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USING SCIENCE FICTION TO TEACH SCIENCE FACT

Editor's Note: With the recent emphasis in Iowa on Writing Across the Curriculum, we thought this article might prove especially useful and timely for teachers.

Naola Van Orden at Sacramento City College in California has her students write science fiction stories to demonstrate their understanding of various scientific concepts. While the assignments made by Van Orden and the responses she received from her students may be too advanced for lower grades, the idea can be used from the elementary level up.

Properties of Elements

Activity: Write an autobiography of an element. Select a chemical element and look up its properties in a handbook and in your text. Then describe those properties by giving them anthropomorphic qualities (human characteristics). Write as if you are the element.

“Oh, hello there. You’re all looking at me again. And what do you see--yourselves. Don’t worry, everyone does it; they can’t help it since I have the highest optical reflectivity when polished. Besides that, I’m used to it. You see, I was born in Egypt sometime before 3500 B.C. and weigh 107.87.

“The ancient Babylonians gave me my start by using me as a monetary metal probably because one form of me is found as a native element which is 87 percent pure.

“Unfortunately though, two-thirds of me is produced as a by-product from ores of other metals, primarily lead, copper and zinc. Yeach! I prefer being pure, but one can’t be picky when you’re rare and make up less than a hundred millionth of my mother earth’s crust.

“Yes, so rare; yet so used and abused by people all over the world as bullion and coins.

“I know how to have fun too! I have a high electrical personality--higher than anyone else. I’m more malleable than any of my cousins, except of course gold. So I can become exquisite jewelry and tableware.

“I’m soft hearted so when my feelings get hurt, I scratch easily and then I need to be stroked and polished just like everyone else.

“Don’t ever ignore me or I’ll get even with you. I’ll even tell you how I’ll do it. You see, though I’m an intermediate in chemical reactivity between my cousins gold and copper, and I’m resistant to corrosive agents, such as oxygen, water and dilute acid, if you ignore me, I’ll combine so readily with hydrogen sulfide in the air that it will make your head swim. Ha ha! And all you’ll have is good old black tarnish.

“I have a more serious side as well, and when duty calls, I’m there.

“I’m important in my work in dentistry for bridgework, pins and fillings.

“Also the bactericidal properties (of colloidal form) make me useful in medicine, or as caustics, astringents and antiseptics.

“I also work in industry--yes, in this day and age we must have more than one job to get by. I’m a corrosion-resistance alloy used as a lining material in vessels and pipes. And I’m workable; I don’t give the boss a hard time.

“So, have you figured out who I am yet?

“No! O.K., here is another clue: I bring out the vanity in you all. About one-third of me is consumed in the form of a photosensitive material used in photography, so you can get your picture taken--then pass it on to that special person.

“More clues? If you get me mad, I boil at 1950 degrees Celsius. My most common valence is +1, but the +2 is also found. Well, I’m sure you have guessed my identity by now.

“Sincerely,

““Ag””

(Friday Forsthoff, 1989).

Kinetic Molecular Theory of Gases, Liquids and Solids

Activity: A) Pretend you are a water molecule swimming around in a lake on a warm day in October. (What kind of motion do you have? Why do you have motion?) B) You suddenly have enough energy to leave the lake and become a vapor above the lake. (How did you get enough energy?) C) A cold front comes in and by 9 p.m. the temperature is down to +50. D) By 2 a.m. the temperature is -10 degrees Celsius. (What happens to you?).

Write a fantasy story describing your actions, your surroundings and your travels. Include friends if needed. 1. Write statements of the kinetic molecular theory which you must understand in order to write an accurate fantasy story. 2. Write the story. Use as much imagination as you wish, but be accurate in the chemistry that you are describing.

“Ah, what a beautiful day it is! I am having a wonderfully relaxing time swimming and doing aqua-aerobics with my sisters in Lake Hydration.

“My sisters and I all look alike. We are polar molecules, being negative towards one end and positive towards the other, even though we are really quite neutral in our ‘thinking.’ A few of my sisters have been up to mischief by snatching hydrogen ions of other sisters and really creating chaos. We move about by our kinetic energy, bouncing off our surroundings and each other. We are continuously in contact with each other and swim about in a rather disorderly fashion.

“I am swimming along the surface of the lake, feeling the invigorating warmth of the sun, which makes me want to swim faster and faster, when suddenly I receive a jolting head-butt by one of my sisters doing her aqua-aerobics beneath me.

“What a shock! No time to think about the pain in my posterior because I am no longer swimming but literally flying in the air above the lake.

“What an exhilarating feeling! I can move farther than I ever have before. This is great fun.

“I am not alone, however; I have other sisters with me flying above the lake. This is different from swimming, although we still collide with each other because we are so disorderly, and in continuous motion.

“I have been flying for quite some time doing aerial flips bouncing rapidly off my sisters and other molecules in the air. It is now close to 9 p.m. and gotten very chilly, and I am slowing down from the cold.

“I cling to some of my sisters and we drizzle down from the cold. I cling to some of my sisters who are still swimming about, but no longer at the invigorating speed that we swam in under the warmth of the golden sunshine. By 2 a.m. we are extremely tired and the cold has made it impossible to swim.

“I am on the surface of the water and extend my legs and arms and balance myself in a graceful lattice structure with my other sisters on the surface of the lake.

“It is too cold to swim and we aren’t as close together now that our legs and arms are outstretched in our lattice structure.

“We also ‘shiver’ from the cold, but we are prepared for our serene winter sleep.”

(Elisa Estrmera, 1991)

Production of Light by Electron Transitions

Activity: Pretend you (or someone else) are an electron in the 3s orbital of a sodium atom in a sodium-vapor lamp. Write an imaginative story about what happens to you when the lamp is turned on and the atoms are given heat energy. Continue your story with what happens when the atom is bombarded with x-rays.

“So here we are in the sodium lamp hanging out with all of our other relatives. There are thousands of us here.

“My name is Sam and I am an electron in one of those atom ‘families.’ I reside in the 3s energy level. (They call me the athlete of the family because I have so much energy.)

“Things are pretty normal around here most of the time. But let me tell you about last month. I was buzzing about in my room on the 3s level and all of a sudden--whoosh--I felt a force push me.

“Before I knew anything, I was in one of the higher 3p levels. It was scary. I had never been there before. I felt very uncomfortable, and there wasn’t anyone there I knew.

“Luckily the force was no longer pushing me so I jumped back down where I belonged. When I landed this beam of light shot out of my body!

“Boy, was I terrified. I had heard about the ‘Light Experience’ from other electrons, but I never thought that it would happen to me. And I hoped nothing like that would ever happen again. But all was well and I was safely back home, so I thought.

“Just when I had gotten back home again, we were hit with x-rays. Because of this, my baby sister was knocked out of her 1s place. It was awful.

“The atom was in an uproar. We didn’t know where she was and we wanted to find her.

“My other sister, Sandra, immediately dropped down to Samantha’s old place to look for her. My brother Perry took Sandra’s place; our brother Paul took his place, and Peter took Paul’s place.

“That left an empty room, so I had to jump down to Peter’s spot. Every time one of us moved down we gave off an x-ray. That was scary.

“We all searched for little Samantha, but we could not find her anywhere. She was gone forever. That was a sad day in the atom.”

(Gemelle Watson, 1992)

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