**Answer Key: Solving Problems like a Scientist**

**Background Questions**
1. How are acids and bases different?
   Acids have a sour taste and dissolve many materials. Bases are bitter and cut through grease. Bases are made of more hydroxide ions, while acids are composed of more hydrogen ions.

2. What does “absorbent” mean?
   Absorbent is a property of a material to take in, or soak up, water.

3. What materials can speed up the process of oxidation (which results in rust)?
   Both salt and water will speed up the process of oxidation.

**Scenario 1**

In the back of the room, there is a cleaning bucket next to the sink with three lemons inside of it. The sink has some soap scum buildup and other dirt inside of it. Research lemons and acidity to answer the following questions.

1. What are 3 uses of lemons (besides food/drink)?
   Cleaning silverware, removing soap scum, removing odor from your hands

2. What materials/objects can lemons be used to clean?
   Silverware, sinks, stoves

3. What can lemons NOT be used to clean? grease

4. Can the lemons be used to clean the sink? Why or why not?
   Yes! Acids like lemon juice work best on alkaline types of stains (as opposed to acidic stains). Since soap is alkaline, lemon juice and vinegar are both great at removing soap scum. They are less effective at removing grease.

**Scenario 2**

You see that next to your teacher’s desk, water has spilled onto the floor. There is a sponge, two sheets of paper towels, wax paper, and a piece of Styrofoam on the desk. Research absorption to answer the following questions to help you decide which material would clean up the spill the most quickly.

1. What makes a material more absorbent than another?
   The more fibers a material has to absorb water with, the more absorbent it is.

2. What is found inside paper towels and tissues that helps them to be absorbent?
   The fibers in tissues and paper towels are made of cellulose molecules—big molecules that consist of lots of tiny sugar molecules chained together.
3. You can only use one material to clean up the spill. Which material do you think would clean it up the most quickly? What evidence can you use to support this claim?
Possible answers are either the paper towels or sponge. Students should provide specific evidence to support their answer to the above question.

Scenario 3
You look out the window and notice that the basketball hoop has an orangey/brown substance on it. Research rust and oxidation to answer the following questions.

1. What is on the basketball hoop? rust
2. How did it get there?
Rust is formed when iron and oxygen react in the presence of water or moisture in the air.
3. What are two things that can be used to prevent oxidation from occurring?
Keep the area around the metal surface dry and use drying agents and moisture barrier products.
4. Your principal decides to buy a new basketball hoop. What could you do in order to prevent the hoop from rusting? What evidence can you use to support this claim?
Paint it or put a protective coat on it so it doesn’t get wet. You could also choose a hoop that is made of a material that will not rust. Since rust forms when iron and oxygen react in the presence of water or moisture, then I would either need to use a material that is not able to rust or to treat the iron with paint or another coating to protect it from water or moisture.