Name: _____ Date: _____

Magnetism

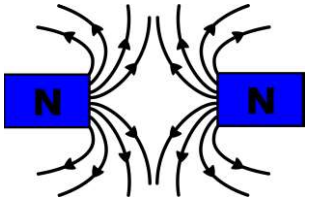
What is Magnetism?

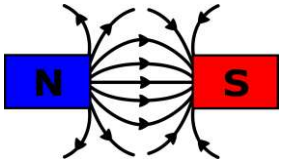
Magnetism is a force that acts at a distance, meaning it doesn't need direct contact to influence objects. This force is caused by a magnetic field, which surrounds a magnet. A magnetic field is an invisible area around a magnet where magnetic forces can be felt. Anything that comes into this field can be attracted or repelled by the magnet.

Magnetic Poles

Every magnet has two ends, called magnetic poles. These are known as the North Pole and the South Pole. The magnetic force is strongest at these poles. Here are some important points to remember about magnetic poles:

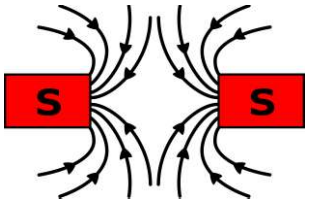
- **Opposite poles attract:** If you bring the North Pole of one magnet close to the South Pole of another magnet, they will pull toward each other.
- **Like poles repel:** If you try to bring two North Poles or two South Poles close together, they will push away from each other.





Magnetic Fields

Although magnetic fields are invisible, we can still see their effects. One way to visualize a magnetic field is by using iron filings. If you sprinkle iron filings around a magnet, they will arrange themselves along the lines of the magnetic field, showing the pattern of the field around the magnet. Other methods, like using small compasses, can also show the direction of the magnetic field.



Earth's Magnetic Field

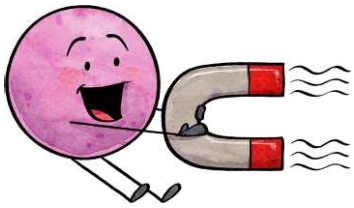
Did you know that Earth itself acts like a giant magnet? The planet has its own magnetic field, with a North and South Pole just like a regular magnet. This field is crucial for many reasons:

- **Navigation**: Compasses work because of Earth's magnetic field. The needle of a compass is a small magnet that aligns with Earth's magnetic field, pointing toward the North Pole. This has been an essential tool for navigation for centuries.
- **Protection:** Earth's magnetic field also protects us from harmful solar radiation by deflecting charged particles coming from the sun.

Magnetism is a fascinating force that plays a vital role in our everyday lives, from the simple fridge magnets we use at home to the Earth's magnetic field that helps us find our way!

Name: _____ Date: _____

Magnetism



1. What is magnetism and how does it act on objects?

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2. How do compasses work and why are they essential for navigation?

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3. Describe how the Earth's magnetic field protects us from solar radiation.

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4. Explain why like poles repel each other and how this principle is applied in everyday objects.

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Name: _____ Date: _____

Electromagnetism

What is Electromagnetism?
Electromagnetism is a branch of physics that deals with the relationship between electricity and magnetism. It's a fundamental force of nature that combines electric and magnetic fields into one unified theory. This force is responsible for many everyday phenomena, from the way electric motors work to how your credit card is read at a store.

Electricity and Magnetism:
Before diving into electromagnetism, let's quickly recap the basics of electricity and magnetism:

- Electricity is the flow of electric charge, typically carried by electrons moving through a conductor, such as a copper wire. This flow is called electric current.
- Magnetism is a force that attracts or repels objects made of certain materials, like iron, nickel, and cobalt. Magnets have two poles (north and south), and opposite poles attract each other, while like poles repel.

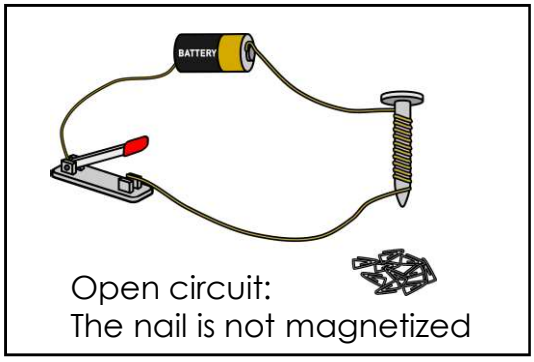
How Are They Connected?
When an electric current flows through a wire, it creates a magnetic field around the wire. This was first discovered by Hans Christian Ørsted in 1820, when he noticed that a compass needle moved when placed near a wire carrying an electric current. This simple observation led to the understanding that electricity and magnetism are closely linked.

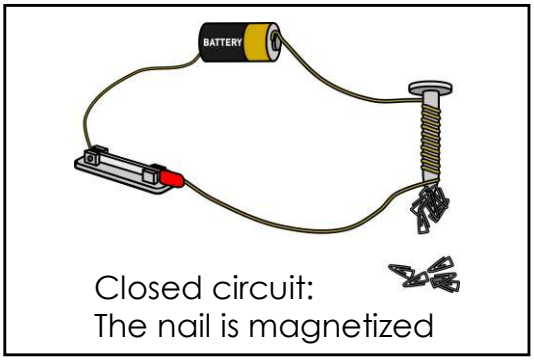
What is an Electromagnet?
An electromagnet is a type of magnet where the magnetic field is created by an electric current. Unlike a permanent magnet, which always has a magnetic field, an electromagnet can be turned on or off with the flow of electricity. This makes electromagnets incredibly useful in many technologies.

How Does an Electromagnet Work?

An electromagnet is made by wrapping a coil of wire around a core, usually made of iron. Here's how it works:

1. **Coiling the Wire:** The wire is coiled to concentrate the magnetic field. The more coils you have, the stronger the magnetic field will be.
2. **Adding a Core:** Placing an iron core inside the coil makes the magnetic field even stronger. This is because the iron core becomes magnetized by the magnetic field, effectively amplifying it.
3. **Electric Current:** When you pass an electric current through the wire, it creates a magnetic field around the wire. Because the wire is coiled, this magnetic field becomes stronger and more focused, creating a powerful magnet.
4. **Turning it On and Off:** One of the key features of an electromagnet is that it only works when there is a current flowing through the wire. When the current is turned off, the magnetic field disappears, and the iron core loses its magnetism.





Applications of Electromagnets:

Electromagnets are used in countless applications. Some common examples include:

- **Electric Motors:** Electromagnets are used in electric motors to convert electrical energy into mechanical energy.
- **MRI Machines:** In medicine, MRI machines use powerful electromagnets to create detailed images of the inside of the human body.
- **Maglev Trains:** Electromagnets are used in maglev (magnetic levitation) trains, allowing them to float above the tracks and travel at high speeds without friction.
- **Relays and Switches:** In electronics, relays use electromagnets to control the flow of electricity in a circuit.

Key Takeaway:

The relationship between electricity and magnetism is fundamental to understanding how many modern technologies work. By experimenting with electromagnets, we can see firsthand how electricity can create a magnetic field and how we can control this field to perform useful tasks.

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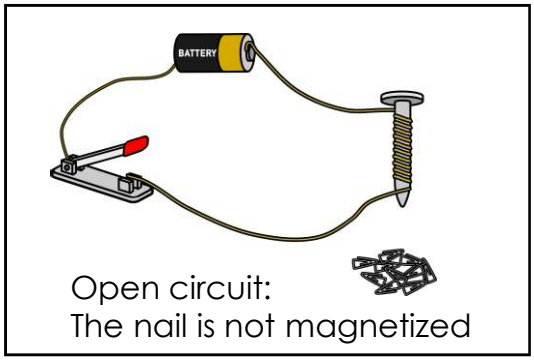

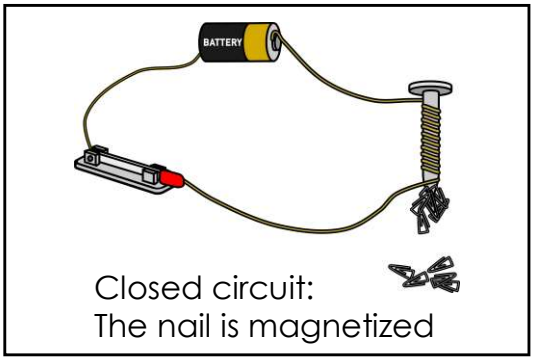

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