

CONDUCTIVITY OF AQUEOUS SOLUTIONS GUIDED INQUIRY VERSION

From *Vernier Investigating Chemistry through Inquiry*



Westminster
College

LAB 4

INTRODUCTION

In this experiment, you will investigate some properties of strong electrolytes, weak electrolytes, and nonelectrolytes by observing the behavior of these substances in aqueous solution. You will investigate these properties using a Conductivity Probe. When the probe is placed in a solution that contains ions, and thus has the ability to conduct electricity, an electrical circuit is completed across the electrodes that are located on either side of the hole near the bottom of the probe body (see Figure 1), and this produces a conductivity reading. The unit of conductivity used in this experiment is the microsiemens per centimeter, or $\mu\text{S}/\text{cm}$.

In the Preliminary Activity, you will gain experience using a Conductivity Probe and data-collection software. You will first measure the conductivity of distilled water, and then, after adding NaCl solid to the distilled water, you will measure the conductivity of the resulting NaCl solution.

After completing the Preliminary Activity, you will investigate your assigned researchable question. Use reference sources to find out more about electrolytes and the electrical properties of aqueous solutions before planning and conducting your investigation.

MATERIALS

LabPro or LabQuest
Vernier Conductivity Probe
Distilled Water
NaCl

Ring stand
Utility clamp
Wash bottle
100 mL beaker

Others requested by students

PROCEDURE

1. Set the switch on the Conductivity Probe to the 0–20000 $\mu\text{S}/\text{cm}$ conductivity range.
2. Obtain and wear goggles.
3. Connect the Conductivity Probe and the data-collection interface.
4. Determine the conductivity of a distilled water sample.
 - a. Add 60 mL of distilled water to a clean 100 mL beaker.

- b. Place the tip of the electrode into the distilled water. The hole near the tip of the probe should be completely covered by the water.
 - c. Start data collection.
 - d. Stop data collection after about 15 seconds.
 - e. Use the Statistics option to determine the mean conductivity value.
5. Determine the conductivity of a sodium chloride solution.
- a. Add about 0.5 g of NaCl to the distilled water.
 - b. Stir to dissolve the NaCl.

Repeat b–e of Step 4 above to determine the conductivity of the NaCl solution

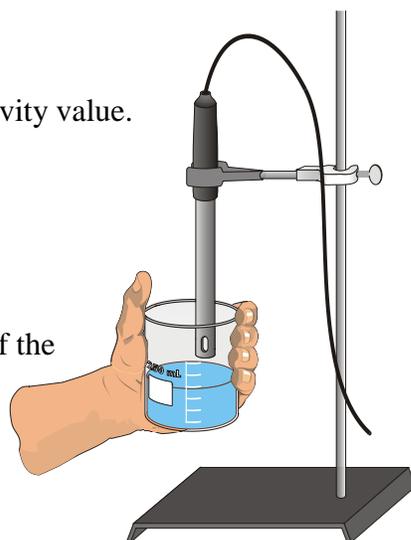


Figure 1

QUESTIONS

1. List three common water-soluble ionic compounds. Try to list three ionic compounds with some potentially interesting relationship.

2. List three common water-soluble molecular compounds.

3. List three common water-soluble molecular acids.

4. List two factors that might influence the conductivity of aqueous solutions.

Note: The plan that you submit for instructor approval should list laboratory safety concerns, including chemical safety concerns, and specify how you will address these safety concerns during your investigation.