

Identifying a Mystery Powder

/25 marks

Forensic Science is the application of science to criminal investigations. Forensic scientists collect, analyze, and evaluate evidence from a crime scene. The evidence is then used in law enforcement. Qualitative analysis (that is, identifying a sample of matter from its physical and chemical properties) is an integral part of forensic science.

In this lab, imagine that you are a forensic scientist. You suspect that a death was caused by the ingestion of a mysterious white powder. Traces of the powder were found near the victim. The victim's partner claims that a severe heart attack was the cause of death. It is your responsibility to identify the mystery powder.

Purpose: Determine the identity of the mystery powder.

Materials:

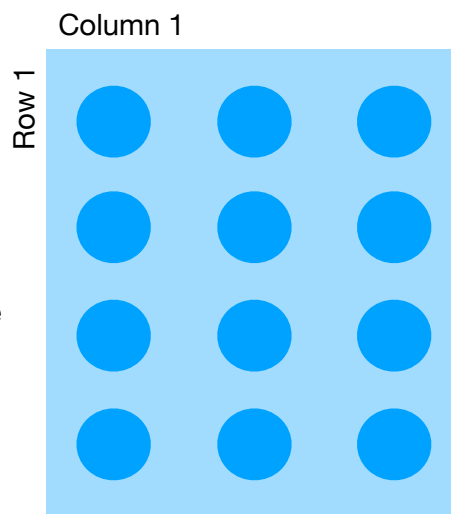
goggles
lab apron
gloves
spot plate
toothpicks
distilled water
universal indicator
1.0 M HCl
Iron (III) nitrate, $\text{Fe}(\text{NO}_3)_3 (\text{aq})$
Iodine solution $\text{I}_2(\text{aq})$

Powders:
aspirin
baking soda
sodium dihydrogen phosphate
sodium monohydrogen phosphate
powdered sugar

Unidentified white powder

Procedure:

1. Obtain a spot plate. Orient the spot plate so that the three wells go across the tray and 4 wells go down the tray.
2. In the four wells of column 1, use the scoopula provided for aspirin and place a sample of the powder in each of the four wells.
3. In each of the four wells of column 2, use the scoopula provided for sodium dihydrogen phosphate and place a sample of the powder in each of the four wells.
4. In each of the four wells of column 2, use the scoopula provided for sodium monohydrogen phosphate and place a sample of the powder in each of the four wells.
5. ACROSS row 1, place a couple of drops of distilled water in each of the 3 wells. Then place a couple of drops of universal indicator in each of the 3 wells (still of row 1). Record your observations. Obtain toothpicks to mix the



- contents well. Be sure to use different ends of the toothpicks for different solutions to avoid contamination of your samples.
6. ACROSS row 2, place a couple of drops of hydrochloric acid in each of the 3 wells. Record your observations. Record your observations. Obtain toothpicks to mix the contents well. Be sure to use different ends of the toothpicks for different solutions to avoid contamination of your samples!
 7. ACROSS row 3, use the eye dropper to place a couple of drops of iron (III) nitrate in each of the 3 wells. Record your observations. Record your observations. Obtain toothpicks to mix the contents well. Be sure to use different ends of the toothpicks for different solutions to avoid contamination of your samples!
 8. ACROSS row 4, place a couple of drops of iodine in each of the 3 wells. Record your observations.
 9. Record your observations. Obtain toothpicks to mix the contents well. Be sure to use different ends of the toothpicks for different solutions to avoid contamination of your samples!
 10. If you wish, take a picture of your well plate – for future reference
 11. Dump all contents of well plate into the waste beaker. Rinse out the well plate.
 12. Repeat steps 1 to 10, using baking soda, sugar, and the unknown powder.
 13. Dispose of waste in the waste container.
 14. Clean your lab station and return all equipment from where you got it.

Observations (8 marks)

| | Water and Universal Indicator | Hydrochloric Acid | Iron (III) nitrate | Iodine |
|-------------------------------|-------------------------------|-------------------|--------------------|--------|
| Asprin | | | | |
| Sodium dihydrogen phosphate | | | | |
| Sodium monohydrogen phosphate | | | | |
| Baking soda | | | | |

| | Water and Universal Indicator | Hydrochloric Acid | Iron (III) nitrate | Iodine |
|---------|-------------------------------|-------------------|--------------------|--------|
| Sugar | | | | |
| Unknown | | | | |

Analysis

1) List the physical properties of the five samples that helped you identify the mystery powder. (3 marks)

2a) List the clues of a chemical changes that you observed in this lab. (2 marks)

b) Which clues helped you identify the mystery powder? (1 mark)

3) Why was it important to test the five samples before identifying the mystery powder? (1 mark)

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4) There are quantitative analyses and qualitative analyses. What kind of analysis did you perform in this lab? Justify your answer. (2 marks)

5) What was the unknown powder? How confident are you in your answer? Justify your level of confidence using evidence from this lab. (2 marks)

Conclusion

Was the lab successful? Why or why not? (2 marks)

Suggest sources of error AND changes to the procedure that would help reduce these sources of error. (2 marks)

In your own words, explain why the qualitative analysis of matter plays an important role in forensic science. (2 marks)