Cosmic Chemistry: Understanding Elements

Past, Present, and Future

TEACHER GUIDE

BACKGROUND INFORMATION

In this lesson students will read a series of texts that provide three perspectives of the study of elements. In "A Historic Overview: Mendeleev and the Periodic Table," after reviewing the work of Johan Dobereiner, John Newlands indicated that more work was needed to organize the known elements. Dmitrii Mendeleev's process of organizing the elements is the basis of the text. If students completed the exploration part of this module, they should be able to relate to this process. In "The Modern Periodic Table," students read about how the periodic table that scientists use today is organized. Groups of elements are also highlighted and properties and uses of some of the elements are described. This text is a good preview to the Element Research activity in the Interaction section. "Elemental Mysteries for Genesis Scientists" examines the questions that scientists are asking about the isotopic abundances that exist in the sun. The information that is obtained through the Genesis mission will affect our understanding of the universe in the future.

The teacher strategies listed in the materials section may be used to facilitate the student texts. The texts may be broken down in to smaller sections to be completed by the students in conjunction with the teacher strategies. The procedure below contains a brief synopsis of the strategies.

NATIONAL SCIENCE STANDARDS ADDRESSED

Grades 5-8

Science as Inquiry:
Understandings about scientific inquiry

Physical Science:
Properties and changes of properties in matter

History and Nature of Science:
History of science
Nature of science

Grades 9-12

Science as Inquriy:
Understandings about scientific inquiry

Physical Science
Structures and properties of matter

History and Nature of Science
Nature of scientific knowledge
Historical perspective

MATERIALS

For each student:

- Student Text, "A Historic Overview: Mendeleev and the Periodic Table"
- Student Activity: Questions and Strategie, "A Historic Overview: Mendeleev and the Periodic Table"
- Student Text, "The Modern Periodic Table"
- Student Activity: Questions and Strategies, "The Modern Periodic Table"
- Student Text, "Elemental Mysteries for Genesis Scientists"

For the teacher:

- Teacher Guide Supplement, "A Historic Overview: Mendeleev and the Periodic Table"
- Teacher Guide Supplement, "The Modern Periodic Table"

PROCEDURE

1. Distribute the student questions for “A Historic Overview: Mendeleev and the Periodic Table.” Present the two options and allow the students time to complete the assignment. This can be done as an ongoing at home project or during class time.

2. Ask students to read the Student Text, "A Historic Overview: Mendeleev and the Periodic Table." Use the following strategies described in detail in the Teacher Guide Supplement section to facilitate the assignment. For the Triad Model use the example of ordering soft drinks at a fast food restaurant. For the Law of Octaves, colored chalk may be used to illustrate this model. Playing cards may be used to illustrate Mendelleev’s game of cards.

3. Ask students to read the Student Text, "The Modern Periodic Table." Compare the descriptions of chemical family characteristics with the students' prior knowledge. Point out well known and interesting examples of elements. Once the students have read the text distribute the student questions. The Teacher Guide Supplement for this text includes comparing elemental tables, using laserdisc videos to illustrate certain concepts, and some references to hands-on activities that will enrich the reading.

4. Close this section by having students read “Elemental Mysteries for Genesis Scientists.” This text relates problem-solving techniques and the periodic table to what problems the Genesis scientists are trying to solve. As students read the text, ask them to develop a list of questions that the scientists have as well as questions they have about isotopic abundance in solar wind.