

Name _____ Date _____

Partners _____

Electrical Devices: Lab #8
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Objective: to examine and investigate various types of electrical devices, both simple and commercial, direct current (DC) and alternating current (AC).

Equipment: bag (2 D batteries with holders, C battery, 3 light bulbs with holders, 5 wires, 3 alligator wires, paper cup, dime, fine sand paper) fine magnet wire on spool, glue, masking tape, small scissors, Genecon hand generator, trays with various electrical devices

Definitions:

Work:

Resistances, examples:

Equivalent resistance in a series circuit:

Equivalent resistance in a parallel circuit:

Background: Electrical devices are all around us and operate on a few simple principles.

Procedure:

1. Paper Cup

Place a dime in the exact center of the outside bottom of your cup. Trace around it, then cut out the hole cleanly with the small scissors. Set the cup aside.

Make a coil by first wrapping a piece of masking tape around the C battery with the sticky side outwards. The battery is just used as a cylinder core to hold the tape neatly. It will not be used as an electrical device today.

Leave 50 cm of varnished “magnet wire” tail before wrapping the magnet wire into a coil of 50 turns on the masking tape. Overlap the coils on top of themselves to keep the width of the coil less than half the width of the masking tape. Leave at least a 50 cm wire tail on the end.

Use the sandpaper to remove the varnish coating from the last several centimeters of the wire tails. Slide the coil off the battery gently so that it does not get squashed. Clip and fold over the masking tape to make a stable ring coil.

Glue the circular coil onto the outside bottom of the cup around the hole you cut previously. You will use this cup in part 6.

2. Batteries

Try one battery in a circuit with a light bulb, then try two batteries in series with the light bulb. Notice the brightness of the bulbs.

Circuit diagrams:

Conclusion:

3. Light Bulbs

a) Try 1, 2, then 3 bulbs in series with two batteries (3 volts total). Notice the brightness of the bulbs.

Circuit diagram:

Conclusion:

b) Try 2, 3, 4 bulbs in parallel with 3 volts EMF. Notice the bulbs' brightness.

Circuit diagram:

Conclusion:

4. Generator Challenge

Connect the Genecon hand-operated electric generator to a light bulb with no battery. Turn the handle gently and watch the bulb light up. (Don't turn it hard or you will burn out the bulb.)

Can you make 3 bulbs in series light up? _____

Connect the Genecon hand-operated electric generator to a circuit with 3 bulbs in a parallel arrangement. Turn the handle and watch the bulbs light up.

If the light bulbs are equally bright in the series and in the parallel circuits, describe how it "feels" to turn the crank in each case (faster, slower, easier, harder).

Bulbs in series:

Bulbs in parallel:

How many bulbs in series can you light up? (Cooperate with other lab teams to amass more light bulbs) _____

5. Electrical dissection

Choose a tray. Examine the electrical device in the tray. You may have to use a screwdriver to remove the cover.

Name the device and sketch its physical layout:

Sketch any electrical circuits you see:

Label whatever you can figure out.

Trade trays with another team and examine another electrical device. Sketch it on the back of this paper or on a separate piece of paper.

6. Paper cup again

When the glue has hardened on your cup and coil, bring it to the instructor.

Follow her instructions.

Does your cup work? _____

Discussion and Analysis:

Explain how the cup works:

How does this lab apply to your life?

Trays contain:

1. Grey buzzer from David, doorbell without cover, 2 D batteries with holders/clips/wires, one six volt lantern battery, tiny alligator wires, instructions:

For each device try one D battery, then two D batteries, then the 6 volt lantern battery. Record your observations for each combination.

2. Radio (old Unisonic, MLW), small Phillips screw driver
3. Black rotary telephone without handset, screw driver
4. Yellow electric can opener from kitchen, needle nosed pliers
5. Beige electric pencil sharpener from David, Phillips screw driver

(Toaster, hair dryer, small transformer,)

Equipment:

Stereo receiver/amplifier (JVC or MLW's boom box)

Small radio (old kitchen, JC Penney)

Tiny light bulb in holder (burns out easily, above 5 on Volume slider, so have 4 spares)

Paper cup speaker already made with hole, 50-turn coil glued in place

Cow magnet

(2 disk magnets from shower curtains)

6 nail scissors

6 dimes

masking tape (Scotch tape is too floppy)

Fine black sand paper (grey drawers, bottom, third from right)

Specific Speaker Instructions for Lab Team #1

Paper coffee cup. Wrap 50 turns of wire around an AA size battery.

Specific Speaker Instructions for Lab Team #2

Paper coffee cup. Wrap 100 turns of wire around an AA size battery.

Specific Speaker Instructions for Lab Team #3

Paper Coca-Cola cup. Wrap 50 turns of wire around an AA size battery.

Specific Speaker Instructions for Lab Team #4

Paper Coca-Cola cup. Wrap 50 turns of wire around a C size battery.

Specific Speaker Instructions for Lab Team #5

Three Plastic deli salad containers. DO NOT CUT a hole in your container.

Wrap 50 turns of wire around an AA size battery.

Center the coil in the inside bottom of one of your containers, leaving the wire tails protruding over the rim.

Slide the next container inside to hold the coil there.

Tape the disk magnet to the center of the outside bottom of your third container.

Lower this container into the other nested containers. Hold them tightly together with a rubber band from the bottom to the rim.

Specific Speaker Instructions for Lab Team #6

Paper ice cream container. Wrap 50 turns of wire around an AA size battery.