Krista Martens

Lesson Plan PAN 2013

Isotope Identity

Purpose: The student will be able to describe and understand the concept of 'isotope'. The student will be able to describe and understand the terms 'atomic number' and 'atomic mass', and determine the number of neutrons given this information. The student will be able to identify elements using atomic mass number.

Background Information: Students have already studied atoms and elements. But, they frequently forget the basics that they are expected to know for scientific literacy and state mandated testing which affects the school's academic record. They already "know" how to: read and use the Periodic Chart, the parts of an atom, an idea about the relative size and scale of an atom, and the definition of isotope.

Opener: Powerpoint "2013 Atoms and Elements". Students are grouped and they briefly work together, brainstorming for the purpose of recalling basic atomic structure – priming their brains for the lesson.

School District 6 Benchmarks:

2.2.38 Know that atoms are composed of particles called protons, electrons, and neutrons.

2.2.39 Know the electrical charge of all particles (Examples: Protons have a positive electrical charge, electrons are negatively charged, and neutrons have no electrical charge.)

2.2.40 Know that an atom of a particular element has a unique number of protons called the atomic number.

2.2.42 Know that the nucleus of an atom is composed of proton and neutron particles.

2.2.43 Know that an atom's protons and neutrons have masses approximately equal to each other but are each approximately 2000 times the mass of an electron.

2.2.47 Understand that radioactive decay is due to atomic nuclei spontaneously breaking apart and emitting subatomic particles.

4.3.1 Understand that increasingly sophisticated technology is used to learn about the universe. (Example: Visual, radio, and x-ray telescopes collect information from across the entire spectrum of electromagnetic waves; computers handle an avalanche of data and increasingly complicated computations to interpret them; space probes send back data and materials from

the remote parts of the solar system; and accelerators give subatomic particles energies that simulate conditions in the stars in the early history of the universe before stars formed.)

Activity: Building Isotopes Students will use the magnetic marble models to build the nuclei of various elements. These are to include isotopes of the same element, for instance Li-5, Li-6, and Li-7. This hands-on modeling will highlight the difference between protons (p^+) and neutrons (n^0). The standard materials contain six protons and six neutrons; if additional nuclei sets are available, then students will be able to make heavier nuclei.

Reinforcement: The students will complete one handout to practice the concepts. Note: run the two pages (files) back to back.

Assessment: Set up a station where the students build three or four specified isotopes from the nuclei models. They will draw from cards that are prepared so they don't know which isotopes will be tested.

Extensions: Isotope Bingo (p 2, 3, PAN 2013) as an introduction to nuclear decay; discussion of what makes an atom unstable and why/how unstable nuclei decay (p 5, PAN 2013) and how nuclear research is done (p 18, PAN 2013). Another activity that will help students understand decay is using the fragmentation box to model nuclear decay.

Krista Martens

Demographics Columbia Falls High School (CFHS), Columbia Falls, Montana

The town of Columbia Falls is located in northwest Montana, close to Glacier National Park. CFHS educates approximately 770 students in grades nine through twelve. The student population is predominantly white and over 65% are on free or reduced lunches.

Community members are very supportive of the high school population and activities. However, many students come from single parent households or homes with even less supervision and guidance.

The classes I teach include sophomore integrated science, algebra, algebra support and credit recovery. The knowledge, experience, materials and activities that were presented through PAN are most useful for integrated science. The curriculum for this class is dominated by earth science but also includes introductory units on chemistry and physics.

My vision for the PAN materials is to help my students understand some introductory concepts about atoms and to connect them to learning with new and engaging hands-on activities and games.