To pot or not to pot, that is the question: Teacher Guide

Subject: Chemistry
Grade Level: High School

Case Summary

How did this high school student end up buying this old pot? He needs help to figure out what he has. Renee Stein, conservator at the Carlos Museum, steps up to help the student out.

Credits

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Smith, T., Commander, J., Etre, K., & Stein, R. (2013). Salt identification lab. Presented at The Science Behind Art Conservation Teacher Workshop, Emory University, July 8-12, 2013

Learning Objectives

1. Predict formulas for ionic and covalent compounds.
2. Identify the unknown ions present.
3. Making observations.
   a. Identify substances based on physical and chemical properties of ionic and covalent compounds.
4. Conduct an investigation, collect and analyze data, and draw a conclusion.

Georgia Performance Standards

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

a. Follow correct procedures for use of scientific apparatus.
b. Demonstrate appropriate techniques in all laboratory situations.
c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSh3. Students will identify and investigate problems scientifically.

a. Suggest reasonable hypotheses for identified problems.
b. Develop procedures for solving scientific problems.
c. Collect, organize and record appropriate data.

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SCSh5. Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

a. Trace the source on any large disparity between estimated and calculated answers to problems.
a. Consider possible effects of measurement errors on calculations.
b. Recognize the relationship between accuracy and precision.
c. Express appropriate numbers of significant figures for calculated data, using scientific notation where appropriate.
d. Solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic formulas as appropriate.

SCSh6. Students will communicate scientific investigations and information clearly.

a. Write clear, coherent laboratory reports related to scientific investigations.
b. Write clear, coherent accounts of current scientific issues, including possible alternative interpretations of the data
a. Use data as evidence to support scientific arguments and claims in written or oral presentations.
b. Participate in group discussions of scientific investigation and current scientific issues.

SC1. Students will analyze the nature of matter and its classifications.

c. Identify substances based on chemical and physical properties.
d. Predict formulas for stable ionic compounds (binary and tertiary) based on balance of charges.
e. Use IUPAC nomenclature for both chemical names and formulas:
    i. •Ionic compounds (Binary and tertiary)

<u>Assessment</u>

- The box charts and lab sheets are the assessment for this activity.

Implementation Strategy

Day 1:

- Students will read scene 1 and fill out box chart 1.
- Students will then read scene 2 and fill out box chart 2.
- Students will use the remaining time in class to conduct research to answer the remainder "What you need to know" questions. This research will be completed for homework.

Day 2:

- Students will complete Part I and Steps 1-2 of Part II of the Salts and Ceramics Lab.
- The rest of the steps will be completed briefly at the beginning of class every two days.

Day 16

- Students will complete the worksheet at the end of the Salts Lab – Student Guide.
- Students will create a graph of the conductivity readings.

Facilitator Guide

Scene 1 – Possible questions:

- What is the white substance on the pot?
- Could the white substance be dangerous? To me? To the pot?
- Who left the pot in New Mexico?
- Why was the pot left in a cave?
- Is it from a burial?
- Is the pot legal to own?

Scene 2 – Possible questions:

- What is Pueblo seed jar?
- What white substance could damage the pot and how?
- Why would you return the pot? And to Whom? (NAGPRA)

Resources:

Pueblo Indians
http://www.indianpueblo.org
http://www.indians.org/articles/pueblo-indians.html

Native American Graves Protection and Reparation Act
http://www.nps.gov/Archeology/TOOLS/Laws/NAGPRA.htm
https://www.azpm.org/p/top-news/2012/8/13/14875-to-its-rightful-place-to-its-rightful-owner/

Care of Pottery
http://www.mnhs.org/preserve/conservation/connectingmn/docs_pdfs/repurposedbook-ceramics_000.pdf
http://www.cr.nps.gov/museum/publications/conserveogram/06-05.pdf
http://museumblog.winterthur.org/2012/08/03/ceramics-salts-and-sun-conservation-at-the-arizona-state-museum/

To pot or not to pot, that is the question: Scene 1

You have decided to go to an auction but not just any auction, THE AUCTION. You are a big fan of the show "Auction Kings" on TLC and this Sunday you are heading over to Gallery 63 to see if there is anything that catches your eye. Who knows, you might end up on TV.

Sunday arrives and you are off to the auction early to get a good seat. When you arrive, you take a good look at the items that will be coming up for bid. In the corner is a large pot, covered with a whitish substance. It is heavy enough to obscure the pot underneath. It's not very attractive but seems to call out to you. You shake it off and continue on your way. It's about time for the auction to begin so you hurry to your seat. Item after item is bid on and bought. The auction is almost over and nothing has caught your eye.

Uh, oh here comes that pot. The auctioneer says the pot was discovered in 1850 in a cave in New Mexico. You find that hard to believe, really! Why is it all white if it was found in a cave? The auctioneer asks for $50 and no one moves. He reduces the opening bid to $25 and I raise my number. Why did I do that? No one else bids, so I'm out for the $25 plus 20% commission. What am I going to do with that ugly, old pot? And they quit filming before I even got to bid, this day stinks!

You wait in line with disgust to pay for the pot. I can't believe I bought that pot! I hand over $30 and they hand over the pot. When I get home, I show the pot to my mom.

Mom: "Why did you buy that?"

Me: "I really don't know. It's almost like it brain washed me into buying it."

Mom: "Brain washed, what do you mean?"

Me: "I don't really know. I felt like it was calling to me."

Mom: "That's kind of weird. How much did you pay for it?"

Me: "$30"

Mom: “That seems a little pricey for that unattractive pot.”

Me: “I know, the auctioneer said it was found in a cave in New Mexico in 1850.”

Mom: “I wonder if it is worth anything. I can’t imagine it is, it’s pretty ugly.”

Me: “Yeah, I know.”

Mom: “You know Ms. Stein, my friend. She works at the Carlos Museum. She might take a look at it for you and give you an opinion.”

Me: “It’s worth a shot.”

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To Pot or Not to Pot Box Chart: Scene 1

What you know:	What you need to know:

To pot or not to pot, that is the question: Scene 2

Me: "Hi, Ms. Stein. My mom suggested I show this pot to you and get your opinion."

Ms. Stein: "Come on in. Let me take a look."

Ms. Stein examines the pot carefully. It is coated in a white powdery substance that obscures the underlying surface. She can tell immediately what the white powdery substance is. The shape of the pottery tells her it is probably a Pueblo Indian seed jar.

Ms. Stein: "Where did you get this pot?"

Me: At Gallery 63, you know, the show "Auction Kings" is filmed there."

Ms. Stein: "I'm not familiar with the show. How much did you pay for it?"

Me: "$30. The guy said it was found in a cave in New Mexico in 1850. I'm not sure I really believe it though."

Ms. Stein: "It is very possible it was. You may have found an ancient Native American seed jar. It needs to be properly cleaned for positive identification and to ensure no further damage to the pot's surface. If it is a Pueblo seed pot, you have to contact the appropriate tribe and inform them of your find. It must be returned to them, if they want it."

Me: "Wooh! How do I clean it? How do I know who to call? Can't I just maybe give it to you or the museum?"

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Mrs. Stein: "You can donate it to the museum. Then we would clean it safely and categorize it. This could be a huge find for us, if the particular tribe lets us keep it. Are you sure you want to donate it?"

Me: "Yes, I'm not sure why, but I do."

Ms. Stein: "Can you bring it down to the museum tomorrow around 10:00 am? I'll help you with the paperwork."

Me: "Yeah, sure, thanks a lot Ms. Stein."

To Pot or Not to Pot Box Chart: Scene 2

What you know:	What you need to know:

References

Pueblo Indians
http://www.indianpueblo.org
http://www.indians.org/articles/pueblo-indians.html

Native American Graves Protection and Reparation Act
http://www.nps.gov/Archeology/TOOLS/Laws/NAGPRA.htm
https://www.azpm.org/p/top-news/2012/8/13/14875-to-its-rightful-place-to-its-rightful-owner/

Care of Pottery
http://www.mnhs.org/preserve/conservation/connectingmn/docs_pdfs/repurposedbook-ceramics_000.pdf
http://www.cr.nps.gov/museum/publications/conserveogram/06-05.pdf
http://museumblog.winterthur.org/2012/08/03/ceramics-salts-and-sun-conservation-at-the-arizona-state-museum/