



“Stuff” of the Stars – Cosmic Connection

Objectives

Participants will:

- Use estimation and percentages to calculate the abundance of different elements found in various substances.
- Understand that the origin of all elements began in space.
- Practice using a periodic table to identify complex organisms.

Suggested Grade Level

3rd –12th

Subject Areas

Science

Math

Timeline

One class period

Standards

Science (Arial Narrow, Bold and Underline)

NS.K-12.1 Science as Inquiry

- Understanding about scientific inquiry

NS.K-12.3 Life Science

- The characteristics of organisms
- Diversity and adaptations of organisms

NS.K-12.4 Earth and Space Science

- Properties of earth materials
- Objects in the sky
- Origins and evolution of the universe

Math

NM.-ALG.K-12.3 Algebra

- Use Mathematical Models to Represent and Understand Quantitative Relationships

NM.-DATA.K-12.3 Data Analysis and Probability

- Develop and Evaluate Inferences and Predictions That are Based on Data

NM.-CONN.K-12.3 Connections

- Recognize and Apply Mathematics in Contexts Outside of Mathematics



SPACE FOUNDATION

Education Programs

Inspiring Tomorrow's Explorers



Background

The chemical elements are all around us, and are part of us. The composition of the Earth, and the chemistry that governs the Earth and its biology are rooted in these elements. The elements have their ultimate origins in cosmic events. Further, different elements come from a variety of different events. So the elements that make up life itself reflect a variety of events that take place in the Universe. The hydrogen found in water and hydrocarbons was formed in the moments after the Big Bang. Carbon, the basis for all terrestrial life, was formed in small stars. Elements of lower abundance in living organisms but essential to our biology, such as calcium and iron, were formed in large stars. Heavier elements important to our environment, such as gold, were formed in the explosive power of supernovae. And light elements used in our technology were formed via cosmic rays. The solar nebula, from which our solar system was formed, was seeded with these elements, and they were present at the Earth's formation. Our very existence is connected to these elements, and to their cosmic origin.

Vocabulary

Big Bang, hydrocarbons, supernova, cosmic rays, solar nebula, elements, periodic table

Materials

Colored beads to represent the elements

Clear bottles or large clear cups

Periodic table

Calculator (optional)

Lesson

1. Give the bottles to the students, with each pair of students working on one bottle. Provide them with a copy of the Periodic Table of Elements, bead color key, and a copy of the "Stuff" of Stars – Cosmic Connection worksheet. Have the students identify and estimate the composition of the bottles by giving the name and percentage of each element.
2. Have students attempt to identify the "stuff" that is represented in their bottle. You can provide information or have the students attempt to do research to help try and identify their unknown substance.
3. Once students are finished with their bottle, have them pass it on to another group until each group has had a chance to identify each bottle.
4. As a class, discuss the students' results to see how they compare to the actual results. After this discussion, have students answer the final question on the worksheet.

Extensions

- Have students work in groups to conduct their own research into the elemental composition of other cosmic substances. From their research, students should present their findings and further develop their response to the question, "What is your cosmic connection?"
- Have students create a presentation that demonstrates their understanding of their cosmic connection and teaches this material to others (ex. newscast, scientific interview, skit).



Evaluation/Assessment

Students will be assessed based on participation in the activity and class discussion. Completion of the worksheet, specifically the last question, can be used to evaluate individual student understanding.

Resources

NASA: What is your cosmic connection to the elements?

http://www.nasa.gov/pdf/190387main_Cosmic_Elements.pdf