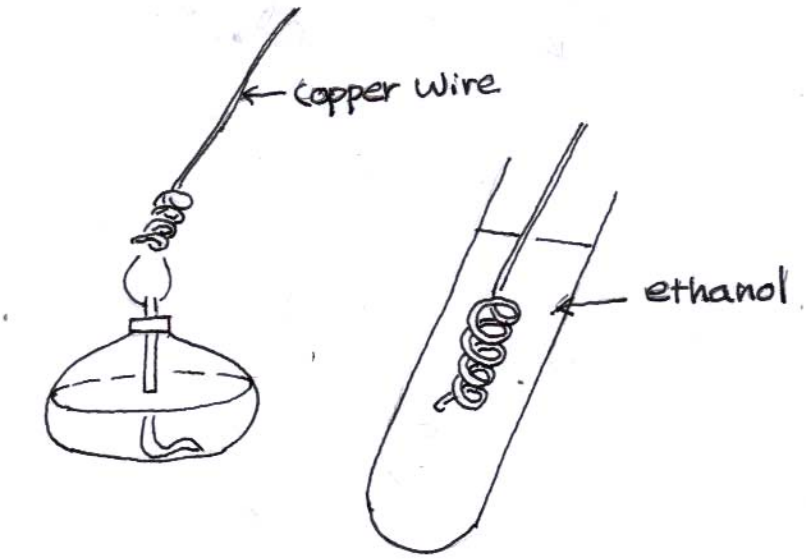
Redox Reaction

Experiment 1: Redox Reaction of Copper and Ethanol

Materials: Copper wire (30cm), ethanol (2ml), spirit lamp, test tube or syringe (1)

Procedure:

(1) Make a coil by winding a copper wire.
(2) Put 2ml of ethanol into a test tube.
(3) Heat the coiled of copper wire by using a spirit lamp.
(4) When the color of the coil becomes red-hot, insert the coil to the test tube with the ethanol.
(5) Take out the coil from the test tube, then insert it again.



Questions:

(1) When you insert the coil to the fire, the color of coil will change. What color is observed?
(2) When you insert the red-hot coil to the test tube with the ethanol, the color of coil will change. What color is observed?
(3) Check the odor of product. How different is it from ethanol?

Concept:

Primary alcohols are oxidized either to aldehydes or to carboxylic acids.

$RCH_2OH \rightarrow RCHO \rightarrow RCOOH$

(primary alcohol) (aldehyde) (carboxylic acid)

Copper is oxidized to copper oxide (CuO).

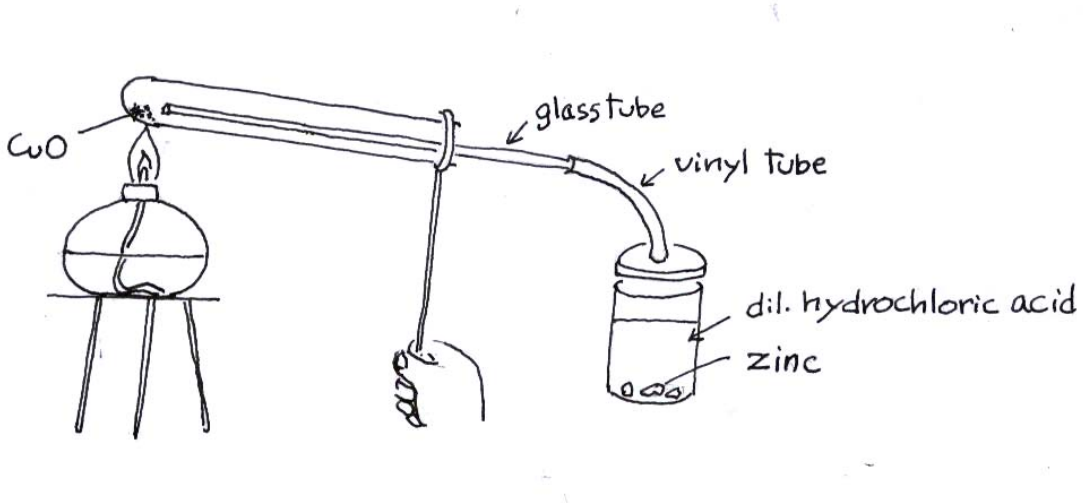
$2Cu + O_2 \rightarrow 2CuO$

Copper oxide oxidizes ethyl alcohol to acetaldehyde, copper oxide is reduced to copper.

$C_2H_5OH + CuO \rightarrow CH_3CHO + Cu + H_2O$

Experiment 2:
Redox Reaction of Copper oxide and Hydrogen

Materials: Film case (1), zinc, dilute hydrochloric acid (10ml), glass tube, vinyl tube, Spirit lamp, tube holder (1), test tube (1)**.**



Procedure:

(1) Fabricate a gas generator using a film case and vinyl tube.
(2) Take a half of small tea spoon of copper oxide in a test tube.
(3) Heat it with spirit lamp as shown in the fig.
(4) Put zinc and dilute HCl into the gas generator.
(5) Insert the glass tube of the gas generator into the test tube and blow hydrogen gas to the CuO.
(6) Check the change of the colour of the CuO.

Question:

(1) When hydrogen gas is blown to the CuO, the color of CuO will change. What color is observed?
(2) What is observed inside the tube?
(3) What reaction happened inside the tube?

Concept:

(1) Copper oxide is reduced to copper.

$$CuO \rightarrow Cu + (O)$$

(2) H2 is oxidized to H_2O

$$H_2 + (O) \rightarrow H_2O$$

(2) The complete reaction is as follows:

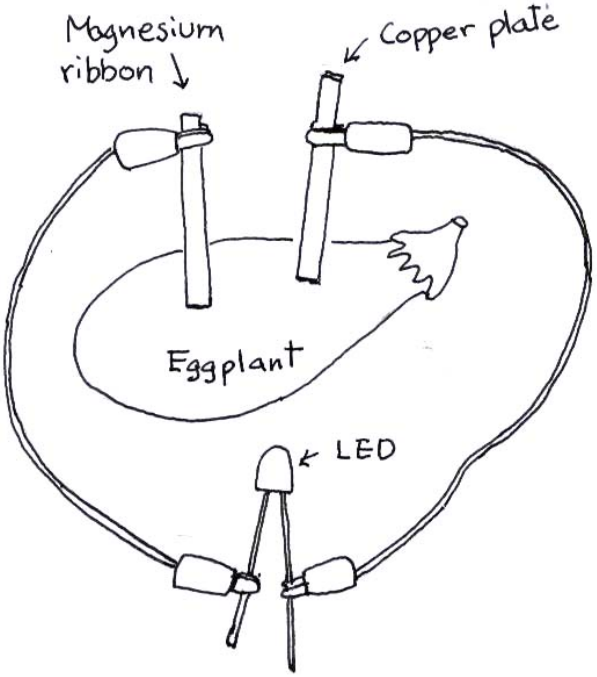
$$CuO + H_2 \rightarrow Cu + H_2O$$

Experiment 3: Vegetable Cell

Materials: Eggplant (tomato, onion), Magnesium ribbon, connecting wire (3), LED bulb

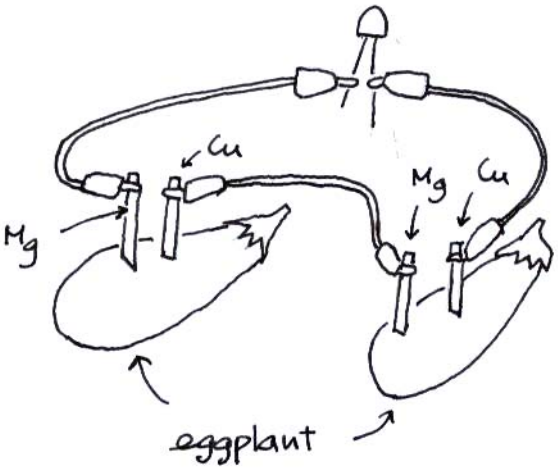
Procedure:

(1) Insert the magnesium ribbon and copper sheet electrodes into the flesh part of an eggplant or tomato as shown in the figure.
(2) Connect the current detector (LED bulb) in series to the circuit.



Question:

(1) Is there enough current to light the LED?
(2) When you use the zinc instead of magnesium, is there enough current to light the LED?
(3) What serves as the electrolyte in this cell?
(4) Write ionic equation for the electrode reaction?



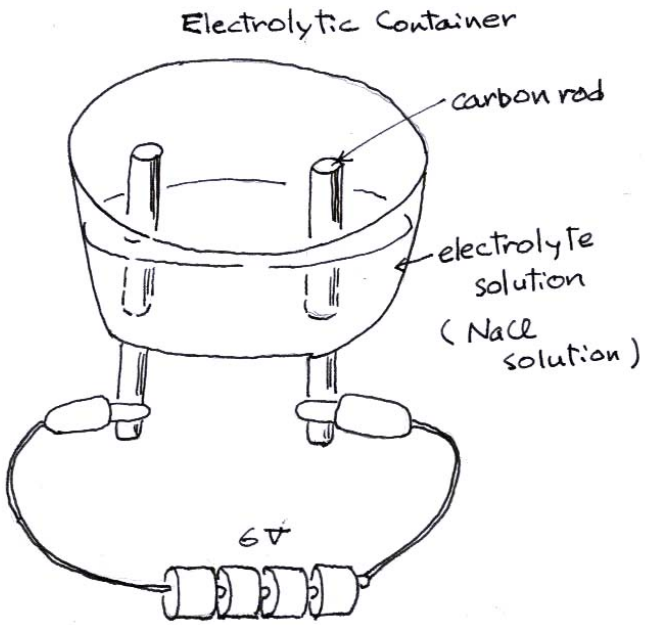
Experiment 4 : Electrolysis of sodium chloride solution

Materials:

Carbon rod, Plastic syringe 10ml (2), infusion tube, paper clips (2), plastic bottle, connecting wire,

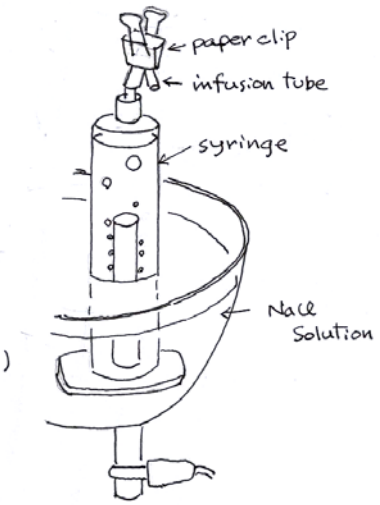
Fabrication: Electrolytic container:

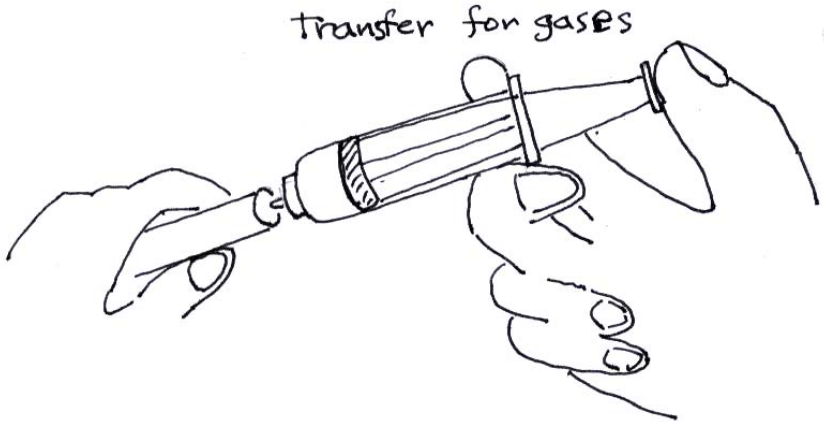
(1) Cut a plastic bottle around 4 cm from the bottom.
(2) Make two holes at the bottom of the bottle using red hot nail.
(3) Insert the carbon rod through each hole.
(4) Apply super glue around the carbon (only outside of the container) to avoid the leakage.
(5) Use the middle portion of the bottle to make a stand for the electrolytic containe.
(6) Attach the connecting wire to each electrode on the lower side of the electrolytic container.

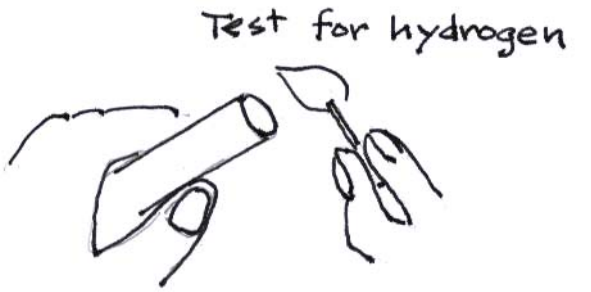


Procedure:

(1) Take concentrated sodium chloride solution in the electrolytic container.
(2) Invert two syringes with an infusion tube on each electrode.
(3) Insert the 20 ml syringe to the infusion tube of one syringe and fill completely with NaCl solution by sucking with plunger and close it with a paper clip.
(4)Other syringe is treated in the same manner.
(5)Connect the wires with the terminal of the dry cell.
(6)When sufficient amounts of hydrogen and chloride gases are collected in the syringe,
(7)transfer each gas into a test tube by sacking the gas as shown in the fig.
(8)Test for each gas as shown in the fig.







Science:
Chlorine and Hydrogen gases are produced in the electrolysis of sodium chloride solution.