

Unit 3

Communication Electronics

Lesson 3.6

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Lesson Title Basic Electronic Theory – DC and AC Theory

Curriculum Area Science

Grades 6 – 8

Duration 2 to 3 class periods

Content Standards SC – 2, SC – 4

Benchmarks SC – 2.1, SC – 2.3, SC – 4.1

Goals

- Develop the students' understanding of basic electrical theory
- Develop the students' understanding of direct current and alternating current

Objectives

- To identify and describe sources of direct current
- To describe methods of producing alternating current

Resource Materials

Now You're Talking, Chapter 5

Understanding Basic Electronics, Chapter 7,16

Instructional Content

1. List the sources of direct current (dc)
Batteries
dc generator
Photovoltaic – solar cells
2. How is alternating current (ac) produced?
Ac generators
Frequency

Activities

1. Guest speaker
 - a. An engineer from the local power company. Speak on how electricity is produced in your area. Students prepare questions ahead of time. Students record answers to questions.
 - b. A field trip to the local power station.
 - c. Unit 3 Activity Sheet #3.4 – Soldering Project

d. Unit 3 Activity Sheet #3.5 – Electromagnet

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Activity Sheet # 3.4

Hook-Up Wire

Jerry Hill, KH6HU

Introduction

Experimenters often need a short piece of wire to make temporary connections while designing or working on projects. To make these wires more useful, alligator clips are often soldered on the ends. This allows for easy and fast connections and disconnections. They are handy to have in any ham shack.

Materials

- roll of hook-up wire
- 2 alligator clips
- soldering iron
- ruler
- wire cutter
- wire stripper

Procedure

- Measure out 12 inches of hook-up wire
- Remove ½ inch of insulation at each end of the wire
- Place an alligator clip at each end of the wire making sure there is a good mechanical connection.
- Plug in the soldering iron being careful to use a proper soldering iron holder
- Solder each alligator clip to the wire

Safety

Soldering irons are hot and can cause burns, they should only be handled by the handle. Never touch the metal part of the soldering iron. Fumes from the solder can be harmful so keep your face a safe distance from the work while soldering.

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Activity Sheet #3.5
Making an Electromagnet
Jerry Hill, KH6HU

Introduction

We know that an electric current produces a magnetic field around a wire. The magnetic force surrounding a straight wire is usually very weak. Larger currents produce stronger magnetic fields. It takes a current of many amperes to produce a strong magnetic field with a straight wire.

What if you bend the wire into a circle, and make several turns next to each other? See **Figure 3.27**. The weak magnetic field around each coil of wire adds to the force of the coil. The magnetic lines of force wrap through the center of the cylinder, and around the outside. The magnetic field of the coil is much stronger than the field of a straight wire.

You probably remember building an electromagnet sometime. If you have never made an electromagnet, this is a good time to try. See **Figure 3.25**.

Materials

- Pencil or pen
- 2' of insulated hook-up wire
- D-size battery
- 2 inch nail

Procedure

- Strip about 2 cm of insulation off each end of the wire
- Leave about 10 cm of wire free on one end
- Begin winding the wire around the nail, keeping the turns close together
- Continue winding until you have about 10 cm free at the end of the wire
- To complete your electromagnet, connect one free end of the wire to the positive terminal of the battery, connect the other free wire to the negative side of the battery

Now try to pick up some paper clips with your magnet. How many paper clips are you able to pick up?

How can you make your electromagnet stronger?

- Increase battery voltage
- Increase the number of turns