Airbag Lab

Objective:

Optimize the conditions for a chemical reaction between acetic acid and sodium bicarbonate so that a plastic bag fully inflates as quickly as possible without rupturing.

Ideal Gas Law: PV = nRT

Solving for Mole: $n = \dfrac{PV}{RT}$

Materials:

- 10 g sodium bicarbonate (baking soda)
- 300 mL 5% acetic acid (vinegar)
- (5) 650 mL sealable sandwich bags
- 100 mL graduated cylinder
- electronic balance
- weigh boats
- paper towels
- scoopula
- tissue
- string
- ruler

SAFETY

Students should wear safety goggles and aprons.

Procedure:

1. Plan your experimental procedure, have it approved by your teacher, and then conduct your experiment. Your procedure should include the following:

   a. list of all safety protocols

   b. description of how to calculate the volume of the sandwich bag

   c. description of how to calculate the amount of baking soda and vinegar reactants needed

   d. description of how to calculate the volume of carbon dioxide gas needed to fill each bag

   e. description of how to measure the time it takes for each bag to fully inflate

Questions:

1. Explain your experimental procedure.

   a. What safety protocols are necessary for your procedure?

   b. How did you calculate the volume of your sandwich bag?

   c. How did you calculate the amount of baking soda and vinegar needed for the reaction?

d. How did you calculate the volume of carbon dioxide needed to fill each bag?

e. How did you time the inflation of each bag?

2. What were the results of your experiment? What conclusions can you make about your model airbags?