

# Preview of Period 18: Information Transfer

## 18.1 Loudspeakers and Microphones

How do microphones and loudspeakers work?

How are microphones and loudspeakers similar? How are they different?

## 18.2 Information Transfer

How is radiant energy used to transfer information?

## Act. 18.1: Loudspeakers

**A loudspeaker converts electrical energy into sound energy.**

- ◆ A changing current induces a changing magnetic field around its wire.
- ◆ This changing magnetic field is attracted to and repelled by a magnet attached to the cone of the speaker.
- ◆ The magnet moves the speaker cone, which produces the sound waves from the speaker.

## Act. 18.1: Microphones

**A microphone converts sound energy into electrical energy.**

- ◆ Pressure from sound waves moves a magnet inside the microphone.
- ◆ The moving magnet creates a changing magnetic field.
- ◆ The changing magnetic field induces a changing electric current.

# Loudspeakers and Microphones

**A loudspeaker is the opposite of a microphone:**

- ◆ Loudspeakers convert electrical energy into sound energy.
- ◆ Microphones convert sound energy into electrical energy.

**Both microphones and loudspeakers use**

- ◆ a changing current, which induces a changing magnetic field around the wire and
- ◆ the magnetic force between the changing magnetic field and another magnet.

## Act.18.1: Building a Speaker

Follow the directions to build a loudspeaker.

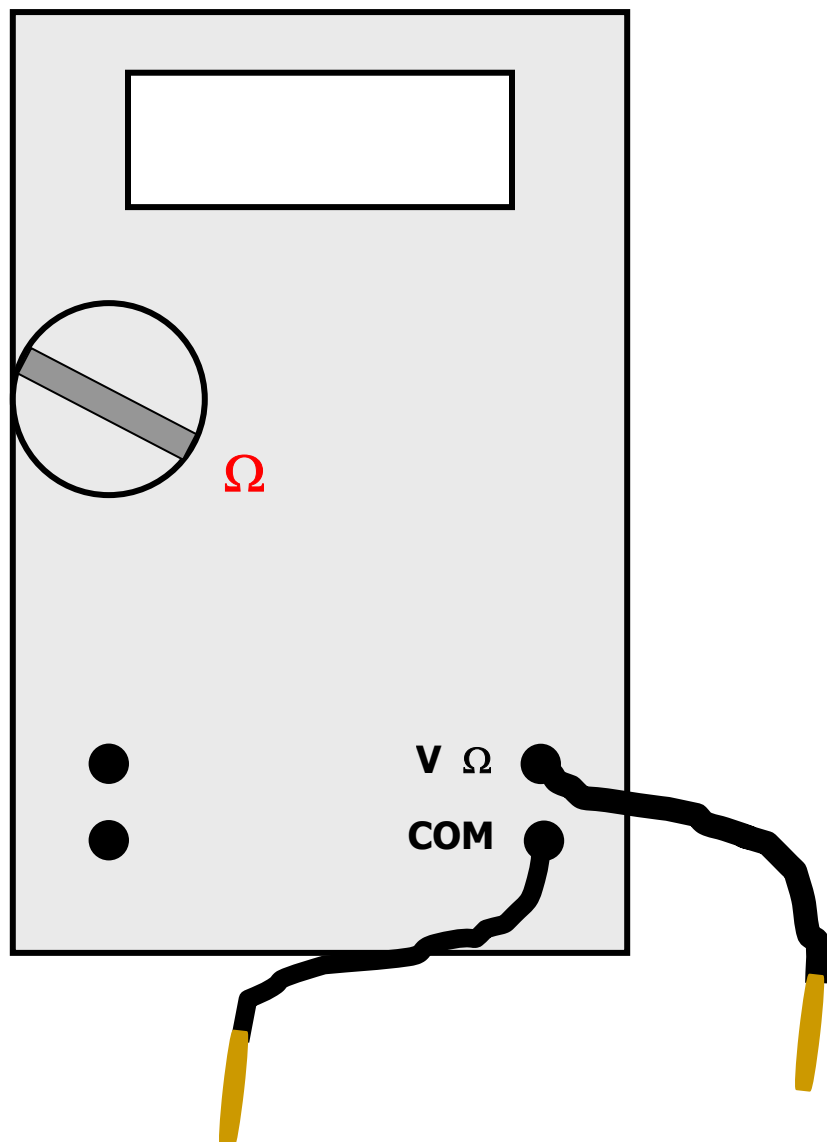
What is the purpose of wrapping wire around the bolt?

How many magnets does the speaker have?

What makes the speaker cone (the foil pan) move?

## Act. 18.1.e: Measuring Resistance

1. Turn the dial to the ohm symbol ( $\Omega$ ).
2. Check that the wire leads are attached to the outlets on the **lower right** of the meter.
3. To measure resistance, touch the ends of the leads to the connections on the cup of carbon.



## Information Transfer

Transferring information requires .....

- a **source** of information (a person or device)
- a **signal** (the information)
- a **receiver**
- **modulation** (changing) of the signal in a meaningful way. Examples: spoken language, Morse Code, or radio and TV broadcasts

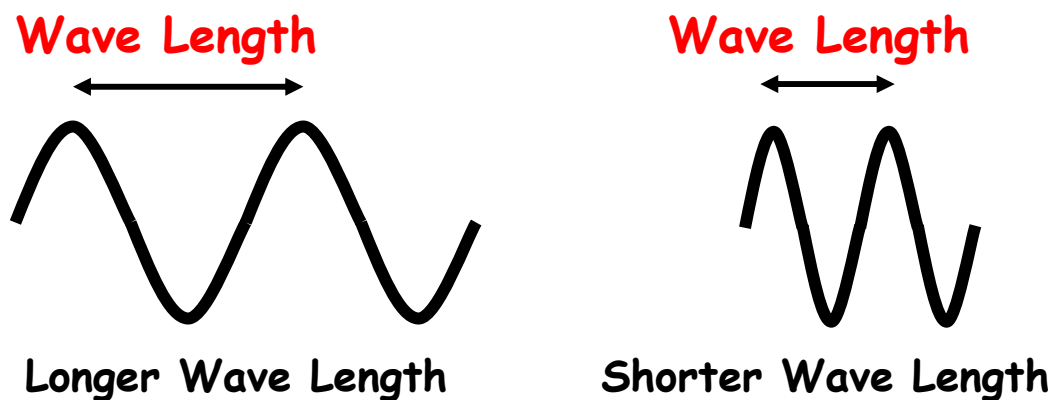
**Some transfers of information involve the transfer of matter, such as current flowing through an electric circuit.**

**Radiant energy can transfer information without transferring matter by modulating radiant energy.**

**Examples of types of radiant energy:  
Radio waves, microwaves, infrared radiation, and visible light**

# Information Transfer with Radiant Energy

- ◆ Information can be transferred with waves of radiant energy (electromagnetic energy).
- ◆ Radiant energy waves can travel through a medium, such as air or water, or through the vacuum of empty space.
- ◆ Radiant energy is transferred by waves of different lengths.



- ◆ Long **radio waves** are used to broadcast radio signals.
- ◆ Shorter **microwaves** are used for communication and in microwave ovens.
- ◆ Visible **light waves** are even shorter.

## Period 18 Summary

**18.1:** Some transfers of energy and information involve the transfer of matter such as current flowing through an electric circuit.

Changing, or modulating, energy in a meaningful way transfers information as well as energy.

A **microphone** converts sound energy into electromagnetic energy.

- ◆ A magnet moves near an electromagnet (solenoid).
- ◆ The changing magnetic field of the magnet induces a changing current in the electromagnet.

A **loudspeaker** converts electromagnetic energy into sound energy.

- ◆ Changing current in an electromagnet moves a magnet attached to the speaker cone.

## Period 18 Summary, Continued

**18.2:** Radiant energy transfers energy without transferring matter.

- ◆ Radio waves, microwaves, infrared radiation, and visible light, are types of radiant energy.
- ◆ Modulating radiant energy allows information to be transferred without a transfer of matter.

## Period 18 Review Questions

- R.1** How does a microphone transfer information using induced current and magnetism?
- R.2** How are a loudspeaker and a microphone similar? How are they different?
- R.3** What was the purpose of the wire wrapped around the bolt in the loudspeaker we built in class?
- R.4** Describe one difference between information transferring using electrical energy and using radiant energy. Give examples of each type of information transfer.