

Bill Nye Quiz Answers Electricity PDF

bill nye quiz answers electricity is a popular topic among students, science enthusiasts, and fans of Bill Nye, the Science Guy. Whether you're preparing for a classroom quiz, a fun trivia game, or just looking to deepen your understanding of electricity, having accurate answers and comprehensive explanations is essential. In this article, we'll explore key concepts related to electricity as they pertain to Bill Nye's quizzes, provide detailed answers to common questions, and offer insights into the science behind electrical phenomena. By the end, you'll be well-equipped with the knowledge needed to ace your quiz and understand the fascinating world of electricity.

Understanding the Basics of Electricity

What Is Electricity?

Electricity is a form of energy resulting from the movement of charged particles, typically electrons. It powers countless devices in our daily lives, from lights and appliances to computers and smartphones. Bill Nye often explains electricity in simple yet engaging ways, emphasizing its importance and ubiquity.

Types of Electricity

There are two main types of electricity:

- **Static Electricity:** The buildup of electric charge on the surface of objects, usually caused by friction. An example is the shock you feel after rubbing a balloon on your hair.
- **Current Electricity:** The continuous flow of electric charge through a conductor, such as a wire, which powers electrical devices.

Conductors and Insulators

Understanding materials' ability to conduct electricity is essential:

- **Conductors:** Materials that allow electric charges to flow freely (e.g., copper, aluminum).
- **Insulators:** Materials that resist the flow of electric charges (e.g., rubber, plastic).

Common Questions and Answers from Bill Nye's Electricity Quiz

1. What is the role of a battery in an electrical circuit?

Answer:

A battery provides the electrical energy needed to power a circuit. It contains chemical energy that converts into electrical energy, creating a voltage difference (electrical potential) that causes electric charges to flow through the circuit.

2. How does a switch control the flow of electricity?

Answer:

A switch opens or closes an electrical circuit. When the switch is closed, it completes the circuit, allowing current to flow. When open, it breaks the circuit, stopping the flow of electricity.

3. What is a resistor, and why is it used?

Answer:

A resistor is a component that limits the amount of current flowing through a circuit. It helps protect other components from excessive current and can be used to control voltage levels.

4. How does a generator produce electricity?

Answer:

A generator converts mechanical energy into electrical energy through electromagnetic induction. When a coil of wire spins within a magnetic field, it induces a voltage, producing electricity.

5. What is the difference between series and parallel circuits?

Answer:

- **Series Circuit:** Components are connected end-to-end, forming a single path for current. If one component fails, the entire circuit stops working.

- **Parallel Circuit:** Components are connected across the same voltage source, creating multiple paths for current. If one component fails, others can still operate.

Key Concepts Explained in Detail

Electric Current and Voltage

Electric current is the flow of electrons through a conductor, measured in amperes (A). Voltage, measured in volts (V), is the electrical potential difference between two points. Think of voltage as the pressure that pushes electric charges through a wire, and current as the actual flow of charges.

Ohm's Law

A fundamental principle in electricity, Ohm's Law states:

$$\text{Voltage (V)} = \text{Current (I)} \times \text{Resistance (R)}$$

This relationship helps in designing circuits and understanding how changing one element affects the others.

Electrical Safety

Bill Nye emphasizes the importance of safety when dealing with electricity:

- Never touch exposed wires.
- Use insulated tools.
- Turn off power before working on electrical devices.
- Understand the circuit before attempting repairs or modifications.

Fun Facts and Additional Insights

How Electricity Powers Our World

Electricity is generated in various ways, including burning fossil fuels, nuclear power, hydroelectric dams, wind turbines, and solar panels. The energy is transmitted through power lines to homes and businesses.

Renewable Energy and Electricity

Bill Nye often discusses the importance of renewable energy sources. Solar, wind, and hydroelectric power are sustainable ways to generate electricity without depleting natural resources or harming the environment.

Future of Electricity

Advances in technology aim to make electricity cleaner, more efficient, and more accessible. Innovations like smart grids, energy storage solutions, and decentralized power generation are shaping the future.

Tips for Answering Electricity Quiz Questions

- Review basic concepts such as current, voltage, and resistance.
- Understand different types of circuits and their characteristics.
- Learn the functions of common electrical components like batteries, switches, and resistors.
- Familiarize yourself with safety procedures when dealing with electricity.
- Watch Bill Nye's videos and read about electricity for engaging explanations and visuals.

Conclusion

Mastering the answers to a "Bill Nye quiz answers electricity" can greatly enhance your understanding of electrical science. By knowing the fundamental principles?such as how circuits work, the role of different components, and safety measures?you'll be better prepared to succeed. Remember, Bill Nye's approach to teaching science is engaging, practical, and accessible, making complex topics easier to grasp. Keep exploring, studying, and experimenting with electricity to unlock the many wonders of this vital form of energy.

If you're preparing for a quiz or just curious about electricity, use this article as a guide, and you'll be on your way to becoming a science whiz!

Bill Nye Quiz Answers Electricity: An In-Depth Review and Guide

Electricity is a fundamental component of modern life, powering everything from household appliances to global communication systems. For students, enthusiasts, and curious minds alike, understanding electricity is essential, and Bill Nye the Science Guy has become a trusted figure in making complex scientific concepts accessible and engaging. The phrase "Bill Nye Quiz Answers Electricity" often appears in educational contexts, especially when learners seek to verify their knowledge or prepare for exams. This comprehensive review explores the significance of these quiz answers, their educational value, and how they enhance understanding of electricity through the lens of Bill Nye's teachings.

Understanding the Importance of Bill Nye's Educational Content on Electricity

Bill Nye has long been celebrated for his engaging approach to science education. His ability to simplify complex topics like electricity makes learning both accessible and enjoyable. Quizzes based

on his teachings serve multiple purposes:

- Reinforce learning by testing comprehension
- Provide quick reference points for key concepts
- Prepare students for exams or practical applications
- Encourage curiosity and further exploration of scientific principles

The specific focus on "quiz answers" related to electricity indicates an emphasis on self-assessment, helping learners identify areas of strength and those needing improvement.

What Are the Common Topics Covered in Electricity Quizzes Based on Bill Nye?

Bill Nye's lessons on electricity typically encompass a wide array of topics, which are often reflected in quiz questions. Some of the most common include:

1. Basic Concepts of Electricity

- What is electricity?
- Difference between static and current electricity
- The role of electrons in electrical flow

2. Electrical Circuits

- Components of a circuit (battery, wires, switches, bulbs)
- Series vs. parallel circuits
- How to complete a circuit

3. Conductors and Insulators

- Materials that conduct electricity
- Materials that resist electrical flow
- Real-world applications

4. Voltage, Current, and Resistance

- Definitions and relationships (Ohm's Law)
- How voltage drives current
- The effect of resistance on electrical flow

5. Magnetism and Electromagnetism

- How electricity and magnetism are related
- Uses of electromagnets
- Magnetic fields around electrical devices

6. Safety and Practical Applications

- Electrical safety tips
- How household circuits work
- Renewable energy sources involving electricity

Analyzing the Accuracy and Educational Value of Bill Nye Quiz Answers on Electricity

When learners seek answers to quiz questions related to electricity based on Bill Nye's content, the accuracy and clarity of these answers are essential for effective learning. Below is an analysis of their features:

Features of High-Quality Answers

- Accurate and Up-to-Date: Reflect current scientific understanding.
- Clear Explanations: Use simple language suitable for different age groups.
- Visual Aids: Diagrams, illustrations, and videos complement textual answers.
- Contextual Examples: Real-world applications help solidify understanding.
- Step-by-Step Solutions: For problem-based questions, guiding learners through the reasoning process.

Pros of Using Bill Nye Quiz Answers

- Engagement: Bill Nye's energetic style makes learning memorable.
- Simplification: Breaks down complex concepts into manageable parts.
- Accessibility: Available online, often for free.

- Supplementary Material: Frequently accompanied by experiments and demonstrations.
- Encourages Curiosity: Inspires learners to explore further beyond quiz answers.

Cons or Limitations

- Simplification Risks: Oversimplification may omit nuanced details.
- Question Variability: Not all quiz questions match exactly with the answers provided.
- Dependence on External Resources: To fully grasp concepts, learners might need additional resources.
- Potential for Outdated Information: Some online content may not reflect the latest scientific advancements.

How to Effectively Use Bill Nye Quiz Answers on Electricity for Learning

Maximizing the educational benefits of quiz answers involves strategic approaches:

1. Active Engagement

- Attempt the quiz first before consulting answers.
- Use answers to verify and understand mistakes.
- Rewrite explanations in your own words.

2. Supplement with Multimedia Resources

- Watch Bill Nye's videos related to electricity.
- Use interactive simulations to visualize circuits and electromagnetic phenomena.
- Review diagrams and demonstrations linked to quiz content.

3. Hands-On Experiments

- Build simple circuits with batteries and bulbs.
- Explore static electricity with balloons.
- Experiment with electromagnets using coils and batteries.

4. Regular Review and Practice

- Revisit quiz questions periodically.
- Create your own quizzes to test understanding.
- Discuss concepts with peers or teachers.

5. Critical Thinking

- Question why certain answers are correct.
- Explore alternative explanations.
- Connect quiz concepts to real-world scenarios.

Sample Quiz Questions and Bill Nye's Answers on Electricity

Below are some representative questions with summarized Bill Nye-style answers, illustrating the educational approach:

Question 1: What is static electricity?

Bill Nye's Explanation: Static electricity is the buildup of electric charge on the surface of objects. It occurs when electrons are transferred from one object to another, resulting in an imbalance. For example, rubbing a balloon on your hair transfers electrons, making the balloon stick to walls.

Question 2: How does a circuit work?

Bill Nye's Explanation: A circuit provides a complete path for electricity to flow. When you flip a switch, it opens or closes the circuit. If closed, electrons flow from the power source through wires and devices like bulbs, lighting them up.

Question 3: Why are metals good conductors?

Bill Nye's Explanation: Metals are good conductors because they have free electrons that can move easily through the material, allowing electricity to flow efficiently.

Question 4: What is Ohm's Law?

Bill Nye's Explanation: Ohm's Law states that the current flowing through a resistor is directly proportional to the voltage across it and inversely proportional to its resistance. Mathematically, $I=V/R$.

Conclusion: The Value and Limitations of Bill Nye Quiz Answers on Electricity

In summary, "Bill Nye Quiz Answers Electricity" serve as an invaluable resource for learners seeking to understand fundamental electrical concepts through a trusted and engaging source. They provide clarity, reinforce learning, and inspire curiosity, especially when used alongside interactive activities and multimedia content. However, learners should be mindful of the potential oversimplifications and ensure they complement these answers with hands-on experiments and further reading to develop a robust understanding.

By integrating Bill Nye's engaging explanations with practical exploration, students can deepen their appreciation for electricity ? a vital force shaping our world. Whether preparing for a test, satisfying curiosity, or simply exploring the wonders of science, these quiz answers are a stepping stone toward becoming more knowledgeable and confident in understanding electricity's principles and applications.

Question What is the primary function of electricity in our daily lives? Electricity provides power to run appliances, lighting, and electronic devices, making daily activities easier and more efficient. How does a circuit breaker protect against electrical overloads? A circuit breaker automatically shuts off electrical flow when it detects an overload or short circuit, preventing damage and fires. What is the difference between AC and DC electricity? AC (alternating current) changes direction periodically and is used in homes, while DC (direct current) flows in one direction and is commonly used in batteries and electronics. Why is it important to handle electricity safely? Handling electricity safely prevents shocks, burns, fires, and other injuries, ensuring personal safety and protecting property. What materials are good conductors of electricity? Materials like copper, aluminum, and silver are good conductors because they allow electricity to flow easily through them. How does electricity generate light in a bulb? Electricity heats the filament inside the bulb, causing it to glow and produce light through a process called incandescence.

Related keywords: Bill Nye, quiz answers, electricity quiz, science quiz, physics questions, electrical energy, electrical circuits, renewable energy, science education, Bill Nye videos

What Is Electricity

What is electricity?

Electricity is a fundamental form of energy that powers our modern world. It is an invisible force that facilitates countless everyday activities, from lighting our homes to powering complex technological devices. Understanding what electricity is, how it works, and its significance in our lives is essential for appreciating the technological advancements that have transformed human society.

Understanding the Concept of Electricity

Electricity is a type of energy resulting from the movement of charged particles, primarily electrons and protons. This movement creates an electric current, which can be harnessed for various practical purposes. Although it is invisible to the naked eye, its effects are evident in the light of a bulb, the operation of a computer, or the functioning of an electric motor.

Historical Perspective

The study of electricity dates back thousands of years, with ancient civilizations like the Greeks observing static electricity. However, it wasn't until the 17th and 18th centuries that scientists such as William Gilbert, Benjamin Franklin, and Alessandro Volta made significant discoveries that laid the groundwork for modern electrical engineering.

The development of the electric battery, the discovery of electrical conduction, and the invention of the electric generator all contributed to our current understanding of electricity.

What Is Electricity? A Scientific Explanation

At its core, electricity involves the movement of electrons within atoms. Atoms are the basic building blocks of matter, consisting of a nucleus made of protons and neutrons, surrounded by electrons orbiting in various energy levels.

Electrons and Protons: The Charge Carriers

- Electrons carry a negative electric charge.
- Protons carry a positive electric charge.
- Neutrons are neutral particles with no charge.

In conductive materials like metals, electrons are loosely bound and can move freely, making these materials good conductors of electricity.

Electric Charges and Coulomb's Law

Electricity arises from the interaction between electric charges. Coulomb's Law describes the force between two point charges:

- The force is directly proportional to the product of the magnitudes of the charges.
- The force diminishes with the square of the distance between the charges.

This fundamental principle explains how charges exert forces and influence each other, leading to electric fields and currents.

Types of Electricity

Electricity manifests in various forms, primarily categorized into static and current electricity.

Static Electricity

Static electricity is the build-up of electric charge on the surface of objects. It occurs when there is an imbalance of electrons, often caused by friction. Common examples include:

- Rubbing a balloon on your hair
- Lightning during thunderstorms
- Shock when touching a doorknob after walking across a carpet

Static electricity is characterized by sudden discharges, known as electrostatic sparks.

Current Electricity

Current electricity involves the continuous flow of electrons through a conductor. It is the type of electricity used to power homes, industries, and electronic devices.

- Direct Current (DC): Electrons flow in a single direction. Used in batteries and electronics.
- Alternating Current (AC): Electrons reverse direction periodically. Used in household power supplies.

How Electricity is Generated

Electricity generation involves converting other forms of energy into electrical energy. The most common methods include:

Electromagnetic Induction

Discovered by Michael Faraday, electromagnetic induction occurs when a conductor (like a coil of wire) is moved within a magnetic field, inducing an electric current. This principle is the basis for most electric generators.

Chemical Reactions

Batteries generate electricity through chemical reactions that produce a flow of electrons from one electrode to another.

Renewable Energy Sources

- Hydropower: Uses flowing water to spin turbines.
- Wind Power: Converts wind energy into electricity via turbines.
- Solar Power: Converts sunlight into electricity using photovoltaic cells.
- Geothermal Energy: Uses heat from beneath the Earth's surface.

How Electricity Travels: The Power Grid

Electricity generated at power plants is transmitted through a vast network known as the power grid.

The Transmission and Distribution System

- High-voltage Transmission Lines: Carry electricity over long distances with minimal losses.
- Step-down Transformers: Reduce voltage for safe distribution.
- Distribution Lines: Deliver electricity to homes and businesses.

This infrastructure ensures that electricity reaches consumers efficiently and safely.

Applications of Electricity

Electricity is indispensable in various sectors, including:

- Lighting and heating
- Transportation (electric vehicles)
- Communication devices (phones, internet)
- Industrial manufacturing
- Medical equipment
- Entertainment electronics (TVs, gaming consoles)

Its versatility makes it central to modern life.

Safety and Electricity

While electricity is incredibly useful, it also poses safety risks if not handled properly.

Electrical Hazards

- Electric shocks
- Short circuits
- Fires caused by faulty wiring

Safety Precautions

- Use of circuit breakers and fuses
- Proper insulation of wires
- Grounding electrical devices
- Regular maintenance and inspections

Understanding and respecting electrical safety is crucial for preventing accidents.

The Future of Electricity

Advancements in technology continue to shape the future of electricity.

Emerging Trends

- Smart Grids: Integrate digital technology for efficient management.
- Renewable Energy Integration: Expand the use of solar, wind, and other clean sources.
- Energy Storage: Improved batteries to store excess energy.
- Decentralized Power Generation: Small-scale, localized generation systems like rooftop solar panels.

These innovations aim to make electricity more sustainable, reliable, and accessible worldwide.

Conclusion

Electricity is a vital, invisible force that underpins virtually every aspect of modern civilization. From the basic scientific principles involving electrons and electric charges to the complex infrastructure that delivers power globally, understanding what electricity is helps us appreciate its importance and the need for responsible usage. As technology advances, the way we generate, distribute, and utilize electricity continues to evolve, promising a future where sustainable and efficient energy solutions play a crucial role in global development.

Keywords for SEO Optimization:

- What is electricity
- Electricity explained
- Types of electricity
- How electricity is generated
- Electricity applications
- Electrical safety tips
- Future of electricity
- Power grid infrastructure
- Renewable energy sources
- Electromagnetic induction

Electricity is a fundamental force of nature that powers our modern world, enabling countless devices, technologies, and systems essential to daily life. Its invisible yet pervasive presence influences everything from the lights in our homes to the vast networks of information transfer across the globe. Understanding what electricity is requires delving into its scientific principles, origins, types, applications, and safety considerations. This comprehensive overview aims to clarify these aspects and provide a detailed insight into this vital phenomenon.

What Is Electricity? A Fundamental Explanation

Electricity is the form of energy resulting from the presence and movement of electric charge. It is a broad term that encompasses a variety of phenomena resulting from the behavior of electrons and other charged particles.

Key Concepts:

- **Electric Charge:** A fundamental property of matter that causes particles to experience a force when placed in an electric and magnetic field. The two types are positive and negative charges.
- **Electrons:** Subatomic particles carrying a negative charge, which are primarily responsible for electric current in conductive materials.
- **Protons:** Positively charged particles in atomic nuclei, which are not typically involved directly in electrical conduction in everyday contexts.

Core Principles:

- **Electric Current:** The flow of electric charge, primarily electrons, through a conductor such as

copper wire.

- Electric Voltage: The potential difference that drives the flow of electrons from one point to another.
- Resistance: The opposition to the flow of electric current within a material, affecting how easily electrons can pass through.

In essence, electricity is the manifestation of the movement or presence of electric charges, which can be harnessed to perform work, generate light, heat, and power myriad devices.

The Scientific Foundations of Electricity

Understanding electricity from a scientific perspective involves exploring several key theories and laws that describe its behavior.

Electromagnetism

Electricity and magnetism are two sides of the same coin, unified under the theory of electromagnetism:

- Electromagnetic Force: One of the four fundamental forces of nature, responsible for interactions between charged particles.
- Maxwell's Equations: A set of four equations formulated by James Clerk Maxwell that describe how electric and magnetic fields are generated and altered by each other and by charges.

Atomic and Subatomic Structure

At the microscopic level:

- Atoms: Consist of a nucleus (containing protons and neutrons) surrounded by electrons.
- Electron Movement: In conductive materials, some electrons are loosely bound and can move freely, creating a sea of charge that facilitates electrical conduction.

Conductivity and Insulation

- Conductors: Materials like copper, aluminum, and silver that allow free movement of electrons, enabling efficient electricity flow.
- Insulators: Materials such as rubber, glass, and plastic that resist electron flow, preventing current passage.

Types of Electricity

Electricity manifests in various forms, primarily categorized into static and current electricity.

Static Electricity

- Definition: The accumulation of electric charge on the surface of objects, resulting in an electric field.
- Generation: Usually caused by friction, where electrons are transferred from one object to another.
- Examples: Lightning, shock from touching a doorknob after walking on a carpet, balloon sticking to a wall.

Current Electricity

- Definition: The continuous flow of electric charge through a conductor.
- Types:
 - Direct Current (DC): Electric charge flows in one constant direction; used in batteries and electronics.
 - Alternating Current (AC): Electric charge periodically reverses direction; used in household power supplies.

Generation of Electricity

Electricity is not naturally abundant in a usable form but is generated through various processes involving the conversion of other forms of energy.

Methods of Generation

- Mechanical Energy Conversion:
 - Generators and Turbines: Mechanical energy from wind, water, steam, or combustion engines turns turbines connected to generators, producing electricity.
 - Examples: Hydroelectric dams, coal-fired power plants, nuclear reactors, wind turbines.
- Chemical Energy Conversion:

- Batteries: Store chemical energy that converts into electrical energy through electrochemical reactions.
- Fuel Cells: Generate electricity through chemical reactions, often involving hydrogen.
- Renewable Sources:
 - Solar Panels (Photovoltaic Cells): Convert sunlight directly into electricity.
 - Geothermal and tidal energy: Use Earth's internal heat or ocean movements to generate power.

The Role of Power Plants

Power plants are facilities where large-scale electricity generation occurs. They often employ turbines driven by steam or water to rotate generators. The generated electricity is then transmitted through power lines to homes, industries, and institutions.

Electricity Transmission and Distribution

Once generated, electricity must be transmitted efficiently over long distances and distributed to end-users.

Transmission Lines

- High-Voltage Lines: Minimize energy loss over distances by increasing voltage and reducing current.
- Transformers: Step up voltage for transmission and step down for distribution.

Distribution Networks

- After transmission, electricity passes through local substations that adjust voltage levels.
- Distribution lines deliver electricity to homes, businesses, and industries.

Applications of Electricity

Electricity's versatility makes it essential across countless sectors.

Residential Use

- Lighting, heating, cooling, cooking, and powering appliances.
- Communication devices such as phones and internet modems.

Industrial Use

- Manufacturing processes, automation, and heavy machinery.
- Data centers, robotics, and large-scale equipment.

Transportation

- Electric vehicles (EVs), trains, and underground transit systems.
- Emerging technologies like electric planes and ships.

Medical and Scientific Fields

- Medical devices such as MRI machines, X-ray equipment.
- Scientific instrumentation and research facilities.

Safety and Risks Associated with Electricity

While electricity is indispensable, it poses inherent risks if mishandled.

Electrical Shock

- Can cause burns, nerve damage, or even death.
- Occurs when electric current passes through the body.

Fire Hazards

- Faulty wiring or overloads can ignite fires.
- Proper insulation, grounding, and circuit breakers are vital safety measures.

Electromagnetic Interference (EMI)

- Disrupts electronics and communication devices.

- Shielding and proper circuit design help mitigate EMI.

Precautions and Safety Tips

- Use qualified electricians for installations.
- Avoid overloading circuits.
- Keep electrical devices away from water.
- Regularly inspect wiring and appliances.

The Future of Electricity

As technology advances, the generation, transmission, and utilization of electricity continue to evolve.

Emerging Trends:

- Smart Grids: Intelligent networks that optimize electricity distribution.
- Renewable Integration: Increasing reliance on solar, wind, and other renewable sources.
- Energy Storage: Development of batteries and other storage systems for balancing supply and demand.
- Decentralization: More localized generation, like rooftop solar panels, reducing dependence on centralized power plants.
- Innovations in Transmission: High-voltage direct current (HVDC) lines and superconductors for more efficient transmission.

Challenges Ahead:

- Balancing energy demand with sustainable and environmentally friendly sources.
- Ensuring grid stability amid variable renewable generation.
- Developing affordable energy storage solutions.
- Addressing cybersecurity concerns for power infrastructure.

Conclusion

Electricity, in its essence, is a powerful and versatile form of energy that has revolutionized the way humans live and work. Its scientific principles, diverse sources, and vast applications underscore its importance in contemporary society. As we look toward a sustainable future, innovations in electricity generation and management will be crucial in meeting global energy needs while

protecting the environment. Understanding the fundamentals of electricity?from its atomic origins to its grand-scale generation and distribution?empowers us to use this vital resource responsibly and efficiently.

Question Answer What is electricity? Electricity is a form of energy resulting from the movement of charged particles, such as electrons, through a conductor. How is electricity generated? Electricity is generated using various methods, including burning fossil fuels, harnessing wind or water flow, nuclear reactions, or solar energy conversion. What are the common sources of electricity in households? Common sources include power plants that produce electricity from coal, natural gas, nuclear, hydroelectric, wind, or solar energy. Why is electricity important in daily life? Electricity powers almost all modern devices and appliances, enabling lighting, heating, communication, and transportation, making daily life more convenient and efficient. What safety precautions should be taken when handling electricity? Always avoid contact with exposed wires, do not overload circuits, use proper insulation, and keep electrical devices away from water to prevent shocks and accidents. How does electricity work in electronic devices? In electronic devices, electricity flows through circuits to power components like chips, screens, and motors, enabling the device to perform its intended functions.

Related keywords: electricity, electric current, voltage, power, circuits, electrons, energy, electrical energy, electrical charge, conductors

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