

Orange Clock

Purpose

To illustrate several principles of batteries by using orange juice to power an electric clock.

Materials

- Magnesium strip or ribbon
- Copper strip
- Orange juice
- Steel wool (not a soap pad)
- Electrical leads (with alligator clips)
- Battery powered clock (variety that requires a single 1.5 V AA battery)
- 250-mL beaker

Safety

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| <ul style="list-style-type: none">• Read the SDS sheets for all chemicals before using them.• Wear safety glasses and gloves.• Do not taste the orange juice! |
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Procedure

1. Clean a strip of magnesium and a strip of copper with steel wool.
2. Pour ~200 mL of orange juice into a 250-mL beaker.
3. Connect an electrical lead to one end of the magnesium strip and submerge the other end in the orange juice. (You could tape it to the side of the beaker).
4. Connect the second electrical lead to one end of the copper strip and submerge the other end in the orange juice on the opposite side of the beaker.
5. Connect the other ends of the electrical leads to the battery compartment of a clock that would normally run on a single AA battery.
6. If the clock does not run, reverse the electrical leads in the battery compartment.

Results

- The second-hand of the clock will begin to move upon connection to the electrical leads.

Follow-up Teaching Notes

- A voltaic (galvanic) cell is created with the magnesium the anode and the copper the cathode.
- The components of the cell can be changed to explore the key components (i.e., change one of the metal electrodes) of a voltaic (galvanic) cell.

Connections

- Electrochemistry, redox reactions, voltaic (galvanic) cells.

Extension

- Connect two or more cells in series to generate a higher voltage.

Disposal/Clean-up

- The orange juice can be disposed of down the drain.
- The metal strips (electrodes) can be cleaned and reused.