Hands-On Activity

Conductivity

Objective:
Students will use simple conductivity meters to explore the conductivity of several aqueous solutions.

Estimated time to complete: 15 minutes

Materials:

For each pair of students:

- homemade conductivity meter*
- small beakers or cups for making solutions (2)
- distilled (or deionized) water
- sodium chloride (table salt)
- sucrose (table sugar)
- plastic spoon
- stirring sticks

Procedure:
Students record observations in their notebooks as they carry out each step of this activity. To use the conductivity meter, begin by testing the meter to be sure that it works. Test the meter by touching the two paper clip ends to one another. The LED bulb should light up. To test the conductivity of a sample, touch both paper clip ends to the sample at the same time.

Before starting the tests, students should predict whether each solution will be conductive. Students should begin their tests by testing the conductivity of the distilled water sample. Students should then make a solution using a half spoonful of salt and distilled water, and test its conductivity. Next, students should make a similar solution using a half-spoonful of sugar and distilled water, and test its conductivity. Additional solutions or samples may be tested as desired.

As they make their observations, ask students to think about the following questions:

- *What does a conductivity meter measure?*
- *Which sample has the greatest conductivity?*
- *Which sample has the least conductivity?*
- *Why did these samples have different conductivities?*
- *What would happen to the conductivity if you increased the amount of salt or sugar in the respective solutions? Why?*

*A homemade conductivity meter can be made using the following materials:

Materials for each meter:

- 9-volt battery
- paper clips (2)
- copper wire (3 pieces)
- LED bulb

Procedure: Unbend both paper clips so that they are straight. Connect the following in this order: paper clip, wire, LED, wire, battery, wire, paper clip. The LED should light if you touch the two paper clip ends together to complete the circuit.

Inquiry and Nature of Science Skills in this Activity:

- Identify Questions
  - Develop a question that:
    - Asks a question about a specific science concept or process
- Design Investigations
  - Design and conduct investigations using:
    - Control (control group) – used for comparison in which the independent variable is not changed
- Gather Data
  - Use tools and the SI (metric) system to accurately measure:
    - Conductivity
  - Choose appropriate tools to conduct an investigation:
    - Other laboratory equipment
  - Use senses to observe:
    - Seeing (color, shape, size, texture, motion)
  - Use the appropriate format to record data:
    - Table
- Interpret Data
  - Identify and interpret patterns using:
    - Trends in data
- Evaluate Evidence
  - Draw and support a conclusion by:
    - Using data to determine the cause-effect relationship observed in the investigation
    - Extrapolating results beyond the investigation
    - Formulating scientific explanations/arguments
- Patterns and Systems
  - Patterns and Change:
    - Some changes are very slow and some are very fast and that some of these changes may be hard to see and/or record.
    - Some small changes can be detected by taking measurements.
    - Things that change may do so in steady, repetitive or irregular ways.
- Scientific Investigation
  - Scientific Investigation:
    - Scientific investigations lead to the development of scientific explanations.
  - Scientific Data and Outcomes:

        - Collecting and analyzing data is the best way to understand a changing pattern.
- Engineering and Technology
    - Uses of Technology:

Human beings have made tools and machines, such as x-rays, microscopes, and computers, to sense and do things that they could not otherwise sense or do at all, or as quickly, or as well.