

Lab: REDOX (Lemon Battery)



Part 1: VOLTAIC CELL (LEMON BATTERY CONTEST)

CHEMICAL ENERGY → ELECTRICAL ENERGY

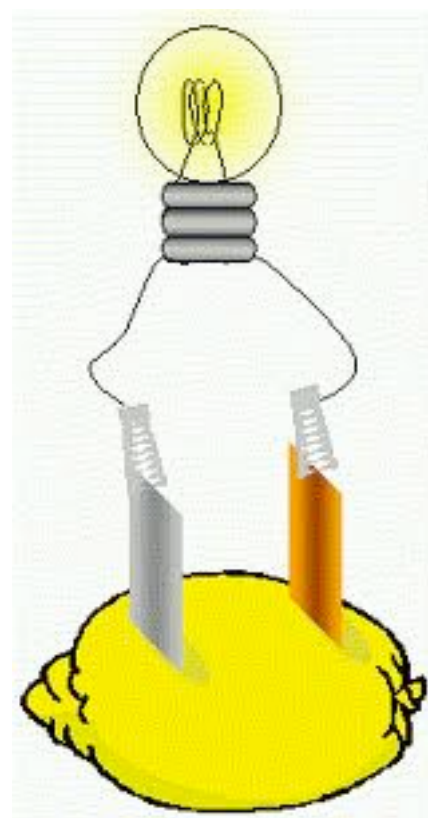
Today you are going to use your knowledge of redox chemistry to design a battery using only a lemon and a selection of metal strips we will provide. As you know batteries are voltaic cells consisting of electrodes made from two different metals, an electrolyte solution and a salt bridge or porous barrier that keeps the electrolyte solution separated but allows the ions to flow from one side of the cell to the other. Refer to Table J to determine what types of metals you will want to use. Choose your metals then construct your battery. Using a voltmeter see how much voltage your battery generates. The largest voltage wins! You must use three (or more) different trials (combinations of metals) to find your maximum voltage.

PROCEDURE: you must wear safety goggles for the entire lab

1. Choose your lemon (sorry you can only use one)
2. Choose your first set of electrodes (strips of metals)
3. Insert the metal strips into the lemon about half way. Do not allow them to touch each other
4. Attach the clips, one to each electrode then the other ends to the voltmeter.
5. If your voltmeter goes down the leads are connected backwards.
6. Draw your setup and label all the parts; record the voltage produced
7. If you brought a sample of fruit or vegetable to try use the same setup as you did for the lemon

DATA: Sketch three separate drawings illustrating your battery designs

*For each one, label ANODE, CATHODE, and DIRECTION OF ELECTRON FLOW



TRIAL 1	TRIAL 2	TRIAL 3
Voltage reading: _____	Voltage reading: _____	Voltage reading: _____

Answer Part 1 questions on Lab Credit Sheet now.

Part 2: ELECTROLYTIC CELL (ELECTROLYSIS of CuCl_2)

ELECTRICAL ENERGY \rightarrow CHEMICAL ENERGY

Now you are going to produce an electrolytic cell, which uses electrical energy to force a non-spontaneous reaction to occur. We will be using Table J again, but this time we'll be combining atoms and ions that won't react spontaneously - we'll provide power (by attaching a battery) to force the reaction to occur.

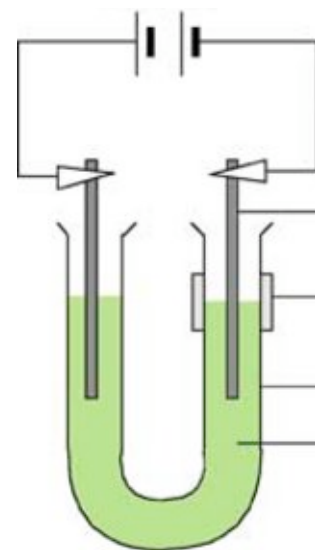
MATERIALS: U-tube, 250ml beaker, two pencils sharpened at both ends, 2 electrical leads, 9 volt battery, copper II chloride solution

NOTE: the pencils are the electrodes and can be identified as "+" or "-" based on which pole of the battery they are connected to.

PROCEDURE:

1. Assemble the device as shown in the diagram, but leave one connection to the battery undone until the teacher approves your arrangement.

2. After approval is given, make the final connection and observe the reaction for about five minutes. Record all observations and sketch your device. Label the "+" and "-" electrodes in your diagram.



3. Cautiously observe the odor (if any) generated. Record your observation, including which electrode the odor was generated.
4. Reverse the wire connections at the battery and record all observations
5. Disconnect the apparatus, wash off the pencils and rinse out the U-tube completely

Answer Part 2 questions on Lab Credit Sheet now.