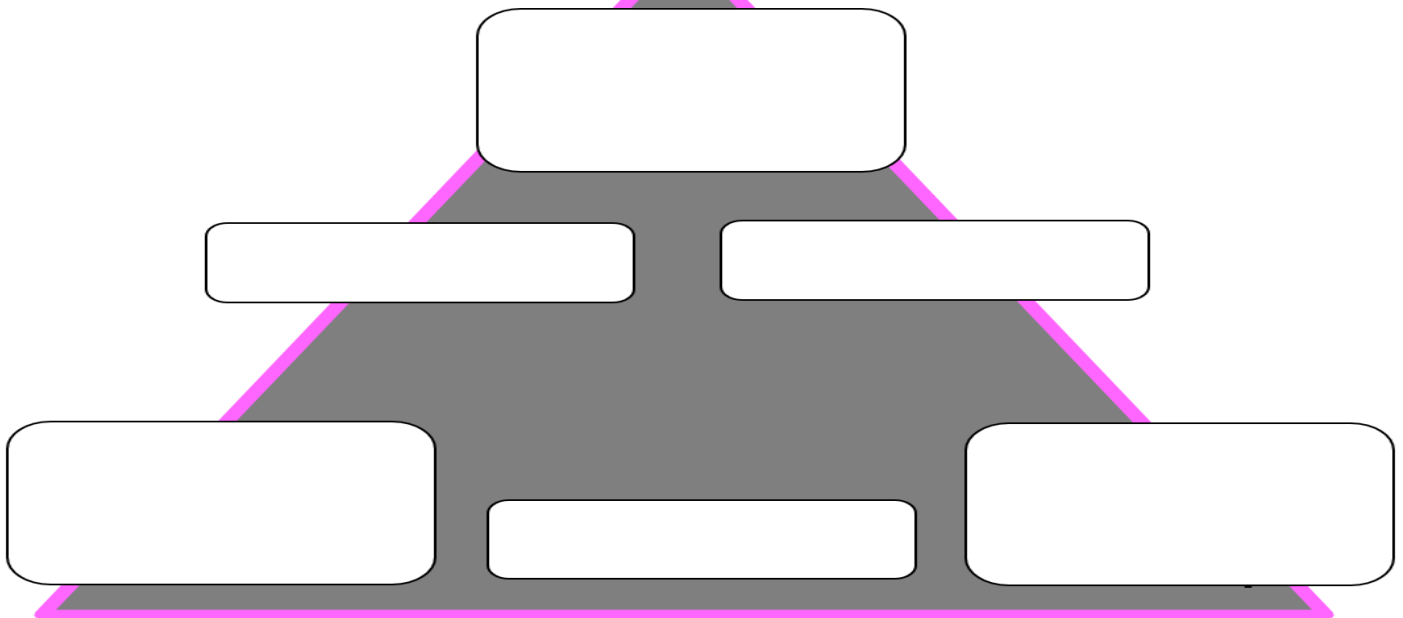
Question? We have a small computer server with a sticker that shows 2.5 amps. Given a 230 Volt, 50 hz power source and the ampere reading from equipment. How many watts does it require?

Electrical Current Conversion Triad



Answer with work=

Electrical Current Conversion Triad



<p>We have a 60 watt light bulb using 5 amps of power. How many volts does it require?</p> <p>Answer with work=</p>	<p>We have a 100 watt light bulb using .83 amps of power per second. How many volts does it require?</p> <p>Answer with work=</p>
<p>A sample electrical panel uses 60 watts at 12 volts. How many amps does it require?</p> <p>Answer with work=</p>	<p>A computer uses 1.75 amps. Given a 50 volt power source, How many watts does it require?:</p> <p>Answer with work=</p>

Resistance: Anything in an electrical circuit that _____ the flow of current is referred to as resistance.

Which describes: Amps, Volts, Watts, Ohms / Resistance

--	--	--	--

Anything in an electrical circuit that impedes the flow of current.

This is a measure of the force or pressure under which electricity flows

This is a measurement of the current flow rate of electrons

This is a measurement of electrical power created.

Part 5 Lesson 4 Ohms, Circuits

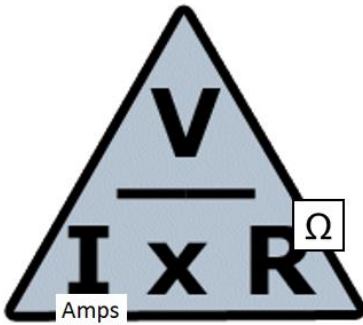
Ohms: The measure of _____ in a circuit to the flow of an electric current.

Equation



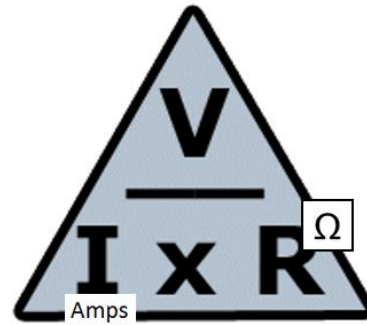
If 220 volts travel through a copper wire and the current is 36A,
What's the resistance of the wire?

Answer with work=



A nine volt battery supplies power to a cordless drill with a resistance of 18 ohms.
How much current (I) is flowing through the drill?

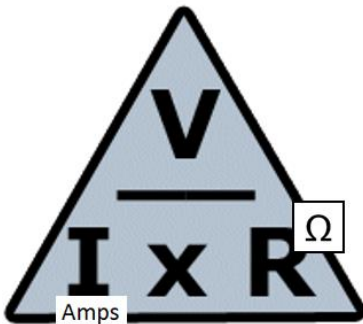
Answer with work=



A Rude Monkey decided to stick his tongue to a 120 V outlet with 50,000 ohms of resistance?

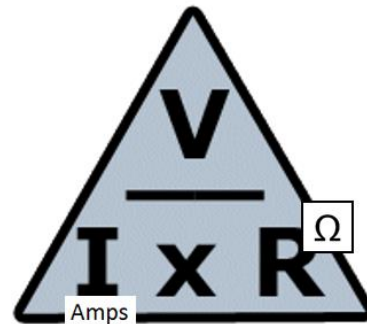
How much current will he experience?

Answer with work=



A 110 volt outlet supplies power to a strobe light with a resistance of 2600 ohms.
How much current is flowing through the strobe light?

Answer with work=



Notes:

Please record the symbols and their names below.

switch (open)

lamp

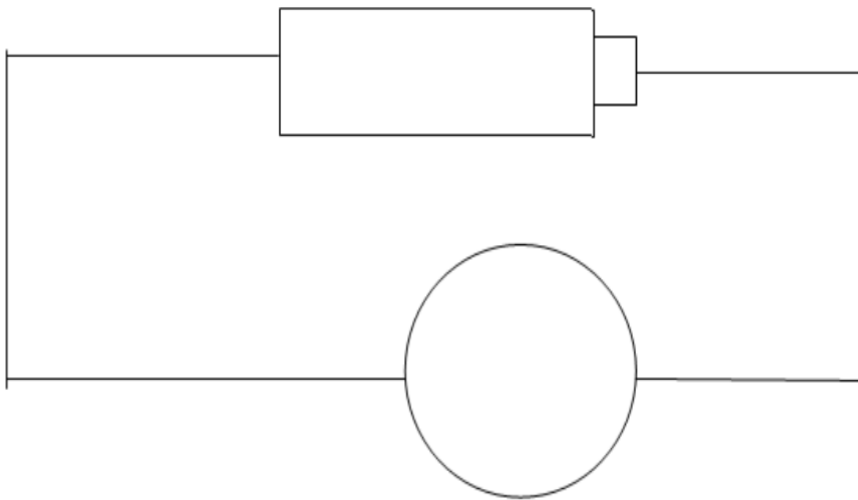
switch (closed)

fuse

cell

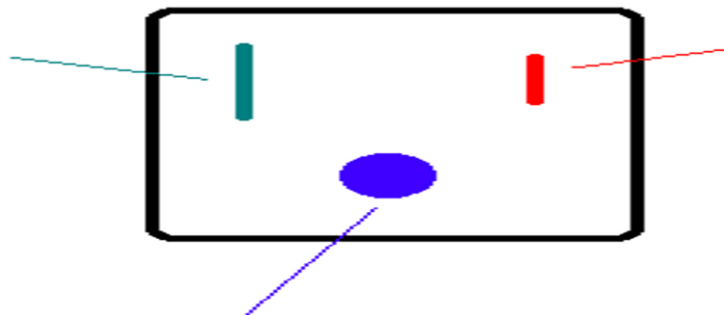
battery

Please label the simple circuit below. Include the following in your diagram. Also use the wire to describe conductors and insulators.



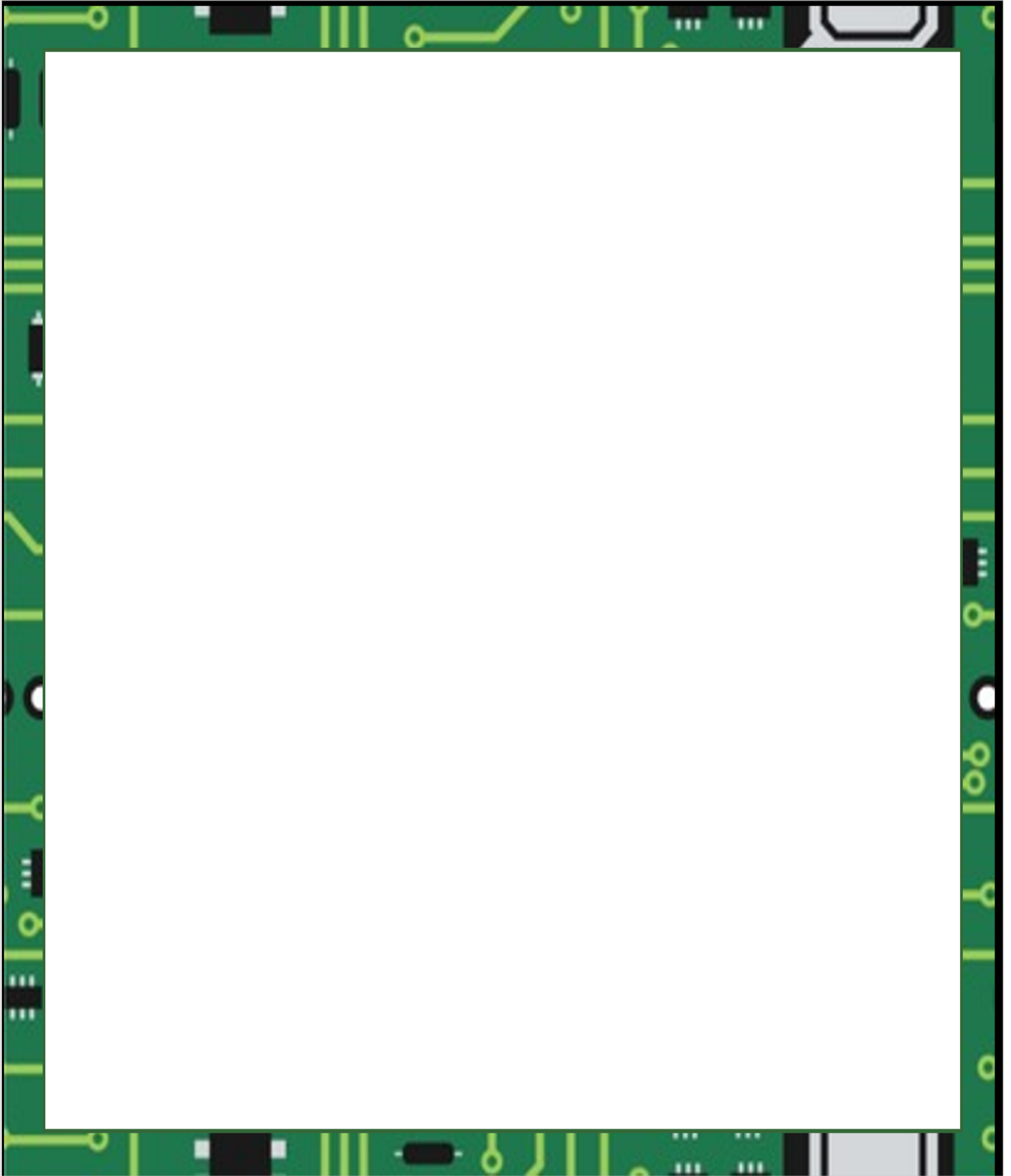
Please label the outlet below.

GROUNDING AC PLUG

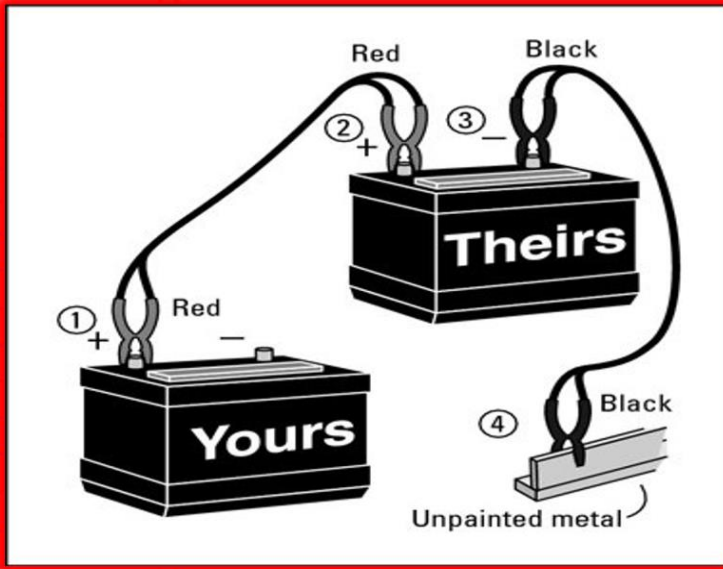


Visit the website below, design a complex circuit. Please sketch your "working" circuit that you created in the space below. The more complex the better.

https://phet.colorado.edu/sims/html/circuit-construction-kit-dc/latest/circuit-construction-kit-dc_en.html



How do you jump start a car in several steps?



Are you ready to start complex electrical work with your newfound knowledge?

Handwriting practice lines consisting of multiple horizontal blue lines and two vertical red margin lines on the left side.

Across

2. A measure of the force or pressure under which electricity flows.
3. _____ are negatively charged
5. A container consisting of one or more cells, in which chemical energy is converted into electricity and used as a source of power
6. An electric _____ includes a device that gives energy to the charged particles constituting the current, such as a battery or a generator; devices that use current, such as lamps, electric motors, or computers; and the connecting wires or transmission lines.
7. Anything in an electrical circuit that impedes the flow of current is referred to as resistance.
8. (AC) - _____ Current is a flow of charge back and forth, changing its direction many times in one second. (Plugs and outlets / household)
11. This is a large spark that occurs when electrons move from one place to another very quickly because of the unequal distribution of electrons.
12. Electrons do not flow easily through a _____
15. _____ are positively charged
16. A flow of electrons, or individual negative charges.
17. _____ Law: Any two charged objects will create a force on each other. Opposite charges will produce an attractive force while similar charges will produce a repulsive force.

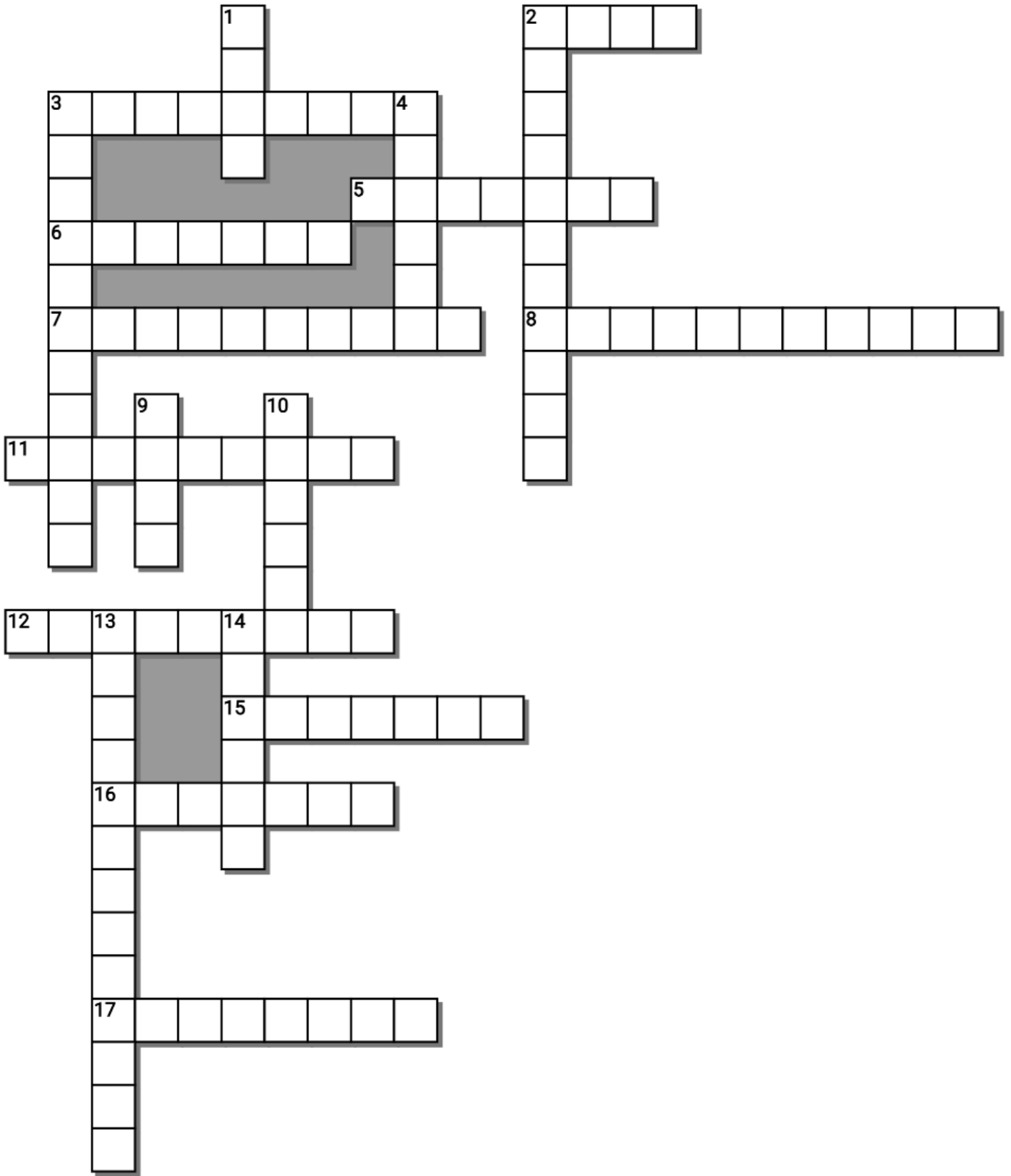
Down

1. The amount of electricity consumed per second.
2. _____ generator is an electrostatic generator which uses a moving belt to accumulate electric charge on a hollow metal globe on the top of an insulated column.
3. A form of energy resulting from the existence of charged particles (such as electrons or protons).
4. _____ Electricity: The imbalance of positive and negative charges.
9. The measure of resistance in a circuit to the flow of an electric current.
10. (DC) _____ Current is a flow of charge always in one direction. (Batteries)
13. A _____ material has an electrical conductivity value falling between that of a conductor, such as metallic copper, and an insulator, such as glass.
14. A measure of how much current moves through a wire in one second.

-----teacher can remove this word bank to make puzzle more challenging-----

Possible Answers

ALTERNATING, AMPERE, BATTERY, COULOMBS, CURRENT, DIRECT, ELECTRICITY, ELECTRONS, INSULATOR, LIGHTNING , OHMS, PROTONS , RESISTANCE, STATIC, VANDEGRAAFF, VOLT, WATT, CIRCUIT, SEMICONDUCTOR



Part 5 Review Game

Name: _____

Score ____ / 100

1-20 = 5 pts

Part 4 Lesson 5

*20-*25 * = Bonus + 1 pt,

(Secretly write owl in correct space +1 pt)

Final Question = 5 pt wager

MOTA BACKWARDS	WIRED	GET YOUR TIRAD OUT	AMPED UP	POWER UP Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ____/5 Answer

Part 5 Electricity

Name: _____

Part 5 Lesson 1 Electricity

Define electricity? There is no single definition called "electricity." Electricity is a variety of independent science concepts all with one single name.

Electricity: A form of energy resulting from the existence of charged particles (such as electrons or protons).

Electrons are negatively charged

Protons (nucleus) are positively charged

Take away (strip) electrons then the atom becomes more positively charged.

An atom that gains a negative electron, it becomes a negative ion

Annoying Tape! What happened? Please describe below

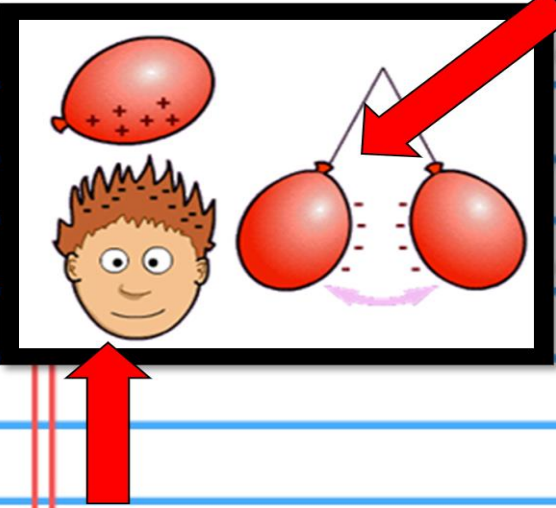
- When you removed the tape from the table you gave it an electrical charge. When you peeled the tape apart from each other, one piece of tape gained more of a charge than the other.
 - Opposite charges attract (+) (-)

Lightning is a big spark that occurs when electrons move from one place to another quickly because of the unequal distribution of electrons.

Electric Fields: The "funky" electrostatic area near any electrically-charged object.

Static Electricity: The imbalance of positive and negative charges.

What is happening below?



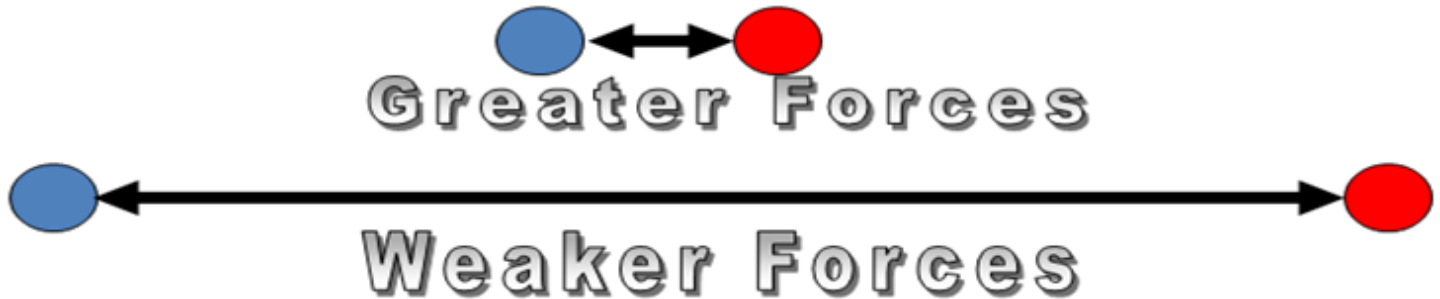
- Electrons from hair are removed and put into both balloon.
- Both Balloons have a slight negative charge.
- The balloons have the same charges and repel away from each other

- Electrons from hair are removed and put into balloon.
- Balloon has slight negative charge.
- The atoms orient and wall has slight positive charge.
- Opposite charges attract and balloon sticks.

A **Van DeGraaff** generator is an electrostatic generator which uses a moving belt to accumulate electric charge on a hollow metal globe on the top of an insulated column. It creates high electric potentials. It produces very high voltage direct current (DC) electricity at low current levels.

Coulombs Law: Any two charged objects will create a force on each other. **Opposite** charges will produce an attractive force while **similar** charges will produce a repulsive force.

- The greater the charges, the greater the force. The greater the **distance** between them, the **weaker** the force.



A **Faraday** cage is a metallic enclosure that prevents the entry or escape of an electromagnetic field.

- For best performance, the cage should be directly connected to an earth ground.

Part 5 Lesson 2 Conductors, Batteries, AC/DC Current

Current: A flow of **electrons**, or individual negative charges.

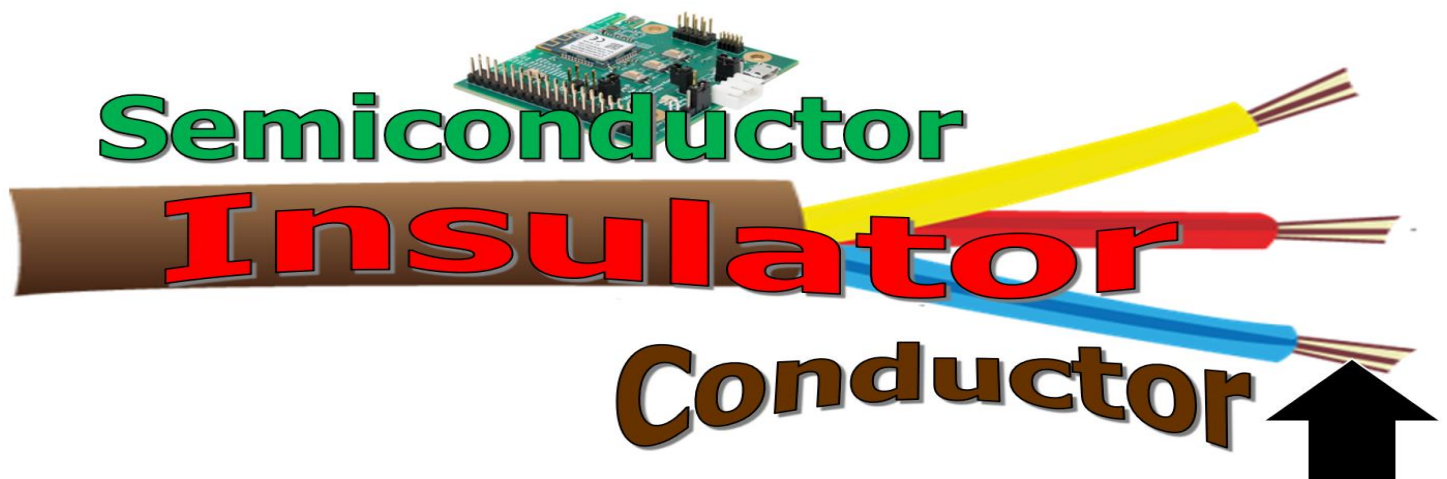
Conductors, Insulators, Semi-conductors: How **easily** energy is transferred through the object by the moving charge.

Conductor: Electrons flow **easily**

Semi-conductor: Conductivity between conductor and insulator (**Electronics** use).

Insulator: Electrons **Do Not** flow easily

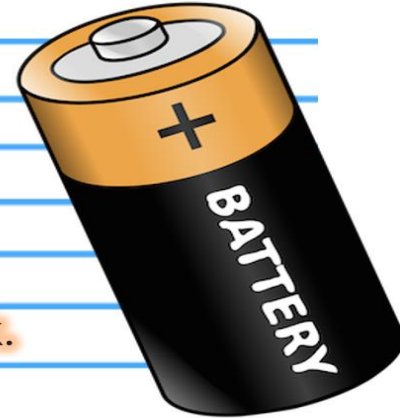
Please use the visual to describe conductors and insulators



How does a battery work?

How does a battery work?

A battery stores chemical energy and converts it to electrical energy. The chemical reactions in a battery involve the flow of electrons from one material (electrode) to another, through an external circuit. The flow of electrons provides an electric current that can be used to do work.



There are two main kinds of electric current, **Direct** current (DC) and **Alternating** current (AC).

(DC) Direct Current is a flow of charge always in **one** direction. (Batteries)

(AC) - Alternating Current is a flow of charge back and forth, changing its **direction** many times in one second.

(Plugs and outlets / household)

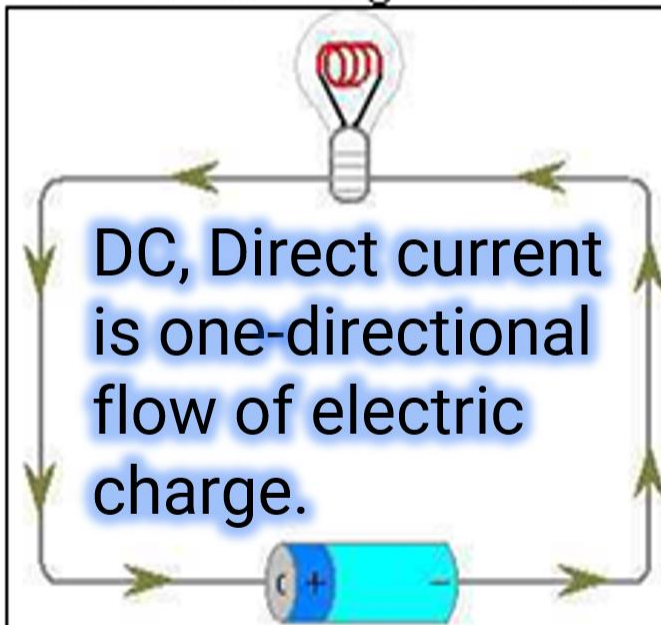
Advantages of AC

Voltage can be raised or **lowered**.

More efficient over long **distances**.

Which is Alternating Current? and which is Direct Current?

Which is Alternating Current and which is Direct Current?



Alternating current is an electric current which periodically reverses direction and changes its magnitude continuously with time in contrast to direct current which flows only in one direction.

Part 5 Lesson 3 Amps, Volts, Watts, Ohms / Resistance

Volt: A measure of the force or pressure under which electricity **flows**.

Ampere: A measure of how much **current** moves through a wire in one second.

Watt: The amount of electricity consumed **per second**.

A Watt is calculated by multiplying volts times amps. Most household electrical usage is billed in kilowatt hours, or the amount of hours times 1,000 watts.

Question? We have a small computer server with a sticker that shows 2.5 amps. Given a normal 120 Volt, 60 hz power source and the ampere reading from equipment...

How many watts does it require?

Watts = Volts x Amps

Watts = 120v x 2.5amps = 300 Watts

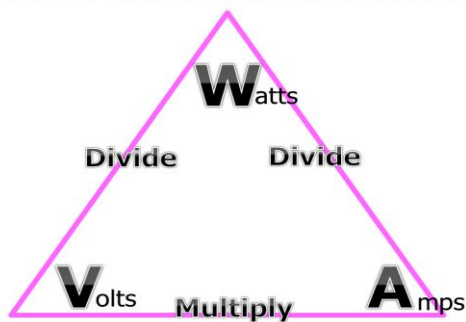
Question? We have a small computer server with a sticker that shows 2.5 amps. Given a 230 Volt, 50 hz power source and the ampere reading from equipment.

How many watts does it require?

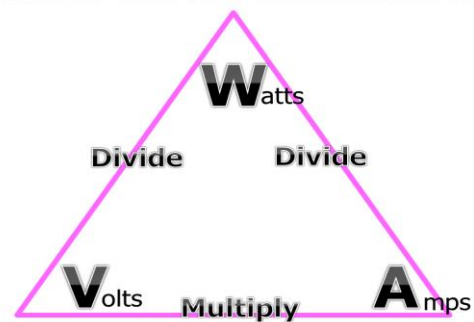
Watts = Volts x Amps

Watts = 230v x 2.5amps = 575 Watts

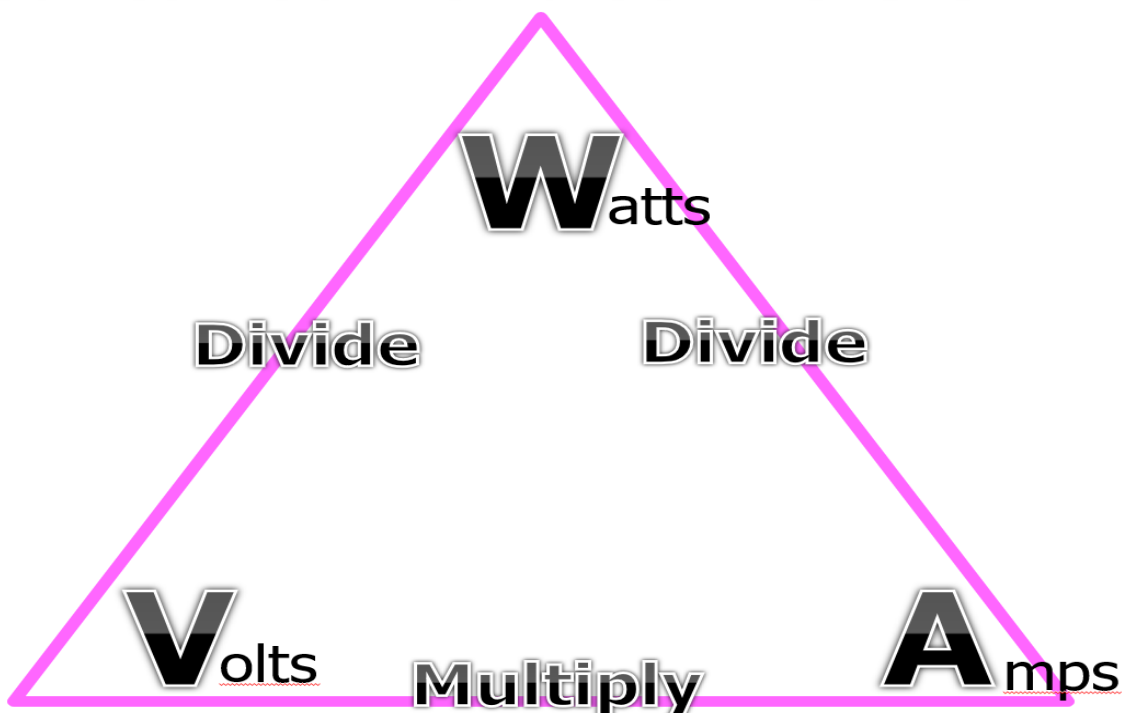
Electrical Current Conversion Triad



Electrical Current Conversion Triad



Electrical Current Conversion Triad



<p>We have a 60 watt light bulb using 5 amps of power. How many volts does it require? Volts = watts divided by amps. Volts = 60 / 5 Volts = 12</p>	<p>We have a 100 watt light bulb using .83 amps of power per second. How many volts does it require? Volts = watts divided by amps. Volts = 100 / .83 Volts = 120</p>
<p>A sample electrical panel uses 60 watts at 12 volts. How many amps does it require? amps = watts / volts amps = 60 / 12 amps = 5</p>	<p>A computer uses 1.75 amps. Given a 50 volt power source, How many watts does it require?: watts = volts x amps watts = 50 volts x 1.75 amps = 87.5 watts</p>

Resistance: Anything in an electrical circuit that impedes the flow of current is referred to as resistance.

Which describes: Amps, Volts, Watts, Ohms / Resistance

Resistance	Volts	Amps	Watts
------------	-------	------	-------

Anything in an electrical circuit that impedes the flow of current.

This is a measure of the force or pressure under which electricity flows

This is a measurement of the current flow rate of electrons

This is a measurement of electrical power created.

Part 5 Lesson 4 Ohms, Circuits

Ohms: The measure of resistance in a circuit to the flow of an electric current.

Amps

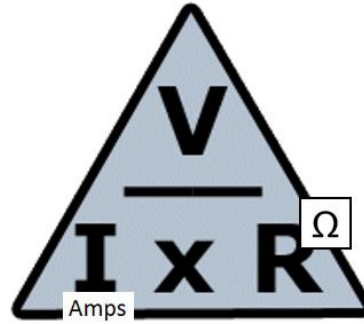
Equation $I = V \cdot R^{\Omega}$

If 220 volts travel through a copper wire and the current is 36A, What's the resistance of the wire?

$$R = \frac{V}{I} = \frac{220}{36} = 6.1 \text{ ohms } \Omega$$

A nine volt battery supplies power to a cordless drill with a resistance of 18 ohms. How much current (I) is flowing through the drill?

Electric Current = Volts / Resistance
 Electric Current = 9 / 18
 Electric Current = .5 amps

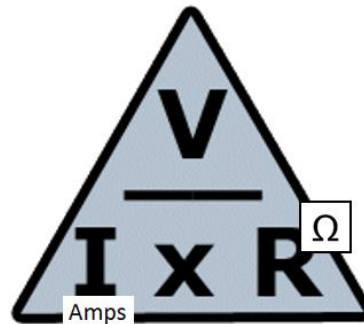
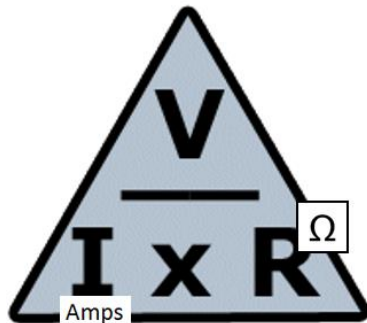


A Rude Monkey decided to stick his tongue to a 120 V outlet with 50,000 ohms of resistance? How much current will he experience? Answer with work=

$$I = \frac{V}{R} = \frac{120}{50,000} = .0024 \text{ A Amps}$$

A 110 volt outlet supplies power to a strobe light with a resistance of 2600 ohms. How much current is flowing through the strobe light? Answer with work=

$$I = \frac{V}{R} = \frac{110}{2,600} = .0423 \text{ A}$$



Notes:

Please record the symbols and their names below.

switch (open)

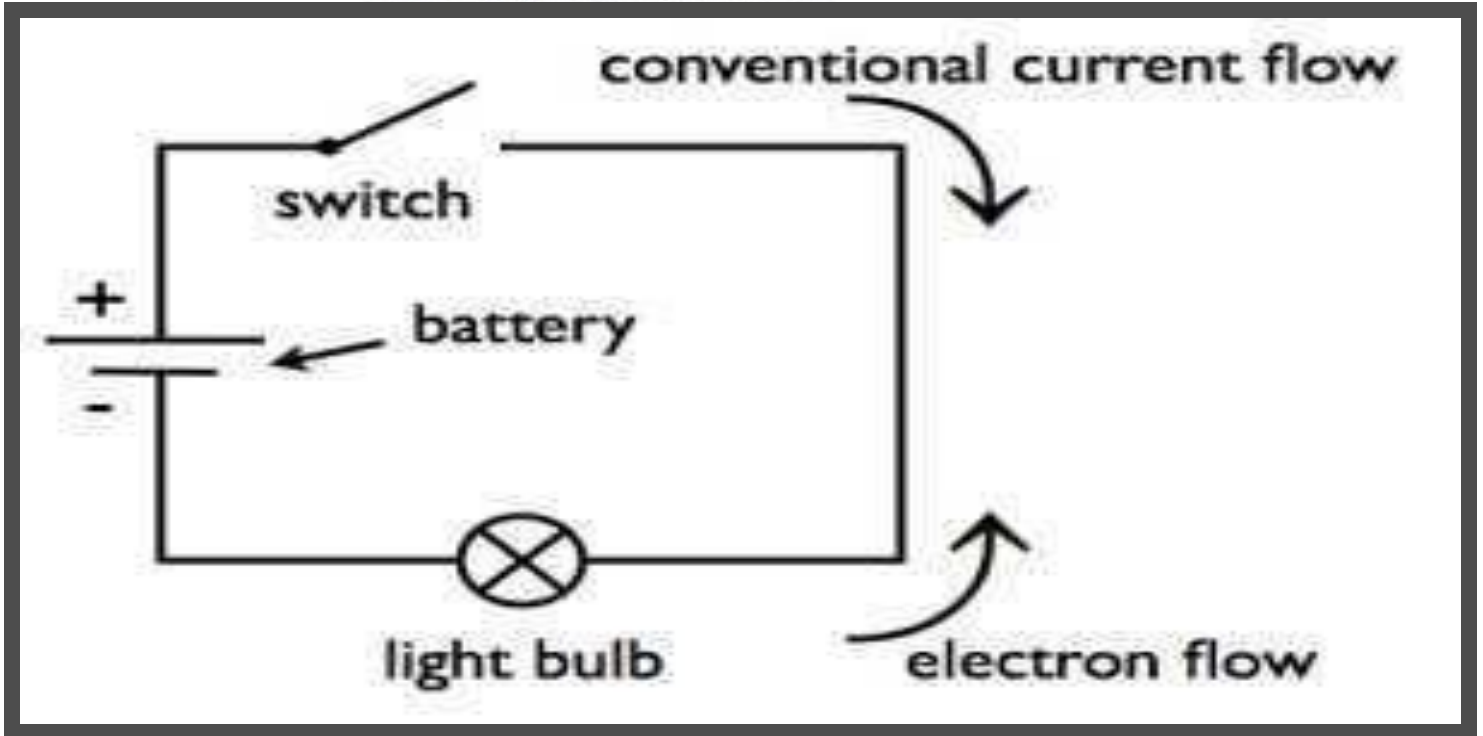
lamp

switch (closed)

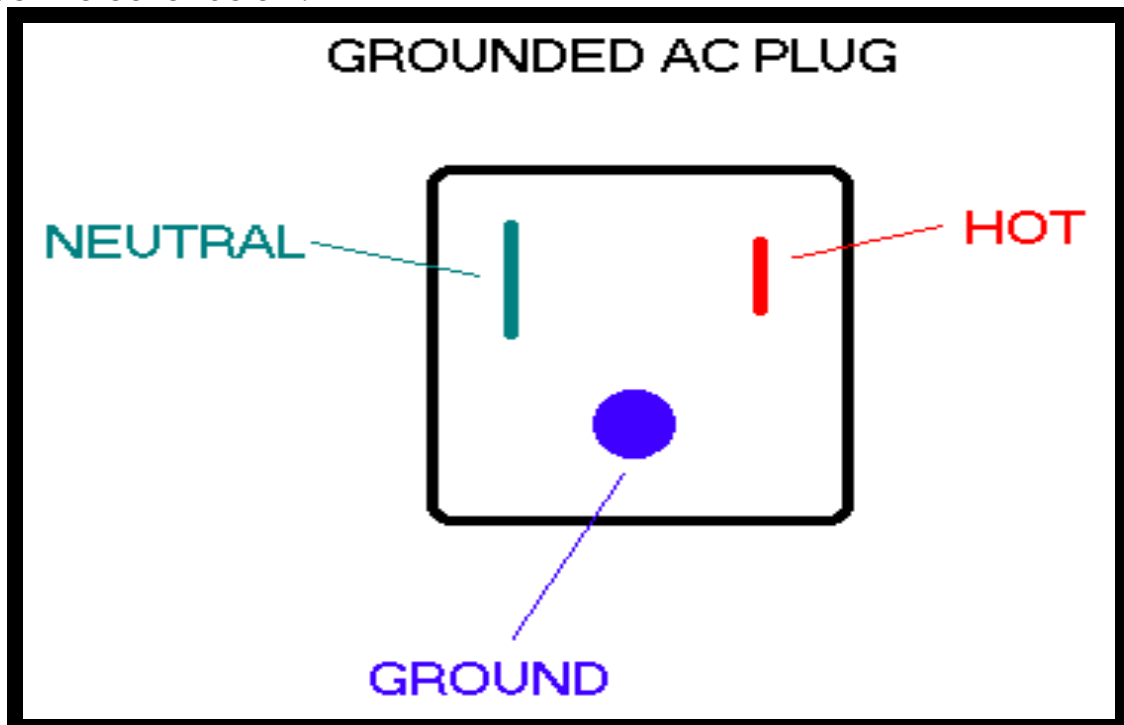
fuse

cell

battery



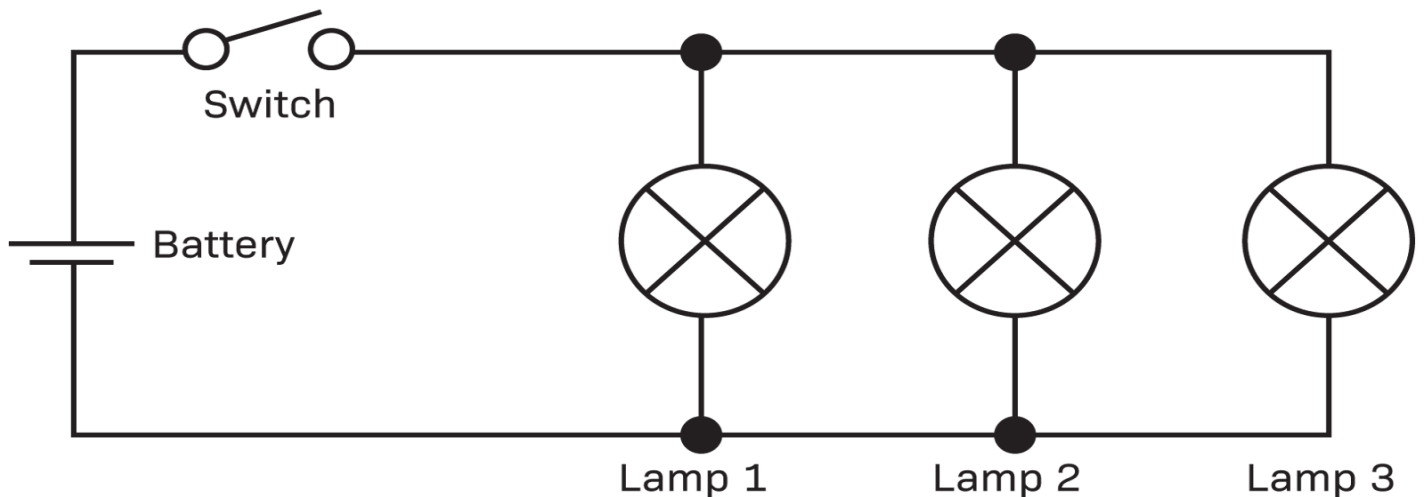
Please label the outlet below.



Visit the website below, design a complex circuit. Please sketch your "working" circuit that you created in the space below. The more complex the better.

https://phet.colorado.edu/sims/html/circuit-construction-kit-dc/latest/circuit-construction-kit-dc_en.html

Parallel Circuit



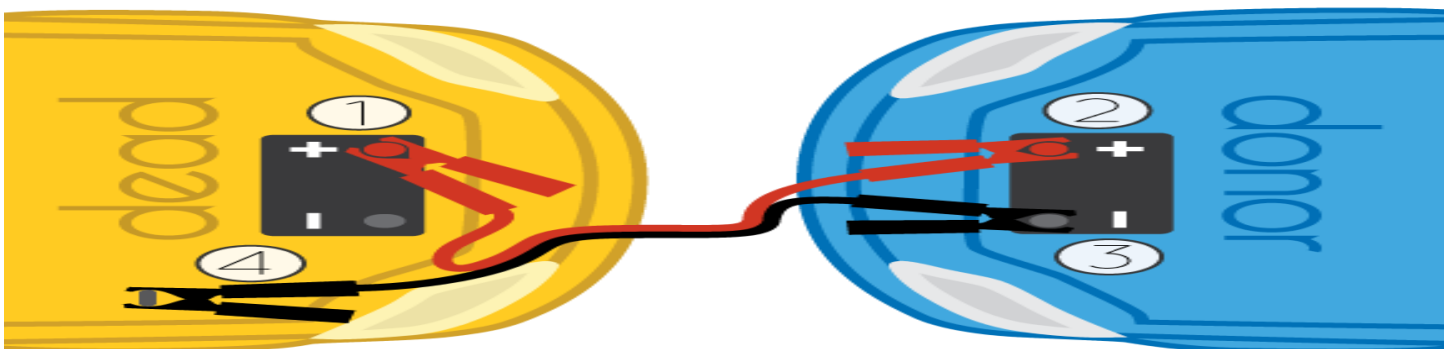
Battery = 1.5 volts, Lamps = 1.5 volts ea.

How do you jump start a car in several steps?

How to Jump a Car

begin with both cars off

1. red on dead +
2. red on donor +
3. black on donor -
4. black on bare metal
5. start donor
6. start dead
7. remove 4-3-2-1



Are you ready to start complex electrical work with your newfound knowledge?

- Danger – Do not attempt electrical work until you have learned the safe and proper technique from a certified electrician.

Across

2. A measure of the force or pressure under which electricity flows.
3. _____ are negatively charged
5. A container consisting of one or more cells, in which chemical energy is converted into electricity and used as a source of power
6. An electric _____ includes a device that gives energy to the charged particles constituting the current, such as a battery or a generator; devices that use current, such as lamps, electric motors, or computers; and the connecting wires or transmission lines.
7. Anything in an electrical circuit that impedes the flow of current is referred to as resistance.
8. (AC) - _____ Current is a flow of charge back and forth, changing its direction many times in one second. (Plugs and outlets / household)
11. This is a large spark that occurs when electrons move from one place to another very quickly because of the unequal distribution of electrons.
12. Electrons do not flow easily through a _____
15. _____ are positively charged
16. A flow of electrons, or individual negative charges.
17. _____ Law: Any two charged objects will create a force on each other. Opposite charges will produce an attractive force while similar charges will produce a repulsive force.

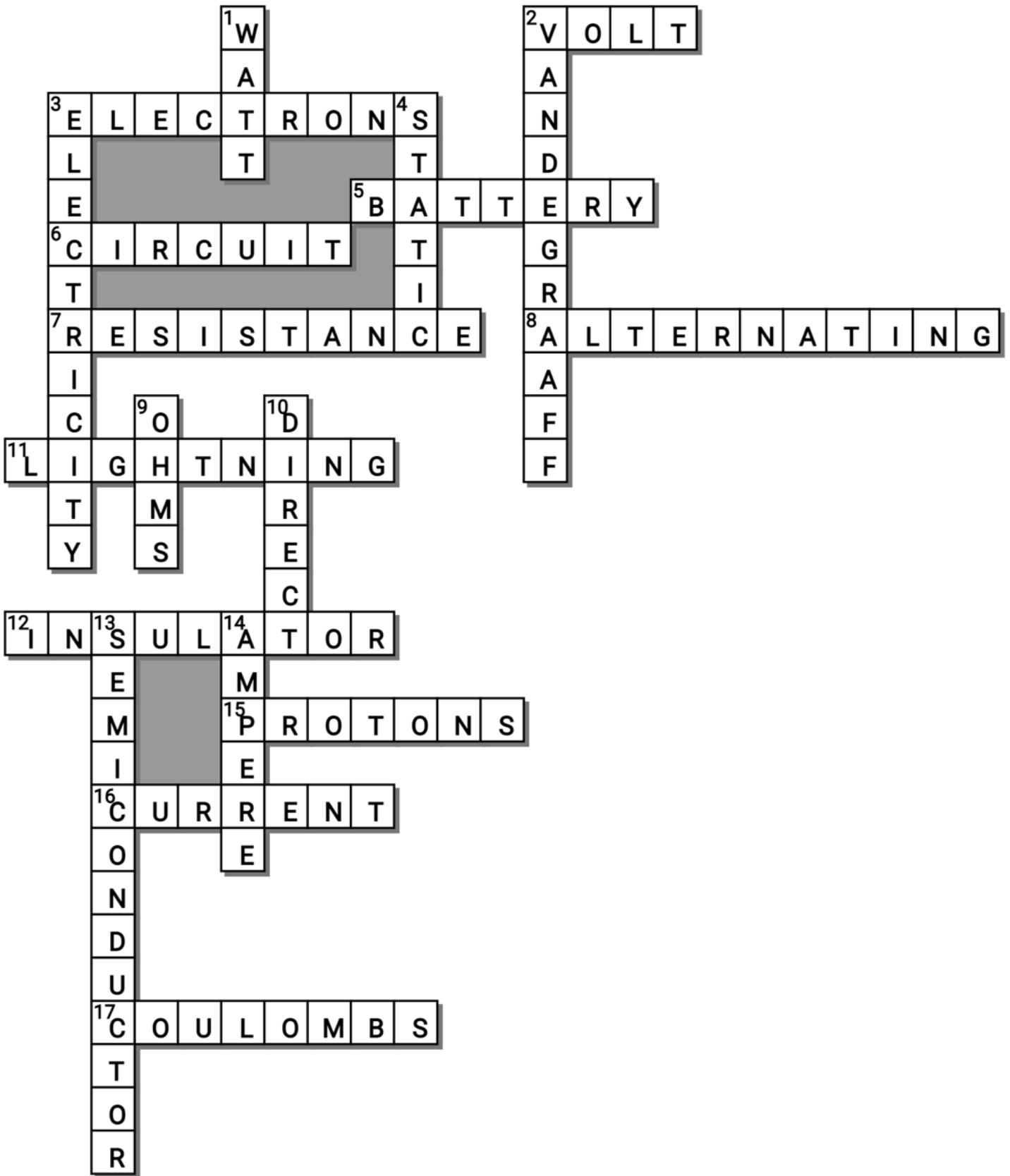
Down

1. The amount of electricity consumed per second.
2. _____ generator is an electrostatic generator which uses a moving belt to accumulate electric charge on a hollow metal globe on the top of an insulated column.
3. A form of energy resulting from the existence of charged particles (such as electrons or protons).
4. _____ Electricity: The imbalance of positive and negative charges.
9. The measure of resistance in a circuit to the flow of an electric current.
10. (DC) _____ Current is a flow of charge always in one direction. (Batteries)
13. A _____ material has an electrical conductivity value falling between that of a conductor, such as metallic copper, and an insulator, such as glass.
14. A measure of how much current moves through a wire in one second.

-----teacher can remove this word bank to make puzzle more challenging-----

Possible Answers

ALTERNATING, AMPERE, BATTERY, COULOMBS, CURRENT, DIRECT, ELECTRICITY, ELECTRONS, INSULATOR, LIGHTNING , OHMS, PROTONS , RESISTANCE, STATIC, VANDEGRAAFF, VOLT, WATT, CIRCUIT, SEMICONDUCTOR



Part 5 Review Game

Name: _____

Score ____ / 100

1-20 = 5 pts

Part 4 Lesson 5

*20-*25 * = Bonus + 1 pt,

(Secretly write owl in correct space +1 pt)

Final Question = 5 pt wager

MOTA BACKWARDS	WIRED	GET YOUR TIRAD OUT	AMPED UP	POWER UP Bonus round 1 pt each
1) Proton +, Electron -	6) Faraday Cage	11) A=Watts B=Volts C=Amps	16) $R = V/I$ $R = 300$ $V / 10 A = 30$ ohms	*21) Super Mario Brothers
2) Attract and Repel	7) Current	12) Volt time Amps	17) Resistance = Voltage divided by Current (I)	*22) The AllSpark
3) Van de Graaff	8) A=Direct Current B=Alternating Current	13) Watts Divide by Amps	18) 240 volts divided by 36 amps gets 6.6 ohms	*23) SHAZAAM
4) Nikola Tesla	9) A=Insulator B=Conductor C=Semi- conductor	14) Watts = Volts x Amps Watts = 120v x 2.5amps = 300Watts	19) Ampere	*24) THE FLUX CAPACITOR
5) Coulombs Law	10) Anode Cathode	15) Ohms	20) A=Neutral B=Hot C=Ground	*25) LADY GAGA

Final Question Wager ____ /5 Answer

- amps = watts / volts
- amps = 2000 / 220
- amps = 9.09

