AMERICAN LANGUAGE COURSE

UNIT 2405

OUTLINE AND STUDY OBJECTIVES

READING: MAGNETISM AND ELECTRICITY

QUESTIONS ON THE READING

USEFUL EXPRESSIONS

TAPE 2405A

TAPE 2405B

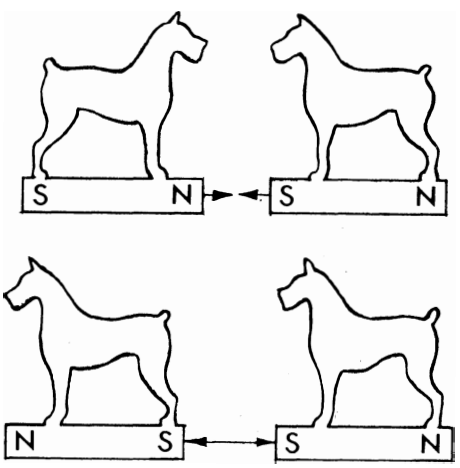
UNIT 2405

READING

MAGNETISM AND ELECTRICITY

People have known about magnets for many *centuries* (hundreds of years). Up to the 16th century, the attracting property of magnets was considered more magical than scientific. Many legends were told about the magic of magnets. One famous story from Greece is about a magnetic mountain that would pull all the nails out of a ship. Any ship that passed near the mountain would fall apart.

In the 16th century, a man discovered another property of magnets. He found out that each magnet has a north and south pole. Furthermore, he found out that *like* (similar) poles repel each other and unlike poles attract each other. A good illustration of this is a small toy for children. The toy consists of two dogs which are on top of two bar magnets. Study the illustrations carefully and see why there is attraction in one and repulsion in the other.



QUESTIONS ON THE READING

1. How long have people known about magnets?
2. What did they think about magnets before the 16th century?
3. How many poles attract each other?
4. Which poles attract each other?
5. Which poles repel each other?

It was also discovered that the earth acts as a huge magnet. A bar magnet reacts to the earth as it does to any other magnet. A compass contains a magnet that rotates freely. The *needle* (magnet) of the compass always points north and, therefore, provides a reference. This is a great help to navigators.

1. Why does a magnet react to the earth?
2. Is a compass needle a magnet?
3. Why does a compass needle always point north?
4. How did a compass help navigators?
5. In how many ways does a magnet react to another magnet?

A substance with an electrical charge has some properties of a magnet. When you comb your hair, you sometimes notice that the comb attracts small bits of paper or other light material. This is because your comb is made of hard rubber, and it acquires an electrical charge when you comb your hair. A glass rod will also acquire an electrical charge when you rub it on silk. Your comb has a negative charge and the glass rod has a positive charge. Like charges repel each other; unlike charges attract each other.

1. What kind of charge does the comb have?

2. What kind of charge does the glass rod have?

3. Would two electrically charged combs attract each other? Why?

4. Would an electrically charged comb and an electrically charged glass rod repel each other? Why?

5. Would two electrically charged glass rods repel each other? Why?

6. In which way is the reaction of the electrically charged objects and magnetic poles similar?

An explanation can be made in regard to the actions of the electrically charged comb and glass rod. Normally, the comb and glass rod contain a certain amount of electrons. When you comb your hair, the comb acquires extra electrons. Any object with an excess of electrons has a negative

The glass rod loses some of its electrons when rubbed on silk. Any object that has less than its normal amount of electrons has a positive charge.

1. What does the comb and glass rod contain?

2. What does the rubber comb pick up when you comb your hair?

3. What is lost by the glass rod when rubbed on silk?

4. What is a negative charge?

5. What is a positive charge?

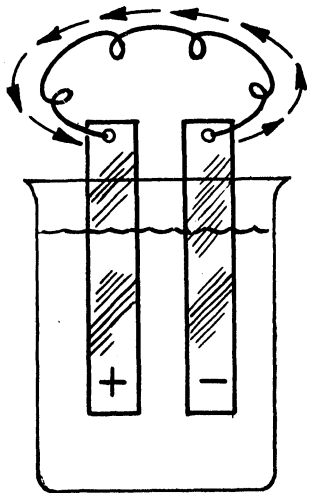
When a negatively charged comb touches a positively charged glass rod, some of the excess electrons from the comb go to the glass rod. If they do not touch each other, the transfer is usually impossible unless a conductor is used. Silver, copper, and most metals are good conductors. A good conductor is any substance that allows the electrons to move freely through it. You can compare a conductor to a water pipe which allows water to go from one tank to another. An electric wire serves the same purpose.

1. What substances are good conductors?

2. Explain what happens when a negatively charged comb touches a positively charged glass rod.

3. How can electrons move from the comb to the glass rod even though they do not touch each other?

4. Compare an electric wire to a water pipe.



So far you have been reading about static electricity. The rubber comb and glass rod had static electricity. It is not useful to man because it is not controlled. Static electricity causes such minor things as paper to "stick" to your comb. It also causes lightning which kills many people in the United States each year.

We can produce a more *controllable electric current* (movement of electrons through a conductor) through chemical action. Chemical action occurs when two different kinds of metal are placed in an acid solution. Basically one metal gains electrons. Therefore, if you connect the two pieces of metal with a conductor, the excess electrons from one metal move to the other. This chemical action occurs in all batteries.

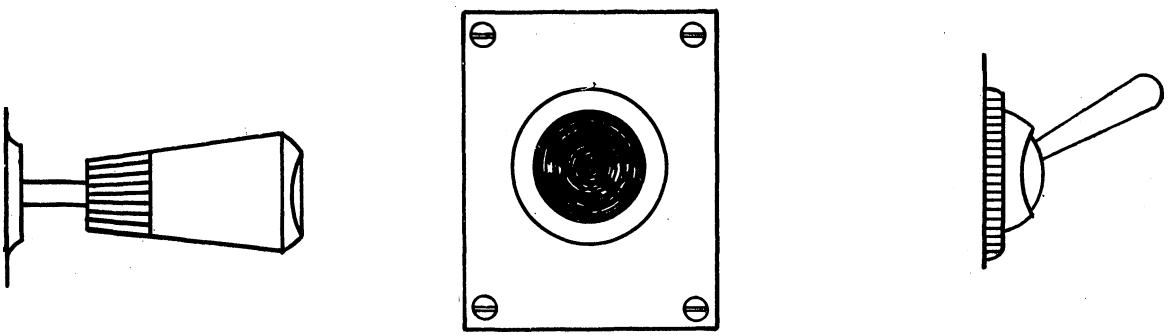
1. Give two examples of static electricity.
2. What gives us a more controllable electric current?
3. Do both metals remain the same when placed in the acid solution?
4. How are the excess electrons transferred from one metal to the other?

Batteries, however, are not our greatest source of electricity. Batteries are used for small machines and tools such as portable radios, flashlights, cars, and airplanes. Only generators can supply a big city with enough electrical energy for its needs. A generator uses magnets to produce an electric current. Some generators are small and are used in such things as an automobile's electrical system. Other big generators produce electricity many miles away from a city and send it with enough energy for all the city lights, factories and other private and industrial needs.

USEFUL EXPRESSIONS

1. A generator *produces* (generates) electricity.
2. There are many kinds of generators.
3. A volt is a unit of measurement in electricity.
4. A high voltage line is very dangerous.
5. An electric shock can easily kill a person.
6. A person who works with electric equipment is generally referred to as an electrician or an electrical repairman.
7. If an electrical repairman specializes in some specific area, he may be called a radio repairman, television repairman, or radar repairman.
8. A switch may turn on or off an electric current.

9. Switches may have different shapes. They may look like a knob, button, or lever.



10. You turn a knob, push a button and pull a lever.

11. Some switches automatically turn themselves on or off.

12. An automatic electric heater switch is called a thermostat.

13. An electric heater or refrigerator has a thermostat.

14. Copper wires are used to carry an electric current.

15. An electric current flows more easily through a thick wire than thin wire.

16. An electrical circuit has a wire which connects a positive pole to a negative pole.

17. The electric current flows through the conductor in an electrical circuit.

18. An electromagnet is an iron bar or rod that becomes a magnet when the electricity is turned on.

19. When the current is turned off, the electromagnet loses its magnetism.

20. An electromagnet can be used to lift heavy pieces of iron.

TAPE 2405A

Listen.

Let's practice the pronunciation of some key words and phrases.

*****

Listen and repeat.

effects of magnetism	*	effects of magnetism	*
We know a lot about the effects of magnetism.			*
bar magnet	*	bar magnet	*
The compass needle is an example of the bar magnet.			*
powerful electromagnets	*	powerful electromagnets	*
Powerful electromagnets are used to produce electricity.			*
suspended in a horizontal position	*	suspended in a horizontal position	*
Suspended in a horizontal position, the bar magnet points nearly north and south.			
magnetized spots	*	magnetized spots	*
Poles are magnetized spots on the magnet.			*
like poles repel	*	like poles repel	*
Like poles repel each other.			*
unlike poles attract	*	unlike poles attract	*
Unlike poles attract each other.			*

Listen.

Listen to the following sentences. Answer the questions when you hear **. Repeat the correct answer when you hear *

Like poles repel each other. Unlike poles attract each other. In other words, the ends of magnets with similar magnetic force push apart. Whereas, the ends of magnets with dissimilar magnetic power draw together.

What is another word for repel?	**
push apart	*
What is another word for attract?	**
draw together	*
What is another word for unlike poles?	**
dissimilar poles	*
What is another word for like poles?	**
similar poles	*

Which poles attract each other? **
unlike or dissimilar poles *

Which poles repel each other? **
like or similar ones *

Listen.

Poles are magnetized spots on the ends of the magnet. The ends of the magnets have strong magnetic force or attraction. The magnetic force diminishes toward the center of the magnet.

Which parts of the magnet have powerful magnetic force? **
the ends *
The ends have powerful magnetic force. *

What happens to this force toward the center of the magnet? **
it diminishes *
It becomes less powerful. *

What are poles? **
magnetized spots *
Poles are magnetized spots. *

Listen.

Electricity is generated or converted in two main ways: chemically and mechanically. The flashlight and the car battery are examples of devices used to convert electricity chemically. The generator and the magneto are familiar examples of devices used to convert electricity mechanically.

In how many main ways is electricity generated? **
two *
It is generated in two main ways. *
Electricity is generated in two main ways. *

What are the two major ways? **
chemically and mechanically *
The two major ways are chemically and mechanically. *

What is a familiar device used to change chemical energy to electrical energy? **
the automobile battery *
The automobile battery is a familiar device. *

What is a familiar device used to change mechanical energy to electrical energy? **
the generator *
The generator is a familiar device. *

Listen to the following dialog.

Student: Do scientists know what electricity is?

Instructor: Scientists tell us that they do not know exactly what electricity is. Yet, we know how to produce it, transmit it, and to use it to do work for us.

Student: In how many different ways is electricity mostly produced?

Instructor: In two ways: chemically and mechanically. The flashlight battery and the car battery are familiar examples of electricity produced chemically.

Student: I noticed that you spoke about *producing* electricity. Is it actually produced?

Instructor: No, it isn't. To be more exact, we *convert* energy.

Student: Chemical energy then is converted into electric energy, isn't it?

Instructor: That's correct. Mechanical energy is converted to electric energy to light our homes and drive our machines.

Student: Water in motion, steam in motion, the gasoline and the diesel engines in motion are examples of mechanical energy.

Instructor: Right. Generators and magnetos are familiar examples of devices used to transform mechanical energy into electrical energy.

Student: Are generators and magnetos different?

Instructor: Yes, but let's not discuss that here. Just remember that both the generator and the magneto change mechanical energy into electrical energy.

*****

Repeat.

Do scientists know what electricity is? *

Scientists tell us that they do not know exactly what electricity is. *

Yet, we know how to produce it, to transmit it, and to use it to do work for us. *

Name two ways in which electricity is produced. *

chemically and mechanically *

The flashlight battery and the car battery are familiar examples of electricity produced chemically. *

I noticed that you spoke about producing electricity. *

Is it actually produced? *

No, it isn't. To be more exact, we convert or transform energy. *

Chemical energy then is converted into electric energy, isn't it? *

That's correct. Mechanical energy is converted to electric energy to light our homes and drive our machines. *

Water in motion, steam in motion, the gasoline and the diesel engines in motion are examples of mechanical energy. *

Right. Generators and magnetos are familiar examples of devices used to transform mechanical energy into electrical energy. *

Are generators and magnetos different? *

Yes, but let's not discuss that here. *

Just remember that both the generator and the magneto change mechanical energy into electrical energy. *

TAPE 2405B

Listen.

Magnets are used to remove particles of iron or steel from wounds in the eye. The powerful electromagnet is especially useful for lifting heavy pieces of metal. When the current is turned on, the electromagnet attracts and holds the pieces of metal. Then when the current is turned off, the load is dropped.

*****
Listen and repeat.

from the eye *
from the eye *
to remove metal particles *
to remove metal particles *
to remove metal particles from the eye *
to remove metal particles from the eye *
Magnets are used to remove metal particles from the eye. *
Magnets are used to remove metal particles from the eye. *

for lifting heavy pieces of metal *
for lifting heavy pieces of metal *
The electromagnet is useful for lifting heavy pieces of metal. *
The electromagnet is useful for lifting heavy pieces of metal. *

the magnet holds the objects *
the magnet holds the objects *
When the current is turned off, the magnet drops the objects. *
When the current is turned off, the magnet drops the objects. *

Magnets are used to remove metal particles from the eye. *

They are also used to remove metal particles from wounds. *

Electromagnets are used to lift heavy pieces of metal. *

The electromagnet holds the pieces of metal. *

It holds them when the current is turned on. *

When the current is turned off, it drops the pieces of metal. *

Powerful electromagnets are very useful for lifting heavy metal objects. *

*****
Listen and answer. Do not repeat the questions.

What are powerful electromagnets useful for? **
for lifting heavy metal objects *
They are useful for lifting heavy metal objects. *

Does the magnet drop or hold pieces of metal when the current is turned off? **
drops them *
It drops them. *

What happens when the current is turned on? **
It holds the pieces of metal. *
The magnet holds the pieces of metal. *

What do doctors use the magnets for? **
for removing metal particles *
Doctors use magnets for removing metal particles from wounds in the eye. *

*****
Listen and repeat.

Turn the tape recorder on. *
Turn the switch to "ON." *
Turn the knob to "ON." *

Turn the tape recorder off. *
Turn the switch to "OFF." *
Turn the knob to "OFF." *

Turn the engine on. *
Turn the starter switch to "ON." *
Turn the ignition switch to "ON." *
Turn the engine off. *
Turn the starter switch to "OFF." *
Turn the ignition switch to "OFF." *

Leave the switch in the "ON" position. *
Leave the switch in the "OFF" position. *

Listen.

Let's practice some question patterns.

*****
Listen and repeat.

How did the magnet get its name? *
How did the Mississippi River get its name? *
How did you come to the United States? *
How did he go to town? *

How long have people known about magnetism? *
How long have you known about the accident? *
How long have you been at Lackland? *
How long have you been in the United States? *
How long have you studied English? *

What was an early use of the bar magnet? *
What was an early use of the compass? *
What was an early use of the helicopter? *
What was an early use of the microscope? *

How are generators usually driven? *
How are large ships usually driven? *
How are trains usually driven? *

You will need pencil and paper for a short dictation exercise. You may correct your work during the playback if necessary. Give your paper to the instructor for review.

First, you will listen to the reading of the paragraph. This time it will be read in a normal manner. Then, you will write the sentences as the speaker reads slowly and carefully. You may correct sentences during the final normal reading.

Ready, here is the paragraph.

A car has a battery and a generator. The electrical energy of the battery is used to start the engine. If the battery is weak, the car may not start. Once the car starts, the engine causes the generator to produce electrical energy. Then the generator supplies all the electrical energy needed to operate the electrical system of a car. Without a renewal of energy by the generator, the battery would soon be too weak to start the engine.