

"Sea" Cell

LESSON PLAN

Grade Level: 11

Subject: Chemistry

SOLs: CH. 1, PH.1, PH.2, and PH.8

Objective(s): The student will be able to:

- (1) determine the relationship between electrolyte concentration and voltage within a cell
- (2) accurately record, organize, and analyze data
- (3) demonstrate proper and safe use of chemicals and equipment
- (4) mathematically manipulate data to graphically display it using a graphing calculator

Procedure/Activity: See attached procedure sheet

Assessment:

1. Describe in your own words what you think is the relationship between voltage and electrolyte concentration.

2. Does there seem to be a limit to the relationship? If so. What?

3. What factors might alter the relationship?

4. What could you do differently to test your hypotheses?

5. Using a piece of graph paper, redraw the graph to show the effect of concentration on voltage.

Equipment/Supplies:	1 - Casio CFX-9850+ Calculator w/link cable	2- 6"x1/4" aluminum rods
	1 - Casio EA-100 Data Analyzer	1- 600mL Beaker
	1 - Voltage probe	1 - 400mL Beaker
	400mL Distilled water	3 - Ring stands
	100mL 2M NaCl Solution	2 - Test tube clamps
	2 - Wire leads w/clamps	1 - Burette with clamp
		2 - One-hole rubber stoppers

Teacher Notes/Troubleshooting: The 2M NaCl solution should be premade by dissolving 11.7 grams of sodium chloride (table salt) in enough distilled water to make 100 mL of solution.

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PROCEDURE SHEET

1. Assemble the electrodes by inserting the aluminum rods into the rubber stoppers. Allow about one inch to protrude at the top of the stopper.
2. Clamp the electrodes, each to a separate ring stand, using the test tube clamps. The stoppers will serve as insulators.
3. Clamp the biuret to the third stand with the biuret clamp.
4. Arrange the stands so that the two electrodes can be inserted as far as possible into the 600mL beaker and where the biuret can easily be dispensed into the beaker.
5. Attach one end of each wire lead to an electrode.
6. Attach the other ends of the leads to the voltage probe leads.
7. Connect the voltage probe to the **Ch. 1** port of the EA-100. Push the red **"ON"** button to activate the data analyzer.
8. Look for the word **"multimeter"** in the lower left corner. If you don't see it, push the **"MODE"** button one time.
9. Press **SHIFT MODE** to begin the set up.
10. Set the time interval to 500 msec. by pressing the **DataLOG** button until 500 appears, then press **TRIGGER**.
11. Choose the number of samples to be taken to 200 by pressing the **DataLOG** button until 200 appears, then press **TRIGGER** again.
12. Next choose **"1"** for actual time recording. **DO NOT** press **"TRIGGER"** at this time!
13. Fill the biuret to the **"0"** line with the 2M NaCl solution.
14. Fill the 600mL beaker with 250mL of distilled water and insert the electrodes.
15. Simultaneously press the **"TRIGGER"** button and open the biuret to allow the solution to dispense at about a 1/2 mL per second rate.
16. When sampling is complete, the EA-100 will display **"DONE"** on the screen.
17. Link the EA-100 to the calculator making sure the cable ends are pushed in securely.
18. Select **PRGM** from the main menu and push **EXE**.
19. Use the arrow key to highlight the *Receive* program and push **EXE**.
20. When the screen says **DONE**, view your graph by choosing **Stat;F (Graph);SET**; highlight

Graph Type;F (xy); EXIT; F (Graph).

21. Sketch your graph on a piece of graph paper properly marking your axes.