



The Mystery Powder Experiment

Student name _____

Period _____ Date _____

1.

Substances to be tested	Test Reagents
Tylenol®	Hexane (100 mL)
Aspirin	Water (100 mL)
Sodium bicarbonate	0.1 M HCl (100mL)
Alka Seltzer®	Universal indicator
Mystery powder	1.0 M FeCl ₃ (100 mL)

1. If the simulation is not currently open, click on the simulation button in the PSI tool.
2. Click on Tylenol® in the area at the top of the screen to ready the substance for testing.
3. Note and record how the substance looks.
4. Add hexane to the Tylenol® by clicking on the button in front of the hexane beaker. Note/record how the substance looks.
5. Click on the turn plate button to change to the next well to add the next test reagent.
6. Continue turning to a "fresh" well, adding the different test substances, and recording your results.
7. Now Click on Aspirin and repeat steps 2-6. Continue with the remaining two substances and the Mystery Powder.
Note: you must use a fresh sample for each test. A contaminated sample will give bad results. The Robotic arm will not function if the sample well hasn't been turned.

What characteristics did you notice when you added the hexane and other substances?

Did you notice similarities between how the various powders behaved in the presence of particular reagents? If so, try to explain why.

What did you conclude in this experiment? That is, which substance was the mystery powder? Explain how you know this?

2.

Suppose you are a forensic scientist, that is a crime-scene investigator. You are asked to investigate a break-in that has occurred in your neighborhood. At the site of each break-in, your team discovers a white powder residue. Based on interviews and other evidence, the police have four suspects in the case. Unfortunately, each one of the four suspects have access to white powders that might have been accidentally left behind at a crime scene.

Suspect One is a school teacher who students say often has chalk powder on her clothing.

Suspect Two is a baker who works with flour all day.

Suspect Three is a janitor who claims to clean lavatories every afternoon before leaving work using a white powder cleanser.

Suspect Four works in a department store cosmetics department selling perfume and talcum powder.

Describe how you would set up an experiment using the white residue found in the crime scenes to try to narrow down the suspects.

3. Check your understanding of the material in The Mystery Powder Experiment by answering the following questions:

a. If a substance is soluble in water, does this mean that the substance will be chemically changed when it is put in water? Please explain your answer.

b. A common test for acids is the bicarbonate test. If the unknown is a powder, adding an aqueous solution of baking soda (a tablespoon of NaHCO_3 in 100 mL water) is a test for acids. Put a drop the baking soda solution on powders you think are acids. If they are acidic, fizzing will occur. What do you think is causing the fizzing?

c. Suppose you know that the pH of a compound is 3.0. What can you conclude about the compound? What would you expect the pH of a very strong acid to be? How about a very strong base? What would the pH of pure water be?

d. What is the difference between Qualitative and Quantitative Analysis?

Which type of analysis have you been doing in this experiment?

e. Classify each of the following as a chemical change (C), a physical change (P) or both (B):

- Baking soda fizzes with vinegar.
- Cornstarch turns black when iodine is added.
- Plaster of Paris turns hard and warm with the addition of water.
- Sugar turns brown, then black when heated.
- Sugar and salt dissolve in water.
- Iodine always changes powders to its own color.



Personal Study Instrument