

# Wave Energy Generator Student Activity Sheet

## Engagement

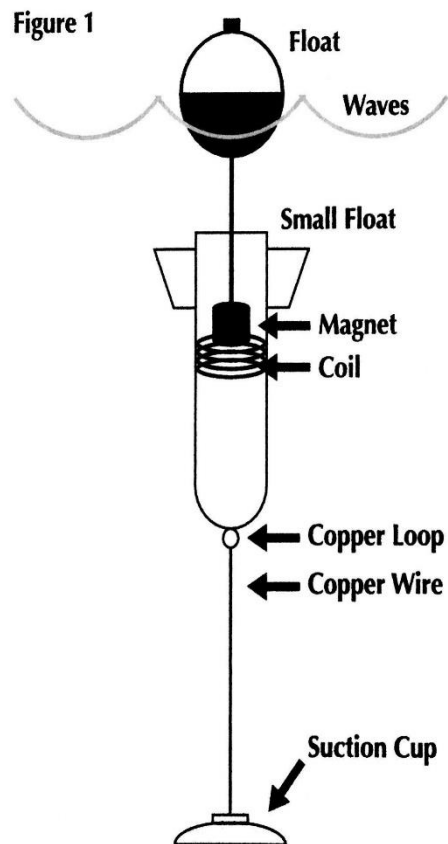
### Procedure

1. Review Wave Energy Generation Handout. Look at the Motion of the Ocean Wave and How a Generator Works.
2. Look at the ShakeLight Flashlight.
3. Discuss ways that ocean waves could be used to produce electricity.
4. Do an internet search of wave-energy devices. What did you find?
5. Draw and explain a wave- energy generator.

The following is an example of one way to construct a model device. Part of this activity is about finding innovative approaches, so it's a good idea to allow for as much trial and error as possible throughout the construction process.

**Step 1.** Create a coil by winding the wire around the test tube. Generally, a minimum of 100 coils is needed to produce a measurable electrical current. Fasten the wire to the tube with transparent adhesive tape, leaving a couple feet of wire free on both ends of the coil to make connections. To ensure effective connections, remove the insulation from the ends of the wire. This can be done by sanding the end of the wire with medium- grit sandpaper. When the wire end becomes a bright copper color, the insulation is removed. This can be tested with the multimeter. If there is zero resistance between the ends of the coil wire, the insulation has been stripped and your wire is ready.

**Step 2.** Attach a loop of copper wire to the bottom of the test tube (copper is not magnetic). This will attach to a suction cup on the bottom of the wave tank and keep the tube from drifting out of position.



**Step 3.** To keep the tube upright in the tank, attach a flotation collar. Wrap the top of the tube in buoyant material and secure with tape.

**Step 4.** Cut a piece of fishing line about a foot long. Tie one end to the magnet necklace clasp. Then stick the clasp to a magnet(s). The magnet clasp makes it easier to change magnets when doing comparative tests. The other end is tied to a fishing bobber.

### **Factors Affecting the Voltage Produced**

- Number of turns in the coil
- Length of the coil: as the coil is “stretched out” with the number of turns remaining the same, the voltage will be reduced
- Diameter of the coil: as the diameter of the coil grows larger, the voltage is reduced
- Strength of the magnet
- Wave height
- Wave period

### **Explanation**

1. How is electricity produced with a generator?
2. What causes the magnet to move through the wire coil?
3. Would the speed of the wave affect the electrical output? Why or why not?

### **Extension**

Design an experiment looking at one variable (use the factors affecting voltage). Make a hypothesis and alter the one variable.

### **Evaluation**

Have students explain their design and experiment to the class.