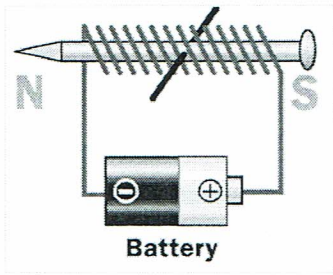
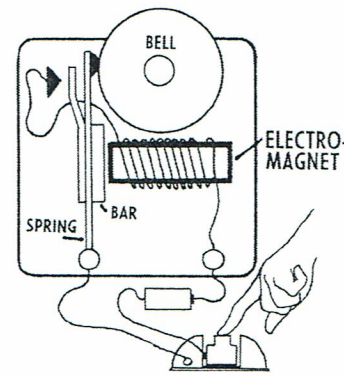
Current Attractions



Magnets Lesson 2

Magnets from Electricity

Electricity can also be used to magnetize metal. When electricity passes through a wire, a weak magnetic field is formed around the wire. The magnetic field can be used to magnetize metal. Look at the picture. A wire has been wrapped around a nail. If you pass electricity through the wire, the nail becomes magnetized. When the current is stopped, the nail is no longer a magnet. A temporary magnet made by using electricity is called an **electromagnet**.



How We Use Electromagnets

Electromagnets come in all sizes, from little ones that make doorbells ring by pulling a striker rapidly forward, to enormous magnets that stick to and pick up entire cars. Some soda cans are made of steel and some of aluminum. Recycling centers want to separate the aluminum cans from the steel ones. Since all steel has iron in it, electromagnets are used to pull the steel cans out from among the aluminum ones.

Electromagnets control what you hear and what you see, too. In a cassette player, the shiny rounded metal parts with black parts on the inside are magnets. You can't see inside a VCR easily because of the way it's built, but it has magnets, too. TV picture tubes and stereo speakers contain powerful electromagnets. Some electromagnets are used in junkyards to move large cars or trucks.

Just the Facts

- Light is a form of an electromagnetic wave.
- Electricity can be used to make powerful magnets called electromagnets.
- Electromagnetic induction allows for the creation of huge electrical generators.
- Electromagnets can be switched on and off. The core of the electromagnet can be iron or steel – this makes the magnet stronger.
- Electromagnets have coils of electric current – the number of coils and voltage control the strength. The strength of an electromagnet may be increased by adding more electrical current to it.
- Without electromagnets, there would be no hair dryers, TV's, or computers.

Electromagnetism

Whenever an electric current goes through a wire, a magnetic field is created around the wire. Electricity and magnetism are related; an electric current produces a magnetic field, and a change in a magnet in a magnetic field can produce an electric current. When current goes through a coiled wire, the magnetic field is strengthened because each coil acts like a separate magnet.

The strength of an electromagnet can be increased in several ways. The number of coils can be increased. The voltage of the current going through the wire can be increased. Using a metal core, such as a nail or a bolt, will also increase the strength of the electromagnet. The magnetic field produced by the current in the coils induces a magnetic field in the iron core.

Electromagnets are an integral part of many common devices such as telephones, electric motors, generators, televisions, and door bells.

Electromagnets are demagnetized each time the electric power is turned off. This is useful because we want to control them. When we tell an electromagnet to magnetize, it will lift heavy objects made of magnetic material. When we tell it to demagnetize, it will drop or let go of the objects. Electromagnets are made so that they gain or lose magnetic power when we press the right buttons. When they lose power, they are doing exactly what we want them to do.

An electromagnet can sort one material from another. For example, if you are trying to separate materials that that contains iron or steel from a material that does not contain iron or steel. This works because the electromagnet will only pick up the material that has the iron or steel and leave the other material alone.

How to Make an Electromagnet

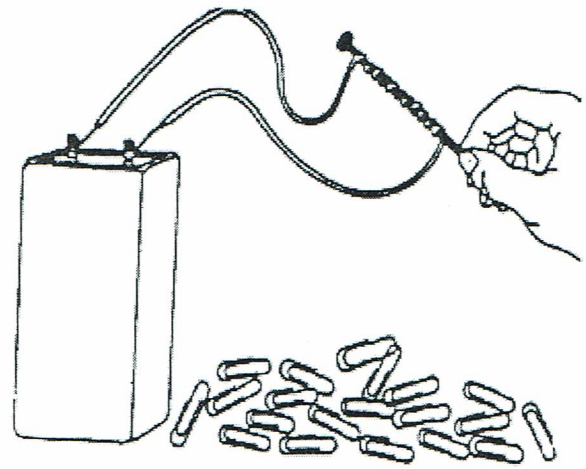
To make an electromagnet you would need some insulated wire, something to use as the core (a nail) and a source of electric current (an electric cell - battery). The wire needs to be wrapped around the iron core. Then connect the ends of the wire to the electric power source. When current is flowing through the wire, the coil and the iron core will become an electromagnet.

You could increase the strength of an electromagnet by increasing the number of loops of wire around the iron core. Another way to increase the strength is to increase the amount of current in the circuit. For example, if you used one electrical cell to make the magnet, use two cells.

Make An Electromagnet Demonstration

Materials

nail, insulated wire, battery, staples, paper clips



Procedure

To make your electromagnet:

1) Wind the wire tightly around the nail, leaving about 10 cm free at both ends.
2) Remove the insulation at both ends of the wire.
3) Attach the wire to both ends of the battery.
4) Test the nail electromagnet by picking up the staples and paper clips with the nail. Record your observations.

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5) Disconnect the battery. Record your observations.

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Conclusion

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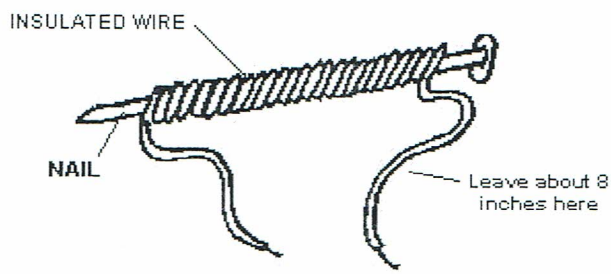
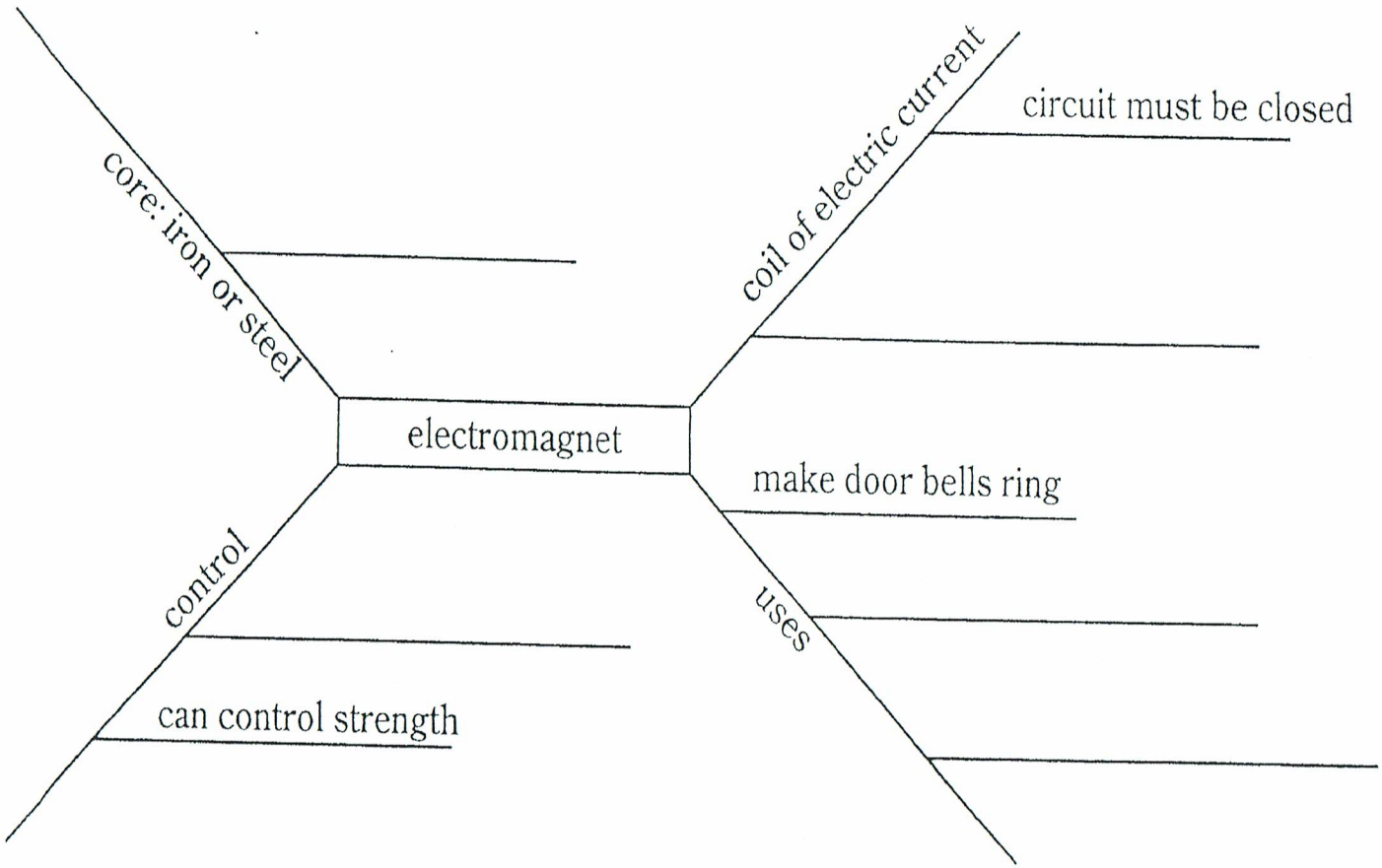




Use the phrases below to correctly fill in the concept map.

makes stronger magnet

number of coils and voltage control strength

can turn on and off when needed

separate steel cans from aluminum

lift big objects

What do I know about magnets?

1. What can a magnet do?

2. How many poles does a magnet have? Name them.

3. Explain how you could make a magnet yourself.

4. What part of a magnet has the most magnetic strength?

5. What would happen if you put two magnets together?

6. Where does the needle on a magnetic compass point?

7. What would happen if you put a paper clip near a magnet?

8. Describe how you could make an electromagnet.

9. What are two ways that you could increase the strength of the electromagnet you just described?

10. How could electromagnets be used to sort one type of material from another?

Final Exam Study Guide for Electricity & Magnetism

Circuit- a path that electricity can move through.

Lightning- electricity in the clouds

Lodestone-"Leading Stone"-a natural, permanent magnet that contains magnetite.

Two objects that pull toward each other are said to have **different** charges.

Nucleus - the part of the atom that contains the protons and neutrons.

Cell - another name for a battery.

Parallel Circuit - a circuit where if one bulb goes out the other bulbs stay lit.

Grounding - the transfer of electrical charges to the ground

Insulator - a material that doesn't allow electric to flow trough it easily.

Switch - a device that opens & loses circuits without unscrewing the light bulbs or disconnecting the wires.

Poles -the ends of a magnet. There is a north & South Pole.

The tiny part of an atom that has a negative charge is called the **electron.**

Atom - the smallest piece of an element that can still be identified as an element.

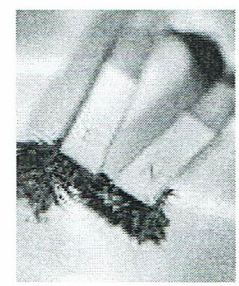
The north pole of a magnet points toward the magnetic north of the **Earth.**

Resistor -a material that resists the flow of electricity.

Circuit Breaker - keeps excess current from flowing through the wires.

When an object loses some of its electrons it will have **positive** charge.

Current Electricity -electricity that moves like currents in stream or river.



Series Circuit - a circuit where if on bulb goes out, they all go out.

Conductors - materials that allow electricity to flow them easily.

An example of a resistor in a light bulb is called a **filament.**

Closed circuit -a circuit with no breaks or interruptions.

Magnetic Force -the pushing & pulling behavior of a magnet.

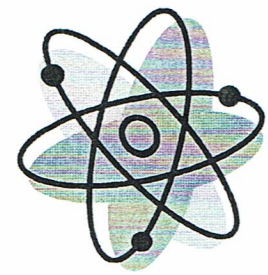
Magnetic Field - the area around a magnet, it is invisible and it surrounds the magnet on all sides.

A strip of metal that allows excess current to flow through it is called a **fuse.**

Static electricity - an electrical charge that is on something and doesn't move.

Electromagnet - a magnet that is produced by an electric current, usually a core of iron wrapped in conductor.

If two objects repel away from each other, they both have the **same** charge.



Protons - the tiny part of the atom that has a positive charge.

Open Circuit - a circuit where there are breaks or interruptions.

Know the following diagrams: How to draw them and their labels

An atom and all its parts, also be able to tell what type of charge it is.
A light bulb and label its parts.
A circuit diagram showing either an open or closed circuit and label its parts.
A bar magnet showing its magnetic filed and label its parts.