

Conductivity of Gatorade Worksheet

- Use the set of solutions on your lab bench and the conductivity meter to complete the data table below. If some of the LEDs remain continuously lit, while others flicker, record the average value (for example, say for the 0.03 solution, the meter reads the bottom 3 LEDs as continuously lit, while the fourth LED from the bottom flickers on and off, record this reading as 3.5). Use the following equation to compute the amount of NaCl needed to make the calibration solutions at the necessary concentrations:

$$C * V * MW = \text{grams NaCl}$$

C = concentration (molarity) of solution

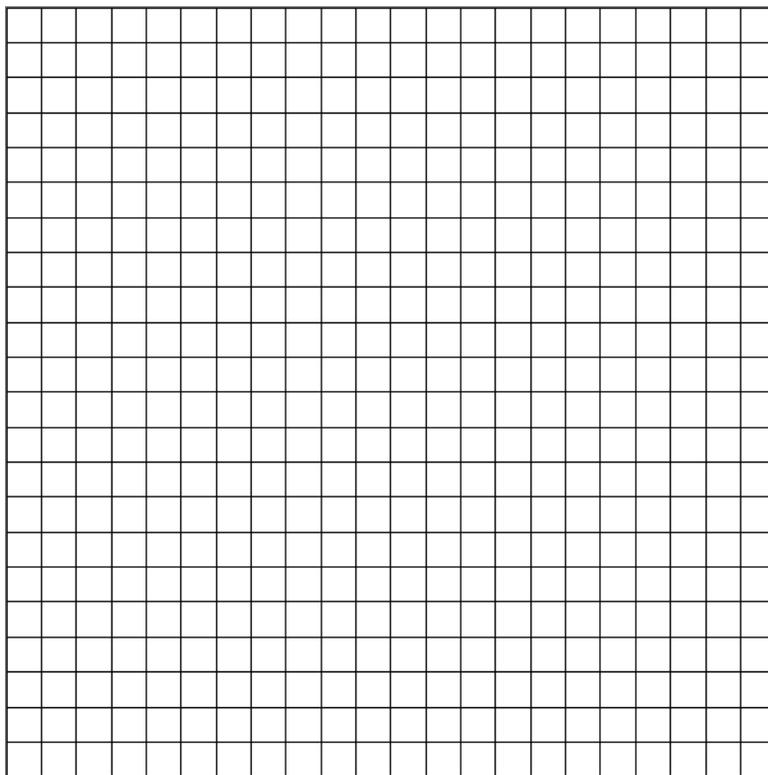
V = volume of solution

MW = molecular weight of NaCl (58.44 g/mole)

For example, to make 2 liters of a 0.01 M solution of NaCl, weigh out 1.17 g of NaCl and add 2 liters of water.

Concentration of NaCl _(aq) (M)	Conductivity (number of lights)
0.01	
0.02	
0.03	
0.04	
0.05	

- Graph the data from the table on the grid below. Label both axes with an appropriate title, scale and units. Circle and connect your points.



Conductivity of NaCl_(aq)

3. Explain, in terms of particles, why NaCl(aq) conducts electricity.

4. Based on your graph, what is the relationship between the concentration of the solution and the conductivity?

5. Explain how you could use your graph to find the concentration of an unknown aqueous solution of NaCl.

6. Use your graph to determine the concentration of the unknown NaCl solution located at the front of the room. Make sure to include units.

7. How accurate is the concentration you recorded for the unknown NaCl solution? (Hint: What are some limitations of the conductivity meters?)

8. Complete the table below for the different flavors of Gatorade. Use your conductivity meter and your graph.

Gatorade Flavor / Color	Conductivity (number of lights)	Concentration of ions (M)

9. Answer the following based on the Gatorade data in #8:
 - a. Which flavor/color of Gatorade has the greatest concentration of dissolved ions?

 - b. Which flavor/color of Gatorade has the lowest concentration of dissolved ions?

- c. The general ingredient list for Gatorade includes: water, liquid sugar, glucose-fructose, citric acid, natural flavors, salt, sodium citrate, monopotassium phosphate, color, ester gum and brominated vegetable oil. List *three* electrolytes found in Gatorade.
- d. Why is the heading in the Gatorade data table “concentration of ions” and not “concentration of NaCl”?
- e. Which flavor/color of Gatorade would be most beneficial for someone who has an electrolyte imbalance (kidney disease, eating disorders, stomach virus, flu)? Explain.
10. Obtain a sample of pickle juice, which we will assume is mostly NaCl(aq). Test the conductivity. Is pickle juice a dilute or concentrated solution of salt? Explain how you arrived at this conclusion.
11. Based on your understanding of electrolytes, circle which of the following two solutions you predict will show greater conductivity. Explain your answer in terms of particles.
- 0.03 M NaCl_(aq) or 0.03 M CaCl_{2(aq)}
12. Obtain a sample of 0.03 M CaCl_{2(aq)} and determine its conductivity. Was your prediction correct? Why or why not?