**Guided Notes: Strength of Electrical Forces**

**Big Idea**:

The strength of electric forces between charged objects depends on their \_\_\_\_\_\_\_, \_\_\_\_\_\_\_ of charge, and \_\_\_\_\_\_\_ from each other.

**Key Concepts**:

• Electric force is the \_\_\_\_\_\_\_ between two electrically charged objects that are close to each other.

• Objects with \_\_\_\_\_\_\_ charges attract, while objects with \_\_\_\_\_\_\_ charges repel.

• The \_\_\_\_\_\_\_ of electric charge affects the strength of the force.

• As the \_\_\_\_\_\_\_ between charged objects increases, the electric force \_\_\_\_\_\_\_.

• Electric force can be \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, or \_\_\_\_\_\_\_ depending on these factors.

• \_\_\_\_\_\_\_ is the unit used to measure electric charge.

**Real World Examples**:

1. Static cling: When you take clothes out of the dryer, they may stick together due to \_\_\_\_\_\_\_ charges attracting each other.

2. Touchscreen stylus: The tip of a stylus pen is made of conductive material that interacts with the screen through \_\_\_\_\_\_\_ forces.

**Guided Notes: Conductors and Insulators**

**Big Idea**:

Conductors allow electric current to flow easily, while \_\_\_\_\_\_\_ resist the flow of electric current due to differences in their atomic structure.

**Key Concepts**:

• The atomic structure of materials determines whether they are \_\_\_\_\_\_\_ or insulators.

• Conductors have loosely bound outer \_\_\_\_\_\_\_ that can move freely.

• Insulators have tightly bound electrons that \_\_\_\_\_\_\_ the flow of electric current.

• \_\_\_\_\_\_\_ is the measure of opposition to current flow in a material.

• Most \_\_\_\_\_\_\_ are good conductors of electricity.

• Common insulators include \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_ electricity is caused by friction between objects.

• \_\_\_\_\_\_\_ electricity is the flow of electric charge through a conductor.

• Some poor conductors can become better conductors when \_\_\_\_\_\_\_ in certain substances.

**Real World Examples**:

1. Lightning rods: These metal rods on buildings are \_\_\_\_\_\_\_ that safely direct lightning strikes to the ground, protecting the structure.

2. Rubber-soled shoes: The rubber soles act as \_\_\_\_\_\_\_ to protect you from electrical shocks when standing on a wet surface near electrical equipment.

**Guided Notes: Electrical Energy Properties**

**Big Idea**:

The properties of electrical energy in a circuit are determined by the relationship between \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_.

**Key Concepts**:

• Electrical energy is generated by the flow of \_\_\_\_\_\_\_ particles called electrons.

• \_\_\_\_\_\_\_ is the difference in electrical energy per unit charge across two points in a circuit.

• \_\_\_\_\_\_\_ measures how quickly electric energy moves in a circuit.

• Current is measured in \_\_\_\_\_\_\_ or coulombs per second.

• A \_\_\_\_\_\_\_ decreases the amount of current by transforming it into other forms of energy.

• \_\_\_\_\_\_\_ is measured in ohms and limits the amount of electric energy that can pass through a circuit.

• The relationship between voltage (V), current (I), and resistance (R) is expressed by the equation: V = \_\_\_\_\_\_\_.

**Real World Examples**:

1. Smartphone charging: If your charger is not compatible, it may provide the wrong \_\_\_\_\_\_\_, causing your phone to charge slower or faster than normal.

2. Dimmer switch: Adjusting a light dimmer changes the \_\_\_\_\_\_\_ in the circuit, which alters the brightness of the bulb by controlling the \_\_\_\_\_\_\_.

**Guided Notes: Electric Circuits**

**Big Idea**:

Electric circuits allow electrical energy to be \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ into other forms of energy while conserving the total amount of energy.

**Key Concepts**:

• An electric circuit is a \_\_\_\_\_\_\_ path through which electric current flows.

• The main components of a circuit are: \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_.

• Electrical energy in circuits comes from sources like \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, or \_\_\_\_\_\_\_.

• Energy can be transformed but not \_\_\_\_\_\_\_ or \_\_\_\_\_\_\_, according to the Law of Conservation of Energy.

• Common energy transformations in circuits include:

 - Electrical to \_\_\_\_\_\_\_ (in light bulbs)

 - Electrical to \_\_\_\_\_\_\_ (in speakers)

 - Electrical to \_\_\_\_\_\_\_ (in toasters)

 - Electrical to \_\_\_\_\_\_\_ (in motors)

• Energy forms include: \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_.

**Real World Examples**:

1. Electric car: Chemical energy stored in the battery is transformed into \_\_\_\_\_\_\_ energy to power the motor, which then converts it to \_\_\_\_\_\_\_ energy to move the car.

2. Wireless earbuds: \_\_\_\_\_\_\_ energy from the battery is converted to \_\_\_\_\_\_\_ energy in the speakers, while Bluetooth signals use \_\_\_\_\_\_\_ energy to transmit data.

**Guided Notes: Strength of Magnetic Forces**

**Big Idea**:

The strength of magnetic forces in an electromagnet depends on the \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ of the electric current.

Key Concepts:

• An electromagnet consists of a coil of wire wrapped around an \_\_\_\_\_\_\_\_\_\_ core.

• When an electrical current travels through the wire, a \_\_\_\_\_\_\_\_\_\_ field is produced.

• The strength of the magnetic force increases when:

 - The \_\_\_\_\_\_\_\_\_\_ of the electric current increases

 - The number of \_\_\_\_\_\_\_\_\_\_ in the wire coil increases

• \_\_\_\_\_\_\_\_\_\_ refers to the property of matter that determines how it acts in a magnetic field.

• An electric current is the \_\_\_\_\_\_\_\_\_\_ of charges through a conducting wire.

• Magnetic force is the force of \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_ between moving charged particles.

**Real World Examples:**

1. Maglev trains: These high-speed trains use powerful electromagnets to \_\_\_\_\_\_\_\_\_\_ above the tracks and propel forward. The strength of the electromagnets affects how fast the train can \_\_\_\_\_\_\_\_\_\_ and how smoothly it rides.

2. Electromagnetic door locks: Many modern buildings use electromagnetic locks on doors for security. The strength of the electromagnet determines how \_\_\_\_\_\_\_\_\_\_ the door is held closed and how much force is needed to \_\_\_\_\_\_\_\_\_\_ it.

**Guided Notes: Electromagnetism in Use**

**Big Idea**:

Electric currents and magnetic fields are closely related, allowing for the creation of \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_.

**Key Concepts**:

• An electric current passing through a conductor generates a \_\_\_\_\_\_\_\_\_\_ field around it.

• The magnetic field exerts a \_\_\_\_\_\_\_\_\_\_ force on nearby objects without physical contact.

• In an electromagnetic motor:

 - A conductor connected to a \_\_\_\_\_\_\_\_\_\_ produces a magnetic field when current flows

 - This magnetic field interacts with a \_\_\_\_\_\_\_\_\_\_ to cause motion

• Electromagnetism has many technological applications, including:

 - \_\_\_\_\_\_\_\_\_\_ generators

 - Electric \_\_\_\_\_\_\_\_\_\_

 - \_\_\_\_\_\_\_\_\_\_ microphones

**Real World Examples**:

1. Hard disk drives in computers: These use electromagnets to read and write data on magnetic disks. The strength of the electromagnet affects how quickly and \_\_\_\_\_\_\_\_\_\_ data can be accessed and stored on the \_\_\_\_\_\_\_\_\_\_.

2. Electromagnetic locks: Many schools and businesses use electromagnetic locks on doors for security. When electricity flows through the electromagnet, it creates a strong magnetic field that keeps the door \_\_\_\_\_\_\_\_. The strength of the electromagnet determines how much force is needed to \_\_\_\_\_\_\_\_ the door.