**Kimberly Miller**

**Alex Smith**

**4-H Prototype – Head:**

**Bottle Rocket Experiment**

    “A popular science project is mixing soda and vinegar in a rocket or race car out of a plastic water bottle. When the baking soda and vinegar react, it creates a carbon dioxide gas. The gas is what causes bubbles and foam when the two ingredients are mixed. This gas builds pressure within the bottle or other rocket structure. Once enough gas builds up, the bottle’s opening will release, propelling the rocket forward.” – Kelly Gray

**Materials:**

* + An empty water bottle
  + Vinegar
  + Baking soda
  + Toilet paper
  + A cork (Make sure it fits snugly into your bottle opening before getting started)

**Instructions (Control):**

1. Poor about 1 inch (1/2 cup) of vinegar into the empty water bottle.
2. Pour a small amount of baking soda (about the size of a quarter or 1 teaspoon) onto 2 squares of toilet paper.
3. Fold the ends into the middle and roll shut, creating a time release capsule. When you drop this into the water bottle (don’t do this quite yet!), it’ll take a few seconds to begin to react, giving you time to set up your rocket and move away from the launch site so you don’t get bonked in the face with a bottle rocket.
4. Outside, in a spacious area, drop the paper and baking soda wrap into the bottle. IMMEDIATELY cap with the cork. Stand the bottle on the cork and step back.
5. **BLAST OFF!** Wait and watch. As the paper dissolves in the water, it slowly releases the baking soda, creating a chemical reaction that releases the gas that will power the rocket. *Allow plenty of time for the paper to unravel and mix the two ingredients – don’t approach the bottle and stand well back while you wait for blast off!*

**Instructions (A):**

1. Poor about 1 inch (1/2 cup) of vinegar into the empty water bottle.
2. Pour 2 teaspoons of baking soda onto 2 squares of toilet paper.
3. Fold the ends into the middle and roll shut, creating a time release capsule. When you drop this into the water bottle (don’t do this quite yet!), it’ll take a few seconds to begin to react, giving you time to set up your rocket and move away from the launch site so you don’t get bonked in the face with a bottle rocket.
4. Outside, in a spacious area, drop the paper and baking soda wrap into the bottle. IMMEDIATELY cap with the cork. Stand the bottle on the cork and step back.
5. **BLAST OFF!** Wait and watch. As the paper dissolves in the water, it slowly releases the baking soda, creating a chemical reaction that releases the gas that will power the rocket. *Allow plenty of time for the paper to unravel and mix the two ingredients – don’t approach the bottle and stand well back while you wait for blast off!*

**Instructions (B):**

1. Poor about 1 inch (1/2 cup) of vinegar into the empty water bottle.
2. Pour ½ teaspoons of baking soda onto 2 squares of toilet paper.
3. Fold the ends into the middle and roll shut, creating a time release capsule. When you drop this into the water bottle (don’t do this quite yet!), it’ll take a few seconds to begin to react, giving you time to set up your rocket and move away from the launch site so you don’t get bonked in the face with a bottle rocket.
4. Outside, in a spacious area, drop the paper and baking soda wrap into the bottle. IMMEDIATELY cap with the cork. Stand the bottle on the cork and step back.
5. **BLAST OFF!** Wait and watch. As the paper dissolves in the water, it slowly releases the baking soda, creating a chemical reaction that releases the gas that will power the rocket. *Allow plenty of time for the paper to unravel and mix the two ingredients – don’t approach the bottle and stand well back while you wait for blast off!*

**Instructions (C):**

1. Poor about 1/2 inch (1/4 cup) of vinegar into the empty water bottle.
2. Pour a small amount of baking soda (about the size of a quarter or 1 teaspoon) onto 2 squares of toilet paper.
3. Fold the ends into the middle and roll shut, creating a time release capsule. When you drop this into the water bottle (don’t do this quite yet!), it’ll take a few seconds to begin to react, giving you time to set up your rocket and move away from the launch site so you don’t get bonked in the face with a bottle rocket.
4. Outside, in a spacious area, drop the paper and baking soda wrap into the bottle. IMMEDIATELY cap with the cork. Stand the bottle on the cork and step back.
5. **BLAST OFF!** Wait and watch. As the paper dissolves in the water, it slowly releases the baking soda, creating a chemical reaction that releases the gas that will power the rocket. *Allow plenty of time for the paper to unravel and mix the two ingredients – don’t approach the bottle and stand well back while you wait for blast off!*

**Instructions (D):**

1. Poor about 2 Tablespoons of vinegar into the empty water bottle.
2. Pour a small amount of baking soda (about the size of a quarter or 1 teaspoon) onto 2 squares of toilet paper.
3. Fold the ends into the middle and roll shut, creating a time release capsule. When you drop this into the water bottle (don’t do this quite yet!), it’ll take a few seconds to begin to react, giving you time to set up your rocket and move away from the launch site so you don’t get bonked in the face with a bottle rocket.
4. Outside, in a spacious area, drop the paper and baking soda wrap into the bottle. IMMEDIATELY cap with the cork. Stand the bottle on the cork and step back.
5. **BLAST OFF!** Wait and watch. As the paper dissolves in the water, it slowly releases the baking soda, creating a chemical reaction that releases the gas that will power the rocket. *Allow plenty of time for the paper to unravel and mix the two ingredients – don’t approach the bottle and stand well back while you wait for blast off!*

**Questions to Consider:**

1. Does changing the amount of *vinegar* change the reaction time or the pressure of the bottle rocket?

2. Does changing the amount of *baking soda* change the reaction time or the pressure of the bottle rocket?

3. How does the bottle rocket build its *pressure*?