

## Lesson Preparation – Mighty Mix-Up (<1 hour active time)

### Materials (for 24 students) :

Thermometer ( 1 per group )  
Dixie Cup ( 2 per group )  
Plastic Cup, Clear, 8-12 oz ( 2 per group )  
Baking Soda ( 1.5 Tbsp per group )  
Vinegar ( 1/4 cup per group )  
Calcium Chloride ( 1 Tbsp per group )  
Water ( 1/4 cup per group )  
Plastic Bowl ( 1 per group )  
Marking Pen ( 1 per class )  
Tablespoon ( 1 per class )  
Quarter Cup Measure ( 1 per class )  
Mighty Mix-Up Worksheet ( 1 per student )

### Before Lesson:

1. Distribute 1 Tbsp of Baking Soda into a Dixie cup, preparing one cup per group. Label the cup.
2. Distribute 1 Tbsp of Calcium Chloride into a Dixie cup, preparing one cup per group. Label the cup. NOTE: Once you open Calcium Chloride it will very quickly absorb water. Prepare this chemical right before use, and seal any unused portion carefully.
3. Distribute  $\frac{1}{4}$  cup of vinegar into a larger clear cup, preparing one cup per group. Label the cup.
4. Mix 0.5 Tbsp of Baking Soda into  $\frac{1}{4}$  cup of water in a larger clear cup, preparing one cup per group. Label the cup.

## Lesson Plan – Mighty Mix-Up (50 min)

### Opening (5 Min)

Begin by reviewing what the students know about energy. What is energy? How do we know if something has energy? *Energy is the ability to do work, and it can be measured in many ways. The energy in our food is measured as a calorie, but the energy in electricity is measured in kilowatt hours. Because energy is used to do work, we can often see energy as a change of some sort, like something getting hot, or a lightbulb lighting up.*

Have the students list all the types of energy they can think of. Emphasize that there are lots of types of energy, but don't worry about making sure they go over every single one. *Common types of energy are mechanical (motion), electrical, light, heat, and sound.*

Ask the students how they think a battery provides energy. What type of energy is a battery? *A battery is typically a form of chemical energy. Different types of chemicals in the battery work together to produce energy. The energy in a battery is stored as a potential energy – energy that could be used to do something! When you hook something up to the battery and use it, the potential chemical energy becomes kinetic energy.*

Have one of the students read the paragraph at the top of the worksheet.

### Instruction (5 min)

Tell the students that today they will be mixing up some chemical reactions to see if they produce or absorb energy. Ask the students how they think they might measure energy change in a chemical reaction. *There are lots of ways to measure energy – but the easiest way to measure a change in energy is to measure a change in temperature. Heat is a common form of energy.*

Show the students the thermometers they will be using and demonstrate how to read them.

Hand out the cups of vinegar and have the students measure and record its temperature. Go over the temperature of the vinegar as a class to assure that they are using the thermometer correctly.

Before handing out the supplies, clarify the guidelines for handling the chemicals. The students should not put the chemicals near their eyes or mouths. They should try not to touch the chemicals, and they should wash their hands if necessary. None of the chemicals is particularly hazardous, but it is good practice for the students to handle them carefully.

Go over the two reactions with the students, telling them that you will pass out reagents as needed. Show them how to place their cup of vinegar in the middle of the plastic bowl in order to catch any reaction products that overflow the cup. Remind them to make notes on their observations in the appropriate space on their worksheets.

### Exploration (30 min)

Hand out the baking soda, and allow students to add it to their vinegar and observe. Have them record the highest or lowest temperature they see on the thermometer.

When that reaction is complete, hand out the baking soda solution in the clear cup and have students record its temperature. Hand out the calcium chloride and proceed as before.

As students work, move about the classroom and ask reinforcing questions. What do you think is happening to the energy in the reactions? What is changing in the reactions? Where is there energy as the beginning of the experiment and where does it go? *In these reactions, energy is stored in the two chemicals being mixed together. When they are mixed, they actually change into different chemicals, and this process either creates energy or it needs energy. When the mix creates energy, the mixture gets warm (baking soda solution and calcium chloride). When the mixture needs energy it takes it from the environment, and the mixture gets cooler (vinegar and baking soda).*

### Making Connections (10 min)

When the students are done collecting their data, have them fill out the conclusion section of the worksheet.

Gather together as go over some questions with the entire group. Start by having the students share their observations with the class, reinforcing the concepts as you go. *Chemicals can store energy as potential energy, and when they are mixed they can create kinetic energy.* Students may also have noticed some physical changes, such as a white solid forming, or foaming. These are indications that the chemicals are changing when mixed.

Allow students to ask any questions they may have about energy.