

Calcium in Tums Activity:

Al DeGennaro

Teacher's Guide

Goals

- To make the distinction between elements and compounds
- To use technology in order to visualize chemistry

The Activity

In this activity, students watch QuickTime movies of chemical reactions between different elements. This is to help students understand the difference between elements and their compounds. Then they try to answer whether there is calcium in Tums. The introduction of technology helps the students to visualize the difference between compounds and elements.

Materials

- CD-Rom about the periodic table: http://jchemed.chem.wisc.edu/JCESoft/Issues/Series_SP/SP17/prog1-SP17.html
- Computer connected to TV set—check connections before class!
- Story about calcium in Tums (See Lecture Notes)

Lecture Notes

Let's talk about the computer software, which I'm going to show you today. What I have is a CD-ROM, which has little animation clips. Most of them are QuickTime movies, samples of different elements.

Name an element. For example, gold. We can have a movie that just shows pictures of gold. If you are a wealthy person, then you are very familiar with it: it is a bright, orange, shiny metal.

Now, let's try some reactions with it. There are the reactions of gold with air, the reaction of gold with water, the reaction of gold with acid and the reaction of gold with base.

Which reaction do you want to be? The reaction of gold with acid.

Show movie. There's no reaction.

But think about it: why do people like to have gold? Because it doesn't react with anything.

Magnesium: what does it look like? (Close-up view) Shiny, silver colored, metallic.

Let's try air, next. It should be heated first, and then the reaction occurs.

Story About Calcium in Tums

Everybody has seen that commercial, that Tums contains calcium.

Now, your lab partner Joe tells you that there's no way that calcium can be in Tums, because it's a bright, shiny, metal.

To prove this, shows you the periodic table CD-ROM that we have just seen. Sure enough, not only is calcium a gray shiny metal, but it also reacts quickly with water, which must be a bad thing, if you actually have swallowed it.

Calcium in Tums Activity: Teacher's Guide, page 2

Like a typical student, Joe wants the two of you to write a letter to the Tums company and call them liars. He also tells you they might offer you money to be quiet about this.

You have to decide whether you agree that it is impossible for calcium to be in Tums.

What you're going to do is use what you observe, and what you learned about elements and compounds, to write a letter to Joe that explains why you agree or disagree with the statement that calcium couldn't possibly be contained in Tums.

Let's observe the CD about calcium. What color is it? A dull gray. Let's do water. Any other video clip you want to see about calcium? Acid, because there is acid in your stomach.

To conclude: Is there Calcium in Tums? Why?

Teaching Tips From Mr. DeGennaro

To understand the chemistry of life you need to have a very good understanding of what elements and compounds are. That's actually at certain different levels.

Our objective here is that they be able to make the distinction between elements and compounds. In our society they are thrown about interchangeably. This makes sense to me, as a trained scientist, but it doesn't make any sense at all to students.

The compounds react dramatically differently than the elements from which they are composed. The most obvious example is sodium chloride. Sodium and chlorine are both very toxic, very reactive, and salt is essential for life, almost harmless.

In this assignment, the idea was to create a situation that was more interesting, realistic and challenging and so the mass-media was helping me out: it was right in my lap—that Tums contain calcium.

Is calcium in Tums? Yes or no, I mean, calcium atoms are in Tums, but it's not pure calcium. Now, the scenario with the students is: are they being dishonest by not making the distinction?

And I'm prepared to accept either answer. If the student says, sure it's not actually pure calcium, but it's calcium carbonate, and as far as your health is concerned, that calcium is as good as the calcium that you find in milk or in other stuff. And so it's not really dishonest.

On the other hand, he might be a purist, saying that it's not pure calcium and that they are lying, and what matters is only the justification.

References: Links

<http://www.chem.latech.edu/~deddy/chem104/104Antacid.htm>

A lab procedure for analyzing antacids chemically.

<http://www.calciuminfo.com/index.htm>

Click on any of the links on this page for more information on calcium.

<http://www.tums.com/>

The TUMS homepage.

References: Readings

Turner, Ray. (2001) "Using Technology to Create a Scientific Learning Community," *Journal of Chemical Education*, Vol. 78, No. 6, pp: 717-719.

Kostecka, K.S. (2000) "Atomic Absorption Spectroscopy of Calcium in Foodstuffs in Non-Science-Major Courses," *Journal of Chemical Education*, Vol. 77, No. 10, pp: 1321-1323.