

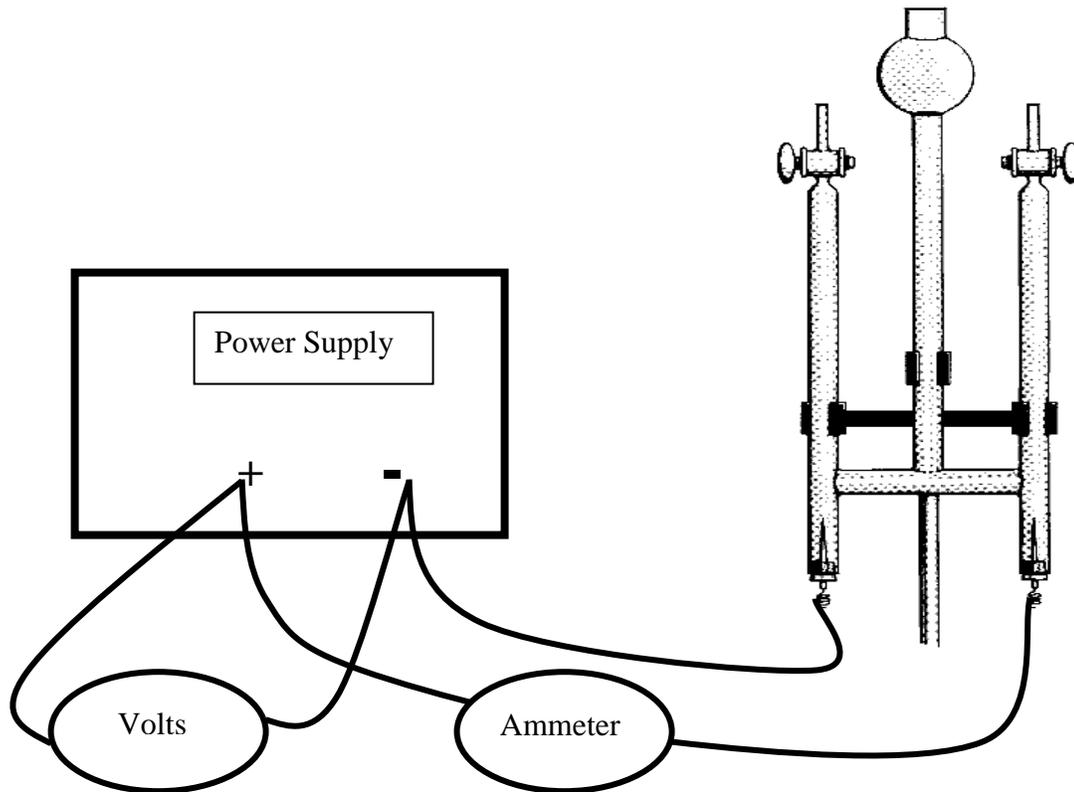
Electrolysis Lab 2

Water can be decomposed into hydrogen and oxygen gases using electricity. Distilled water is not decomposed, but when sodium sulfate is added to the water, it will conduct electricity and be decomposed. In this lab the voltage will be increased until decomposition occurs. A Hoffman electrolysis apparatus collects the two gases separately and shows the 2 to 1 ratio nicely. If the current is also measured the relationship between current and volume of hydrogen produced can be seen. If a pH indicator is used the anode becomes yellow and cathode becomes blue. Hydrogen gas can be burned to produce a small pop sound and the oxygen can be used to re-ignite a glowing wooden splint.

When a DC current is passed through an aqueous sodium sulfate solution, water is oxidized at the anode producing O_2 and reduced at the cathode producing H_2 . The solution becomes acidic at the anode and basic at the cathode.

Materials:

- Hoffman electrolysis apparatus
- 2 electrodes
- DC power supply
- 2 digital multi-meters
- Column Stand
- Sodium Sulfate
- 60 mL of bromothymol blue (optional)
- stirring rod
- Pasteur pipettes
- 2 test tubes
- wooden splints

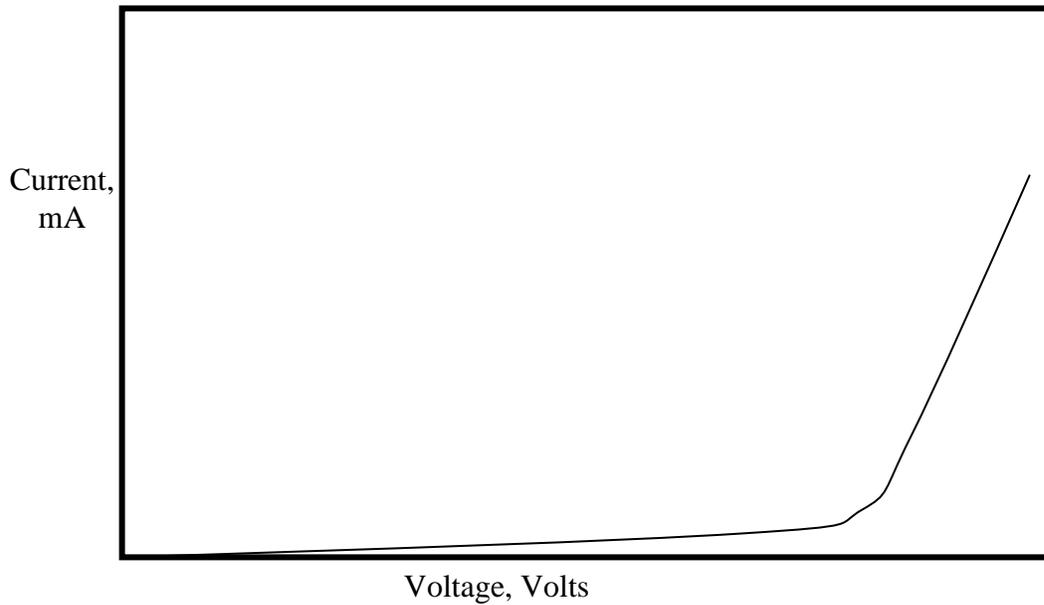


Procedure:

1. Open the stopcocks on the Hoffmann apparatus and fill with sodium sulfate solution water. Close the stopcocks with no air in the tubes.
2. Clip the black lead from the negative terminal of the power supply to the multi-meter used as an ammeter. Clip another black lead from the ammeter terminal of the multi-meter to the cathode of the Hoffman apparatus. Clip the red lead from the positive terminal of the power supply to the other electrode (this will be the anode).
3. Clip another black lead from the negative terminal of the power supply to the common or ground on the multi-meter that is used as a voltmeter. Clip another red lead from the positive terminal of the power supply to ammeter or positive terminal of the multi-meter used as a voltmeter.
4. Increase the voltage of the power supply in 0.10 volt increments from 0 to 2.0 volts.
5. Record in Table 1, below the voltage and the current at each increment.
6. Make a graph of the voltage vs current data of Table 1. This can be done by hand or on a spread sheet.

7. The graph of the data in Table 1 should look something like the Figure 1, below:

Figure 1



8. Figure 1 shows that a significant current does not start flowing until a certain voltage is reached. This voltage is given by the point of intersection of the steeper line and the voltage axis.

9. What is this voltage? _____

10. What is the theoretical voltage for splitting water into hydrogen and oxygen?

11. Why was the voltage from your data different from the theoretical voltage?

