



Background

It's Christmas morning and you answer a frantic phone call from your grandma. She tells you she spent all day yesterday baking her famous pies for Thanksgiving dinner and left them on the counter to cool overnight. When she woke up this morning, they were gone. She doesn't have time to make more pie, and Thanksgiving dinner won't be the same without them. She suspects the thief is someone she knows, so she has already collected some evidence. She is depending on you and your chemistry skills to help her track down the thief and confirm her suspicions.

When you arrive at her house, you notice some white powder that has been tracked across her kitchen floor. You ask her what it is, but she used so many white powders in the creation of her masterpieces, she's not sure which one it is. You head to her pantry and discover the following:

- Salt, NaCl , an ionic compound used for flavoring
- Baking soda, NaHCO_3 , an ionic compound that is used as a leavening agent in baked goods
- Corn starch, $\text{C}_6\text{H}_{11}\text{O}_5$, a covalent compound used as a thickening agent
- Sugar, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, a covalent compound used as a sweetener

You take some notes then ask her about her preliminary investigation. She hands you the following profiles:

Suspect #1

Name: Betty Crump

Occupation: Grandma's best friend & nosy neighbor

Evidence: White powdery substance collected from the stairs of the back door to her house

Back-story: Betty has extended family coming to town for Thanksgiving dinner and is a terrible cook

Suspect #2

Name: Gladys Smith

Occupation: Retired teacher & vocal city councilwomen

Evidence: White powdery substance collected near her kitchen sink, right next to where she keeps her dentures

Back-story: Gladys is Grandma's biggest Bingo rival, and she is jealous of Grandma's recent winnings

Suspect #3

Name: George Jones

Occupation: Works for the city's transportation department

Evidence: White powdery substance collected from his work boot soles

Back-story: George is a big fan of Grandma's pies and has been begging her to make him one for him to take to his own family's Thanksgiving

Suspect #4

Name: Millie Malone

Occupation: Retired lunch lady & county fair blue ribbon contender

Evidence: White powdery substance collected from the door handle leading into her kitchen

Back-story: Millie's pies placed second in the last county fair behind Grandma's, and she still hasn't gotten over it

You collect the white powder from the kitchen floor, the white powders from the pantry, the evidence collected at the homes of the suspects, vinegar from the pantry, iodine from the medicine cabinet, a hot plate, beakers, a spot plate, a conductivity tester, and pH paper from your chemistry lab, and get to work.

Procedure: You will not be doing this procedure yourselves, but you will watch the video (found below) in which I go through these steps. You will submit a completed data table and conclusion based on the results you see in the video.

1. Add a small amount of water to a small amount of the powder sample in a small beaker or cup and mix them together. Record your observations.
2. Use the conductivity tester in the powder-water mixture to see if it conducts electricity.
3. Add a small amount of the powder to a spot plate. Pour a small amount of vinegar into the same spot. Record your observations.
4. Add a small amount of the powder to another spot on the spot plate. Add a few drops of iodine. Record your observations.
5. Repeat for each sample.