

11 Is Enough

Standards of Learning

Science 6.1, 6.4

Objective

Students will:

- Recognize that 11 major elements make up the majority of living things

Materials

- Periodic Table
- 11 elements written on puzzle pieces
- 8 x 11 ½ paper preferably different colors

Background Knowledge

All living things are created from elements. There are currently 118 elements. 92 are natural and 26 man-made. Of those, 11 elements are considered major elements because they predominantly occur in the earth's crust, living matter, oceans, and the atmosphere. These elements are silicon, aluminum, iron, sodium, calcium, potassium, magnesium, hydrogen, oxygen, nitrogen, and carbon. Share information from the periodic table with the class. Highlighting elements found in the earth's crust.

Silicon is essential to biology and is very important to the metabolism of plants. Aluminum is remarkable for its ability to resist corrosion due to the phenomenon of passivation and the metal's low density. Structural components made from aluminum and its alloys are very important in other areas of transportation and building. Its reactive nature also makes it useful as an additive in chemical mixtures. Iron is a vital constituent of plant and animal life and works as an oxygen carrier in hemoglobin. Sodium is vital in the manufacture of esters and in the preparation of organic compounds. The metal may be used to improve the structure of certain alloys, descale metal, and purify molten metals. Calcium serves as a life form for bones and shells. Calcium is able to keep bones healthy and strong by eating a lot of dairy products. Potassium is necessary for the function of all living cells, and is thus present in all plant and animal tissues. It is found in especially high concentrations in plant cells, and in a mixed diet, it is most highly concentrated in fruits. Magnesium is used for flashlight photography, flares, and pyrotechnics. The metal improves the mechanical, fabrication, and welding characteristics of aluminum when used as an alloying agent. Magnesium is also used in some medicines. Great quantities of hydrogen are required commercially for nitrogen fixation using the Haber ammonia process, and for the hydrogenation of fats and oils. It is also used in large quantities in methanol production. Other uses include rocket fuel, welding, producing hydrochloric acid, reducing metallic ores, and filling balloons. Plants, animals, and humans rely on oxygen for respiration. Hospitals frequently prescribe oxygen for patients with respiratory ailments. The nitrogen cycle is one of the most important processes in nature for living organisms. Bacteria in the soil are capable of "fixing" the nitrogen into a usable form for plants. Nature has provided a method to produce nitrogen for plants to grow. Animals eat the plant material where the nitrogen has been incorporated into their system, primarily as protein. Carbon is used in power plants and in the iron industry to make steel. Carbon is also used for jewelry and is a great conductor and is used for pencils and sports equipment.



Procedure

1. Quickly review the periodic table. There are currently 118 elements. 92 are natural and 26 man-made. Of those, 11 elements are considered major elements because they predominantly occur in the earth's crust, living matter, oceans, and the atmosphere. These elements are silicon, aluminum, iron, sodium, calcium, potassium, magnesium, hydrogen, oxygen, nitrogen, and carbon.
2. Show each one of the puzzle pieces and ask students where they have heard of the elements before. Example: Oxygen – we breathe it. You could then say you are correct, in fact there is 21% oxygen in the atmosphere and oxygen's symbol is O.
3. Put on the front of the booklet – 11 is enough, 2nd page O – oxygen, we breathe it and there is 21% in the earth's atmosphere.
4. After all 11 have been discussed, go back through the 11 elements and specifically direct students as to the importance of each element to a farmer. Example: during the nitrogen cycle, nitrogen is re-deposited into the soil which causes it to act as a natural fertilizer.
5. Ask the following discussion questions:
Are there other elements that were not mentioned that would be especially useful to a farmer?
Why do you think these elements were chosen as the top eleven elements?

Extension

Instead of asking for immediate responses in #3, you could put students in groups and let them come up with ideas for the elements and where they are found that need to go in the book.

