Electricity Lesson 1: Static Electricity

BY: MR.K

- Have you ever heard of static electricity?

- What do you think it means?

- What do you think of when you hear the word?

More on this shortly…but first…

YOU GET TO LEARN ABOUT ME (:


CAMP ROTARY

Now tell me about you!

…THEN BACK TO ELECTRICITY…

Static Electricity

WHEN OBJECTS RUB TOGETHER OR COLLIDE AND CREATE A CHARGE THAT REMAINS STATIONARY ON THE SURFACE OF THE OBJECT

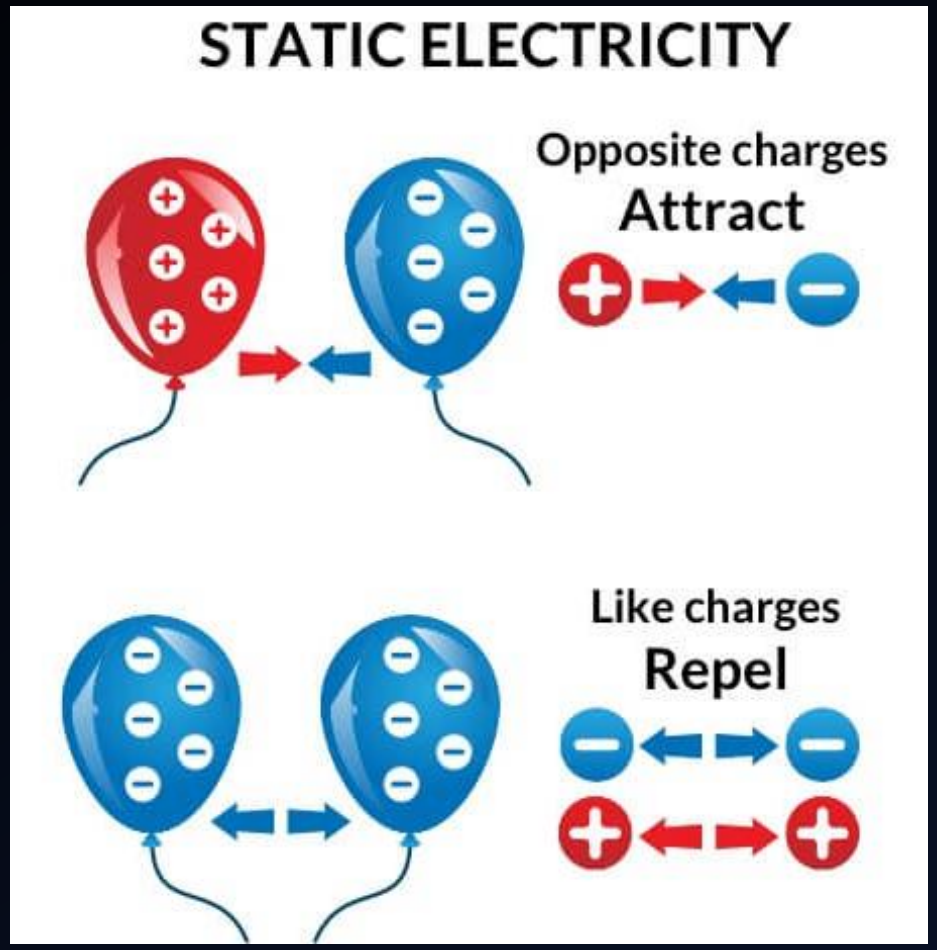
INSULATORS

- Materials that charge cannot move freely on or through
- When a spot on an insulator gets charged, it stays stationary and doesn't move or spread
- Primarily Non-Metals
- Ex) Wood, rubber, plastics

CONDUCTORS

- Materials that charge can move freely on or through
- When a conductor gets charged the charge spreads can then spread over the surface or through the object
- Primarily Metals
- Ex) Copper, Aluminium, water

Law of Attraction and Repulsion

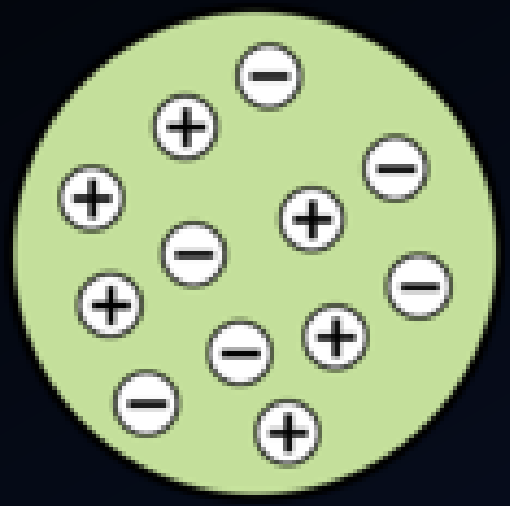


- - Like charges repel and opposite charges attract
- - Charges are either Positive or Negative & attraction is caused by the need to be neutralized

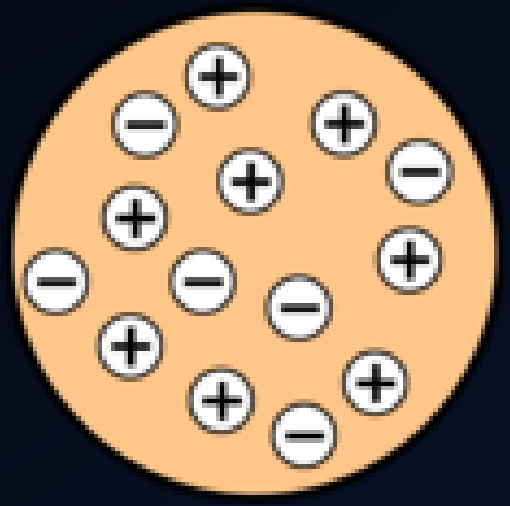
Do neutral objects have charge?

YES!

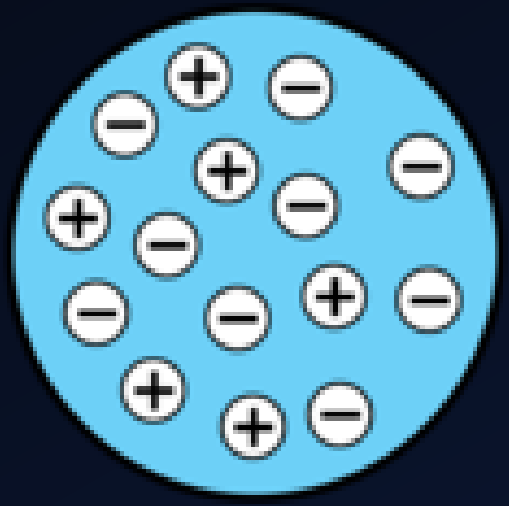
- Neutral objects have charge
- Rather than an absence of charge all together, neutral objects have an equal number of positive and negative charges
- Charged objects can still be attracted to neutral objects, but why is that?



Neutral

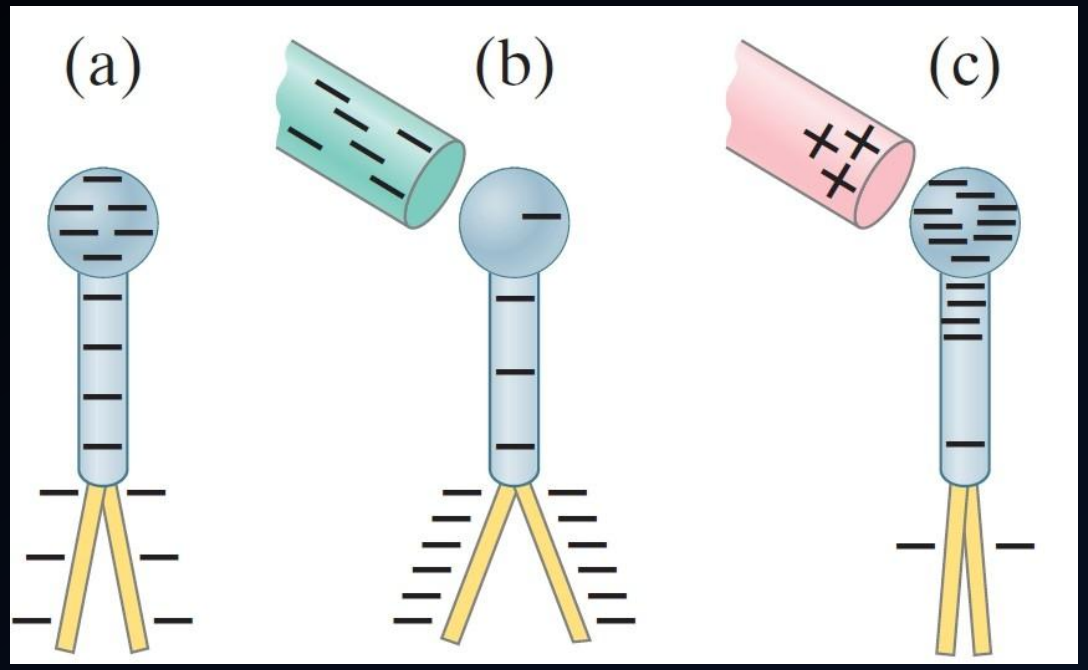


Positive



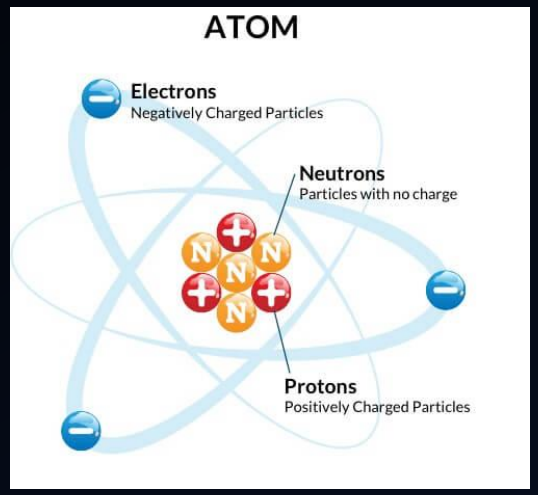
Negative

Induction



- Charge in one object creates a charge (sometimes temporary) in another
- Electroscopes get induced charges when the sphere is close to a charged object.
- When an electroscope gets charged, you can determine the charge by holding positive and negative objects near it

Subatomic Particles (a review…maybe?)



ELECTRONS

- Negative charge
- Stored in outer layers of the atom (electron shells)
- Mobile (can move freely from atom to atom)

PROTONS

- Positive charge
- Stored in the center of the atom
- Stationary (stuck in the nucleus, cannot move from atom to atom)

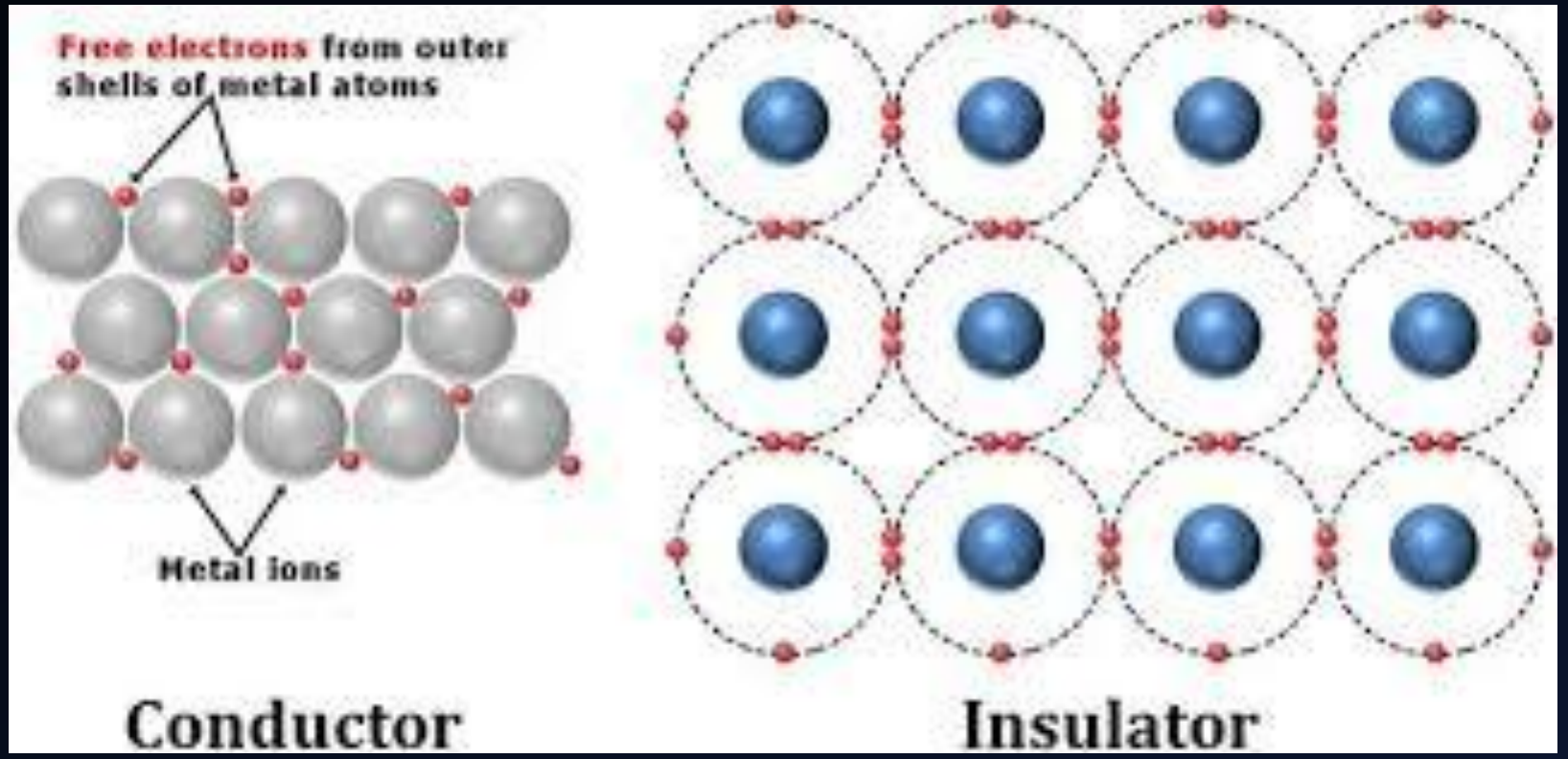
NEUTRONS

- No charge
- Stored in the center of the atom with the protons
- Stationary (stuck in the nucleus, cannot move from atom to atom)

Electrons…

WITHIN A CONDUCTOR

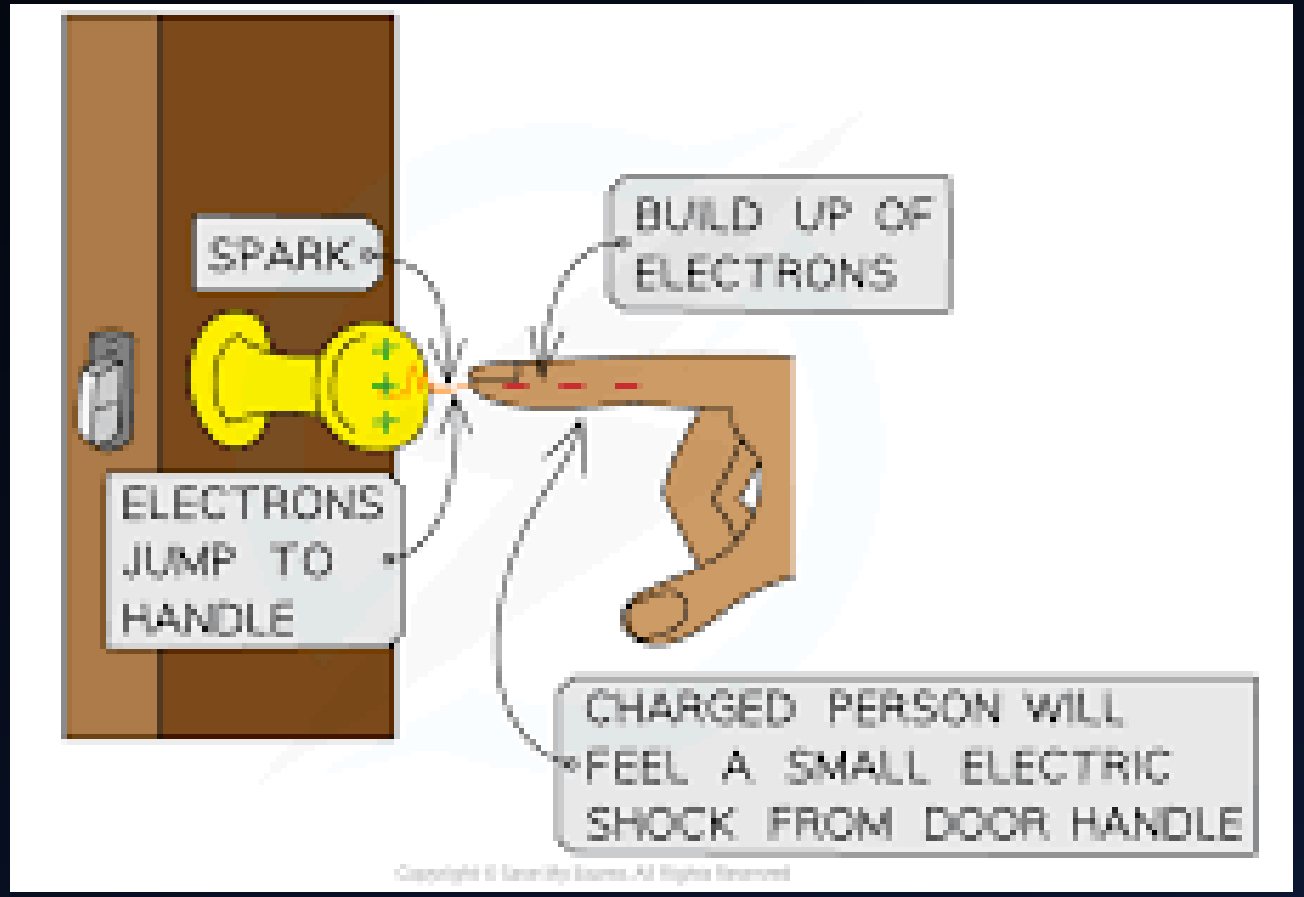
WITHIN AN INSULATOR



Air as a Conductor

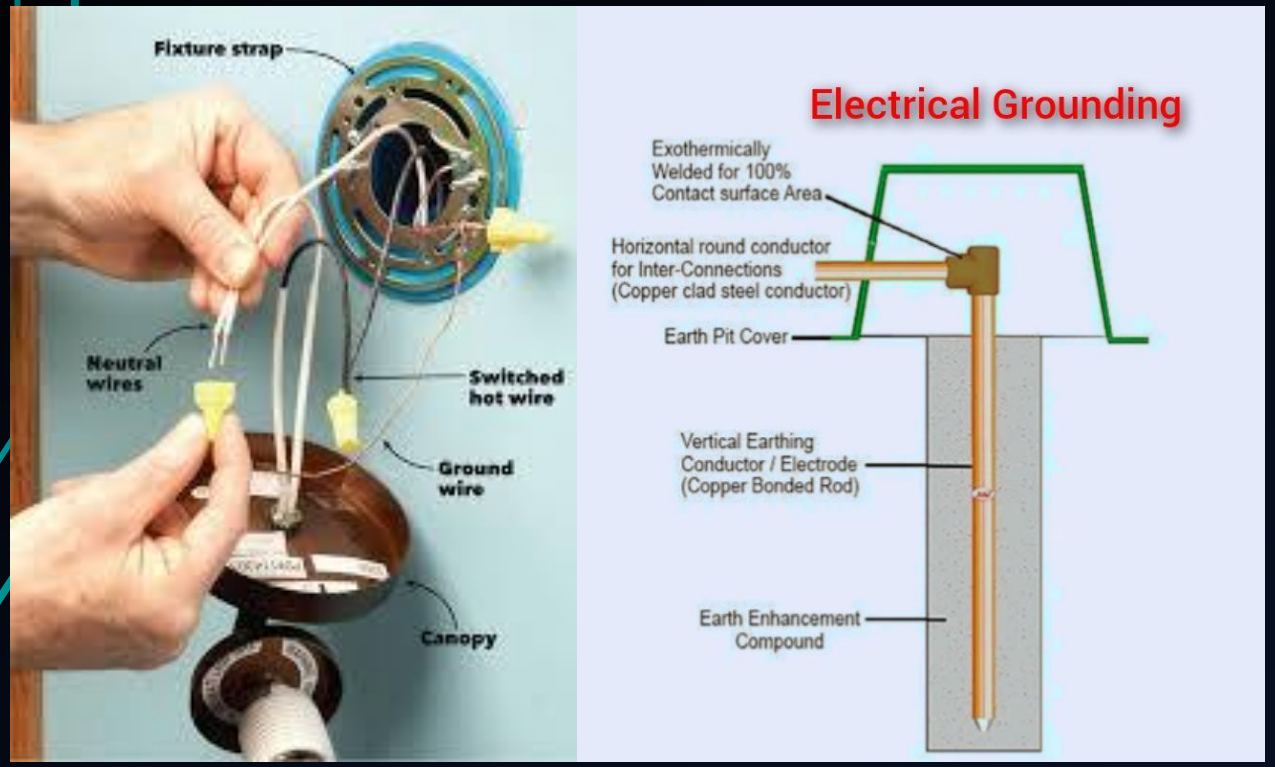
- A spark can be seen when an intensely negatively charged object is in close proximity to a positively charged object.
- What you see is a bunch of excess electrons flowing through the air, using it as a conductor
- Air isn’t a good conductor, especially dry air.
- How is this possible?

- The very large opposite charges have a very strong interaction
- This breaks up molecules in the air into ions that form a superconducting channel
- The electrons move through the channel so fast and as they move through and collide with other particles they emit light (sparks)



What is grounding? Have you heard of it before? Chat with your group for a couple minutes to try and come up with a possible meaning for the word

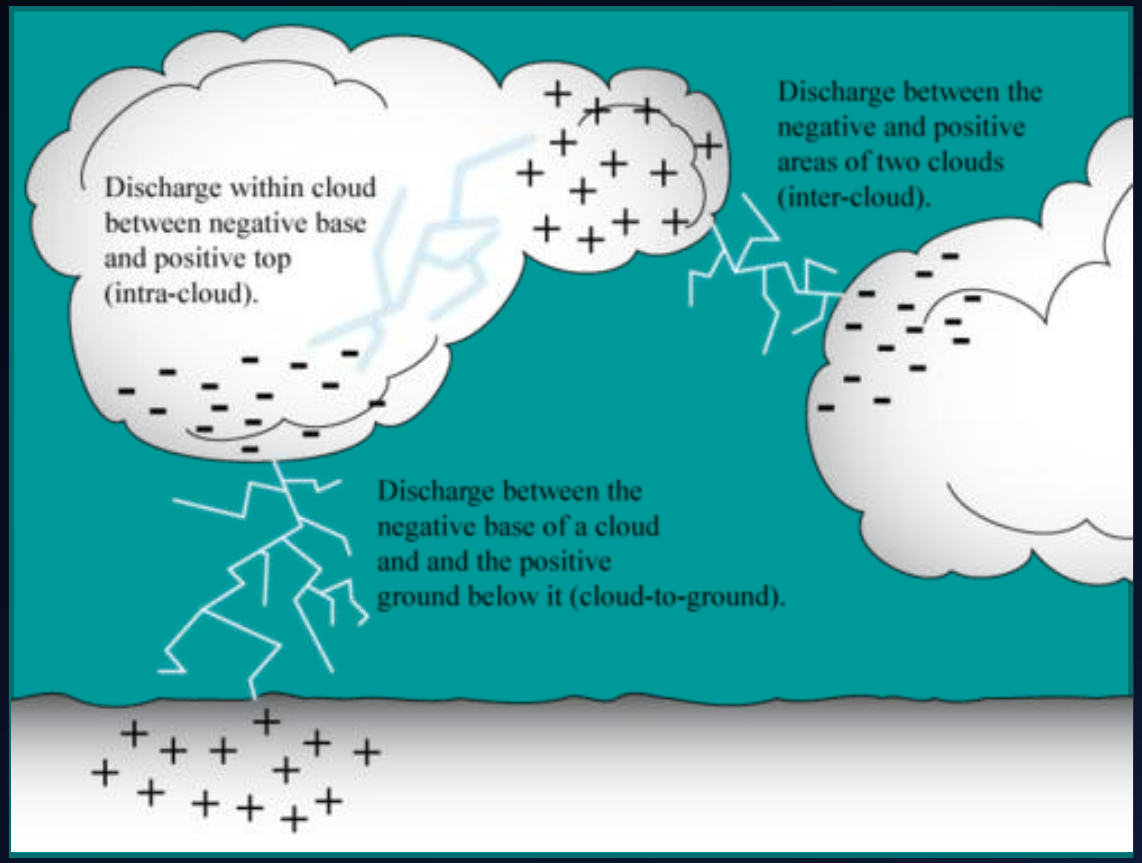
Grounding (literally)



- Grounding is the term for running electrical charges into the ground/earth
- This removes excess electrons from an apparatus by plunging them into the earth
- The earth is so large that this doesn’t affect its charge
- Ex) Grounding wires in light fixtures, grounding rods on 3 prong cords

Lightning (AKA a really big spark)

- Water particles build up (more rubbing & colliding, thus static)
- Electrons pool at bottom of the clouds, repelling electrons in ground so the surface becomes positive
- Strong opposite charges break up air molecules & ion channel forms and excess electrons from the clouds jumps through the channel (BIG spark)

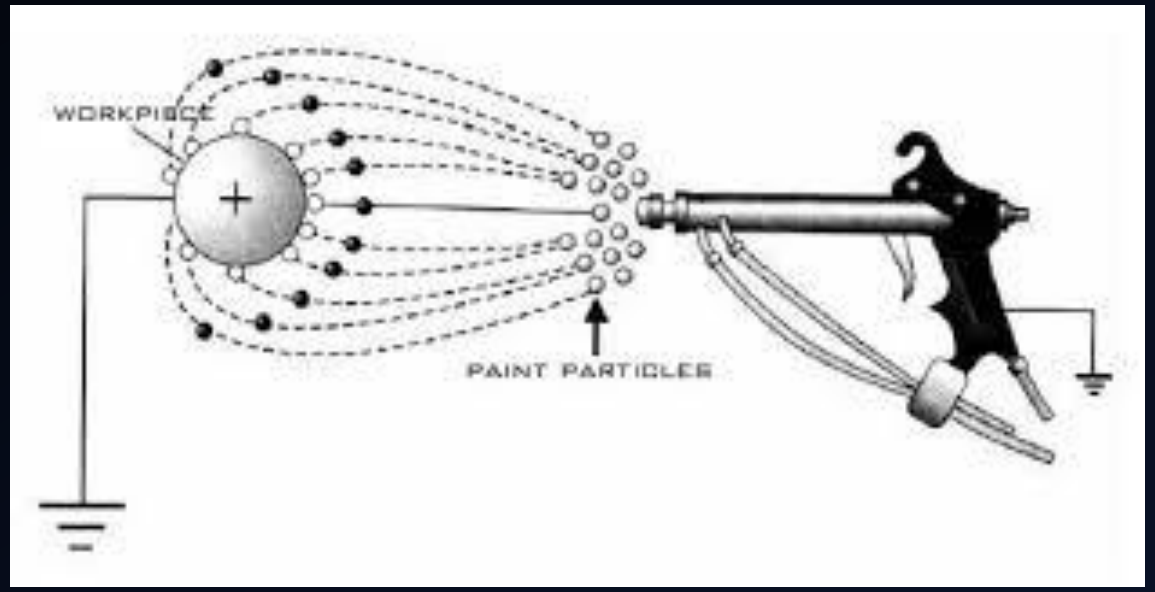


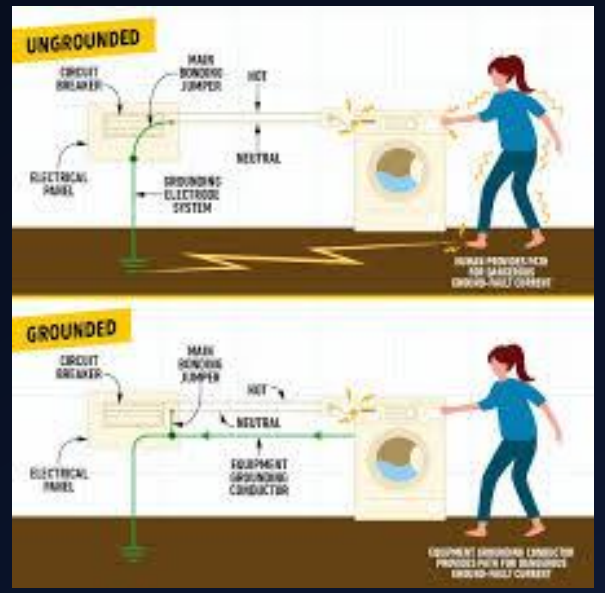
With all this in mind, how do lightning rods work? How do they attract lightning? What happens when it gets struck?

- LIGHTNING RODS ARE OFTEN AT HIGH POINTS OFF THE GROUND.
- CLOSER TO THE CLOUDS MEANS ION CHANNEL IS MORE LIKELY TO FORM HERE.
- LIGHTNING RODS THEN GROUND THE LIGHTNING

Discuss amongst yourselves…

- What might be some real world applications of electrostatics?
- Where can we apply key themes such as grounding, friction, and the law of attraction and repulsion?





Key Terms to Remember:

- Static Electricity
- Induction
- Insulators and Conductors
- Law of Attraction and Repulsion
- Electrons (and the other subatomics)
- Grounding

See you next class! We will be in the Physics Lab Upstairs!

References

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