

Electricity and Why it Moves

Electricity

Electricity is moving electrons; Protons can't move.

Protons are held together in the nucleus by the strong nuclear force, the strongest force in nature, but **electrons can move**.



Electricity comes from electrons moving between atoms.

Charge

Objects can be positive, negative, or neutral. The unit of charge is the **coulomb (C)**.



A **neutral object** has an equal amount of protons and electrons.



A **positive object** has lost electrons, so it has more protons than electrons.



A **negative object** has gained electrons, so it has more electrons than protons.

Electric Force

Any two charges feel a force between them. Electric force depends on the types of charges, the distance between the charges, and the amounts of the two charges.

Attracting Force



Opposites attract

Positive hydrogen atoms in water are attracted to the negatively charged balloon, causing the water stream to bend slightly toward the balloon.



Repelling Force

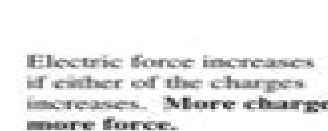


Likes repel



Two charged balloons repel each other, so they must be the same charge (negative).

Just like gravity, electric force increases as distance decreases. **Closer charges: more force.**



Electric force increases if either of the charges increases. **More charge: more force.**

Separating Charges

Naturally, objects are neutral. Work must be done to separate charges. Separating charges cause a charge difference and the electric force tries to move the charges back to neutral.

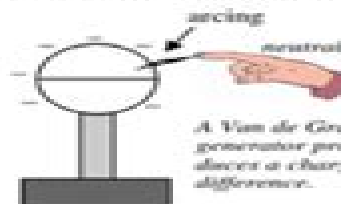
When two insulators rub, charges move between them, causing a separation of charge (static electricity) and an electric force.



Afterwards the rod is charged and it can exert an electric force.

If there is a difference of charge electricity can move between objects. A big enough difference can cause electricity to arc (jump a gap). Bigger differences of charge allow bigger arcs.

No difference in charge—electricity can not move.



A Van de Graaff generator produces a charge difference.



A big charge difference can push thru big gaps, like lightning arcing all the way to the ground.

Batteries

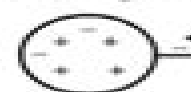
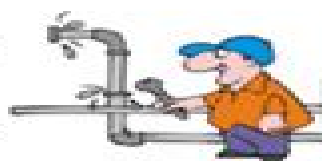


Batteries cause electrons to move by separating charges in chemicals. When connected by wires the charge can flow, eventually neutralizing the battery.

Ground

Ground (the earth) can take or give an infinite number of electrons. Ground is electrically neutral. Both positive and negative charges will neutralize when grounded.

To ground something you can often touch it to a pipe. Pipes are usually connected to ground somewhere in the building.



A **positive object** will take electrons from ground.

Symbol for ground



A **negative object** will give electrons to ground.

Electricity And Why It Moves Unit 9 1

Xiaolong Qi



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 NASA 62 64 65 72 77 **Hearings, Reports and Prints of the Senate Select Committee on Small Business** United
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Table of Contents Electricity And Why It Moves Unit 9 1

1. Understanding the eBook Electricity And Why It Moves Unit 9 1
 - The Rise of Digital Reading Electricity And Why It Moves Unit 9 1
 - Advantages of eBooks Over Traditional Books
2. Identifying Electricity And Why It Moves Unit 9 1
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Electricity And Why It Moves Unit 9 1
 - User-Friendly Interface
4. Exploring eBook Recommendations from Electricity And Why It Moves Unit 9 1
 - Personalized Recommendations
 - Electricity And Why It Moves Unit 9 1 User Reviews and Ratings
 - Electricity And Why It Moves Unit 9 1 and Bestseller Lists
5. Accessing Electricity And Why It Moves Unit 9 1 Free and Paid eBooks

-
- Electricity And Why It Moves Unit 9 1 Public Domain eBooks
 - Electricity And Why It Moves Unit 9 1 eBook Subscription Services
 - Electricity And Why It Moves Unit 9 1 Budget-Friendly Options
6. Navigating Electricity And Why It Moves Unit 9 1 eBook Formats
 - ePub, PDF, MOBI, and More
 - Electricity And Why It Moves Unit 9 1 Compatibility with Devices
 - Electricity And Why It Moves Unit 9 1 Enhanced eBook Features
 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Electricity And Why It Moves Unit 9 1
 - Highlighting and Note-Taking Electricity And Why It Moves Unit 9 1
 - Interactive Elements Electricity And Why It Moves Unit 9 1
 8. Staying Engaged with Electricity And Why It Moves Unit 9 1
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Electricity And Why It Moves Unit 9 1
 9. Balancing eBooks and Physical Books Electricity And Why It Moves Unit 9 1
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Electricity And Why It Moves Unit 9 1
 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
 11. Cultivating a Reading Routine Electricity And Why It Moves Unit 9 1
 - Setting Reading Goals Electricity And Why It Moves Unit 9 1
 - Carving Out Dedicated Reading Time
 12. Sourcing Reliable Information of Electricity And Why It Moves Unit 9 1
 - Fact-Checking eBook Content of Electricity And Why It Moves Unit 9 1
 - Distinguishing Credible Sources
 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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