611-2260 (10-010) Conductivity of Water Tester

Operation requires 26-1310 *light bulb (15 watt) which may be ordered from* **Science First®.**

Warranty and Parts:

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.

Additional Materials Needed:

- **Light bulb**
  15 watt 110 volt recommended, available from building supply stores as appliance bulb. May be ordered from **Science First®** P/N 26-1310
- **Beaker**
  Glass, plastic or pottery - do not use metal
- **Power source**
  110 volt AC only
- **Support rod**
  12.7 diameter (1/2") or less
- **Support for beaker**
  Box or block

Visit us online at: www.sciencefirst.com

Description:

The Conductivity of Water Tester demonstrates in a *qualitative* way the difference in conductivity of water that is pure and water that contains dissolved salts. By connecting a light bulb and 110 volt AC power, you provide a visual demonstration of the fact that *liquids conduct electricity.* As the cord is positioned so it does not come into contact with water, this apparatus is safe for classroom use.

However, as with all instruments that demonstrate electrical phenomena, follow standard safety precautions.

Safety Precautions

- Use by teacher or adult only
- Make sure there are no exposed wires when attaching leads to your power source.
- Do not remove fiberboard cover labeled, **"Caution! 110 volts! Do not remove this cover!"**
- Do not touch solution when apparatus is plugged in. To change the liquid, remove the support under your beaker and slide the beaker down without making contact.
- Use with glass, pottery or plastic container only**. Do not use a metal container** which will conduct electricity; a shock hazard may exist.
- If your unit does not work, press the reset button on the outlet plug.

How to Use:

Refer to Diagram 1, Page 2

1. Attach light bulb to molded body by first applying a thin coating of petroleum jelly to the base of the bulb then screwing into lamp socket holder.

2. Secure tester to ring stand or other support rod. Do so by sliding support rod through hole in plastic body of tester. Adjust with thumbscrew located next to hole.
3. Find a box or block to support your beaker. Support should be of sufficient shape, size and stability to hold beaker steady yet be easily removed when you want to remove your beaker.
4. With one hand, hold beaker under tester so that the 2 recessed electrodes protrude into beaker.
5. With other hand, slide box or block under beaker to hold it in place.
   Do not touch tester when you want to remove the beaker to change its contents.
6. To remove beaker, grasp beaker with one hand and support block with other. Slide block out of way and bring beaker down, making sure electrodes do not contact walls of beaker.
7. Plug in tester.
8. Fill beaker with liquid. If liquid conducts electricity, light bulb will light up. Bulb will light brightly for certain liquids and not at all for others. The reason is that the conducting of electricity is dependent upon degree of ionization in your solution.

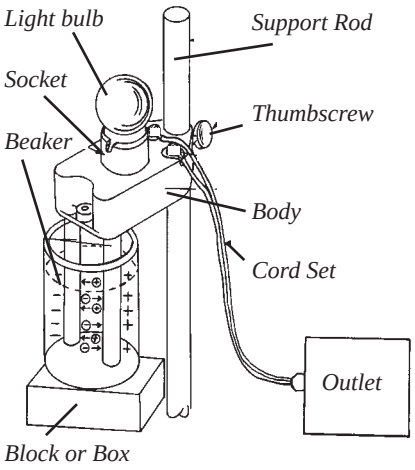

Diagram 1

Theory:

The atoms of a solid may lose some electrons but remain nearly fixed in their positions. An electric current in a solid is composed of electrons.

In a liquid, atoms move more freely. An electric current in liquid is made up of charged atoms called *ions.* Ions are atoms which have gained or lost electrons. When ions form in liquids, they are free to move and are attached, according to their electron configuration, to either the positively or negatively charged electrodes immersed in the liquid. The negative ions are attracted tot he positive electrode and lose electrons to the electrode, thus becoming neutral. The positive ions are attracted to the negative electrode, gain electrons and become neutral. It is the passing through the liquid of electrons which completes the electrical circuit and causes electricity to flow from one terminal on your AC power source to the other in an uninterrupted circle. As a result, the light bulb lights up. *Diagram 1* shows the completed electrical circuit.

P/N 24-10010

Applications:

Pure water is a poor conductor because it is only slightly ionized. Adding an inorganic salt like sodium chloride greatly increases the ionic strength of the solution, making it a better electrical conductor. This can be demonstrated visually or as follows:

Fill two beakers with water. You can use ordinary tap water if it is not too hard, or distilled or rain water. Add a pinch of table salt to the second beaker and test the conductivity of each. When testing the first, the bulb will not light, showing that pure or tap water is a poor conductor. When testing the second, the bulb will light (the brilliance of the light will depend on how much salt is added). This shows that addition of salt makes water a good conductor of electricity. Repeat for other materials which dissolve readily in water.

The brilliance of light from the light bulb can depend upon these factors:

- **Temperature**
- **Concentration**
- **Degree of ionization**

Experimental Materials:

Vegetable oil
Soap
Ammonia
Baking soda
Alkali and alkali earth solids
Lemon juice
Honey
Dilute acid such as vinegar
Sugar
Alcohol
Mercury

Which are good conductors of electricity? Why or why not?

Fill out a chart such as the one below..

Substance	Conducts?	Chemical Reaction?
Water		
Alcohol		
Salt Water		
Mercury		

Related Products:

15080 Conductivity Tester: Test the conductivity of different liquids or the difference in concentration of the same solution with this device.

665-0300 Voltaic Cell - Make electricity in a chemical cell. Build Voltaic Cell, coulometer, storage and dry cell. Includes 10 electrodes, porous cup, screw-on ring and brackets, jar.

How to Teach with Conductivity Tester

Concepts: Electrical conductivity.
Curriculum fit: Chemistry sequence; Properties of Matter. *Unit: Properties of Solutions.* **Grades 6-8**
Concepts: Ionization
Curriculum Fit: Physics Sequence; Matter. *Unit: Change Processes.* **Gr 11-12**
Concepts: Conductors and insulators.
Curriculum Fit: Physics Sequence; Electricity and Magnetism. *Unit: Moving Charge and Magnets.* **Grades 6-8.**

Visit us online at:
www.sciencefirst.com