THE CASE OF THE POISONED PARKS

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The Case of the Poisoned Parks is an activity to use with grade 11 chemistry students that adresses several different ideas. I can be used in the solutions unit, or can be used as a summative task. Curriculum expectations covered are: identifying ions in solution, lab techniques of planning, and conducting an experiment, filtration and separation of mixtures, environmental and health implications of various chemical compounds, and exploring and researching career connections.

To begin, I go around and take pictures of local parks in the area that the kids recognize. I make 8 different scenarios (depending on your numbers this could be more or less) and give the kids a "scenario". See below:

The Case of the Poisoned Parks...

Case 1: Kanata, Ontario

Image result for picture of a park

A statistically significant number of children between the ages of 2-8 were admitted to the Ottawa Hospital after suffering from some very serious physical symptoms over the last couple of days, in what is a suspected case of poisoning. All children were part of a home daycare program, however, only the group that visited the local park had symptoms. The home was ruled out as a source. Symptoms recorded were: irritability, loss of appetite, weight loss, fatigue, abdominal pain, vomiting, constipation, hearing loss, and seizures. The neighborhood park is considered at this time to be the source of the toxic material and the ministry of health is looking for labs in the area to carry out a test of the contaminated park sand. Your company has been chosen to be one of the testing facilities. You must carry out some diagnostic tests to figure out what is in the sand, and how much is present. It is required that you prepare a report of your findings for the ministry of health and if successful, your company's work (including the methods and calculations and final report) will be used as the template for how to handle the other cases that have been popping up in the region. Your task is as follows:

1. Design and carry out a test to determine what is contaminating the sand.
2. Calculate the % composition of the contaminants in the sand.
3. Prepare your findings to be presented to the ministry of health.

Things to keep in mind: Design your procedure carefully, as it needs to be part of your report. Keep in mind that exact replication of your procedure is crucial, so make it detailed and specific. The ministry requires your lead scientists qualifications, so please prepare a cover letter that will let them know what degree(s) you all have, and what relevant experience you have that would support you as a team of excellent candidates for this job. (You can have some fun with this...)

I prepare several individual samples that have a mixture of sand, either a barium or a lead compound (you can use lots of different stuff here) and I add in some salt or sugar sometimes (as an additional inert contaminent depending on how keen ou think your students are)

There is a spreadsheet that can be used to help with tracking your preparation, and to assess your student results. Please be sure to make a copy of it - then use it for your own data...

https://docs.google.com/spreadsheets/d/1NHbTJQOEERi1qxib9qQFIhkmCNVTMFJrBma5joy_yag/edit#gid=0 (https://docs.google.com/spreadsheets/d/1NHbTJQOEERi1qxib9qQFIhkmCNVTMFJrBma5joy_yag/edit#gid=0)

Extensions and Possibilities for The Case of the Poisoned Parks...

To Simplify:

- You can dictate what solutions the kids must use to figure out the identity of the toxin. (ie: must use Na_2SO_4, or Na_3PO_4...)
- You can tell them what precipitation reactions must be performed (and thereby hinting to them the identity of the toxin and its anion)
- You can do various solution labs beforehand to get them the idea of filtration and diagnostic testing to see completion of reaction.
- It can be more of a diagnostic sequential analysis instead of a quantitative analysis
- You can tell them how much solution will ensure reaction goes to completion (all based on the samples you create - for example, use 100 mL of a 0.2 mol/L sodium phosphate solution...)
- You can provide any part of the results for them as desired

To make it more interesting:

- Mix up in the initial lab and the samples were mixed up (don't know which sample corresponds to which case study sample - must perform the tests and see which case symptoms correspond to which results)
- Include another ionic or molecular substance in your sand sample that they may be able to isolate and/or precipitate. In our lab we added sugar, and have in the past done salt.
- Require them to test for the anion that was present with the metal in the unknown sample (ex: Cl^- or NO_3^-) Ask for nitrate how or if they can be 100% sure...
- Have them come up with a treatment plan for the patients based on research about the specific poisoning (cross curricular with biology)
- Have more than one metal contaminate your sample - order becomes way more important here
- As part of the report to Health Canada, have them do a fully referenced introduction to encompass all of the techniques and theory that will be used in the lab

Personal Set up Requirements:

1. Put together a back story, or use the template. Personalize it to the neighborhoods around your school if you like
2. Get sand and contaminate it with whatever chemicals you have that can be both initially dissolved, and then precipitated out. Hint - do this on the scale as so: tare empty beaker, add small quantity of sand, record, tare, add small quantity of desired chemical, record, tare, add third chemical if using... Spreadsheet is provided for you to add your numbers in and will tabulate your predicted data for you.
3. Make up a selection of testing chemicals for students to use - these will all be based on the solubility table and kids will have to figure out that order matters. You can do as many or as few as you like.
4. Get materials based on what students have put in their procedures - you can have them hand in their materials list ahead of time to do this (or just have them get their own depending on your lab set up)
5. Put together a handout telling them what is required, decide how many students per group, give them a timeframe, and away they go!

Possible Extension Questions:

1. What effect would not rinsing your filter paper have on your results?

2. **How would your results differ if sand had some soluble component(s)?**
3. **Why might your results not be exactly what they should be?**

Anything else you can think of...?

Reflections:

The students had a lot of fun with this lab activity. The creativity of their reports was unbelievable! Some of them had a very hard time planning out what they were going to do - and if you aren't watching them, they might ruin the whole thing immediately by adding the precipitating chemical without filtering out the sand!! As a teacher, I found it was a bit of work to set up - but I did a quite involved variation with individual duotangs and photos of lego character with symptoms etc, so I went all out. You don't have to do that!! Although I can share what I have with you if you want. :)

Exemplars:

https://docs.google.com/document/d/1cXdV6UoalJjPOsoRQTr22G8WzjSQSQ4ec0UPrl4dpfs/edit (https://docs.google.com/document/d/1cXdV6UoalJjPOsoRQTr22G8WzjSQSQ4ec0UPrl4dpfs/edit)

https://docs.google.com/document/d/1bGnNXF_Iu2mcYtGV--N3lDqYeTKu54CLW-U4qyjwN-8/edit?usp=sharing (https://docs.google.com/document/d/1bGnNXF_Iu2mcYtGV--N3lDqYeTKu54CLW-U4qyjwN-8/edit?usp=sharing)

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COMMENTS

racquel carlow
October 21 at 6:47pm

Very innovative activity. It was great to include suggestions for simplification. To complete the submission please include the following: (1) curriculum connection, (2) student exemplar(s), and (3) student-teacher reflection and feedback.

Permalink (/comment/650#comment-650)

RESOURCES

Patient chart (https://docs.google.com/document/d/1zuqV5ZyU5YQtSEuda5GvwH3IsX9uQFTZZ1dyTn4C3mo/edit)

ELEMENT

Inquiry (/expert-elements/inquiry)

(/classroom-catalysts) RETURN TO CATALYSTS (/classroom-catalysts)