Extension Activity – Water

Title of Activity - Conductivity Meter with Simple Circuits

Concepts/Principles Covered –

When salt is dissolved in water, it separates into charged particles called ions which allow salt water to conduct electricity better than freshwater. Therefore, conductivity meters can be used to determine the amount of salt or salinity in the water.

IMPORTANT TERMS
* Voltage (V) – measure of the pushing force available to push the current through the circuit. Higher voltage pushes harder and forces more current through a given load. Common unit of voltage is Volts.

* Current (I) – continuous movement of positive charges through the circuit. Conventional standards assume that current flows out of the positive terminal, through the circuit and into the negative terminal of the source. Electron flow is what actually happens; electrons flow out of the negative terminal, through the circuit and into the positive terminal of the source. The direction of movement is OPPOSITE that of the current. Common unit of current is Amperes or Amps.

* Resistance (R) – something that opposes, or makes difficult, the flow of current (such as a load on the circuit). Common unit of resistance is Ohm(s).

* Ohm's Law: V = IR (V in Volts, I in Amps, R in Ohms)

Short Description –

Use simple components to build electric circuits to learn about conductivity and how the conductivity of water can be modified.

Standards Covered -

MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. *Grades 6-8.*

MS-PS2-3: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

MS-PS2-B: Types of Interactions - Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

HS-PS2-6: Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-PS2-2, HS-PS2-4: Use mathematical representations of phenomena to describe explanations.

HS-PS2-5: Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

CCSS.MATH.CONTENT.HSA.CED.A.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Length - 45 minutes

Age Group – Grades 6-10

Materials and Supplies –

- Electric circuit kit from Amazon with 2 AA batteries
- 9V battery
- Alligator clips and wires
- LED or buzzer
- Conductive carbon rods
- Distilled water in cup
- Salt

Step-by-step Instructions -

- Connect a battery, wires with alligator clips, and an LED light or buzzer to make a complete, closed circuit.
- Open the circuit by disconnecting one of the alligator clip leads. Do not connect the LED directly to the battery as it may burn out the bulb!
- Add carbon rods on each alligator clip and place the rods into distilled water, separating the rods in the water. What happens to the light or sound?
- Add salt in small increments to the water. What happens to the light or sound?
- Test other liquids like tap water, juice, or vinegar. Clean any leads that have been in the salt water before using with each new solution.