

# BASIS Presentation Plan

Lesson Name Elements Of Life

Developed by David Killilea For Grade 5th

**Standards Connection:** Physical Science: Just a few elements make all living things and most materials. Each element is one kind of atom, organized on the periodic table

## Abstract:

- Introduction: David will introduce himself and his assistant. He will briefly discuss elements and compounds, and review the layout of the periodic table.
- Activity #1: The students will make a model of elements (sodium and chloride) forming compounds (salt) by using marshmallows and toothpicks. Key concept: elements come together to make compounds with very different properties than the original elements had.
- Demonstration #1: David will demo the “breakdown” of sugar into its constituent elements using battery acid in a protective chamber. This dramatic reaction will cause the sugar to convert into a black snake-like chain of carbon. Key concept: compounds can be broken apart to recover the original elements.
- Activity #2: The students will then be asked about the elements needed to make up the human body. The class will help David complete a percentage chart of these different elements. Key concept: just a few elements make up most living things.
- Activity #3: David will show them examples of how much of these elements are actually in their bodies using element standards that can be passed around. Finally, David will connect some of these elements to interesting aspects of nutrition and health. Key concept: most elements in us are important, even if at very small levels. Some elements must be acquired from the diet for proper health. Other elements can be toxic.
- Activity #4: If time allows, David will lead a game of element flashcards to have students identify the elements of pictured item leading with concepts from periodic table. Alternatively, David may ask the students to name some of their favorite elements for more information about them.

## Vocabulary/Definitions:

element: substances that consist of atoms of only one kind

compound: substances that consist of atoms of different kind

atom: smallest whole particle of an element

metal: elements that are typically opaque, fusible, ductile, often lustrous, good conductors of electricity and heat

non-metal: elements that are typically brittle, not lustrous, poor conductors of electricity and heat

salt: compound of metal + non-metal, distinct crystal structures, dissolve to create solutions that conduct electricity.

periodic table: list of all known elements grouped by common properties

## Materials:

*What you'll bring with you*

David will bring a homemade molecule modeling kit (cups, toothpicks, & marshmallows), chemistry demo, and a few other props. The chemistry demo consists of Plexiglas isolation chamber, beaker, sugar, gloves, eye protection, and concentrated battery acid (in safety container). David will bring a periodic table if one is not available in classroom.

*What students should have ready*

No student supplies are needed – David will provide material to the students. If science books are readily available, the students could turn to their periodic table and follow along. Some teachers like to have students take notes to emulate the scientific process.

## Classroom Set-up:

*Student grouping, Power/Water, set-up/clean-up time needed*

- If no periodic table displayed in classroom, a spot for David to post one, e.g. an easel or bulletin board
- Dry erase board at front of room with dry erase markers and space to write.
- Table or work area at front of room with no student in direct proximity.

# Classroom Visit

## 1. Personal Introduction:

5 Minutes

I am a scientist at Children's Hospital & Research Center at Oakland [ask if anyone's been and explain mission]. I am interested in nutrition, especially vitamins & minerals – all of which are made of elements. I study what happens when people don't get enough of the elements that their bodies need. Today we're going to be thinking about the different elements that make up everything around us.

## 2. Topic Introduction:

5-10 Minutes

Does anyone know any names of some elements? [Write these on board] Where can we find these elements? Does anyone know what elements are found in water? Does anyone know what elements are found in the air we breathe? Can anyone name some other elements found in this room right now? There are over 100 known elements (118 so far!), although only about 83 of those occur naturally. The rest are "man-made". All the elements we know are on this Periodic Table. Just like 26 letters can be combined into all the words in the dictionary, the elements can be combined into all known compounds. What happens to elements when they come together to make matter? And can you break up matter into the original elements? Let's find out.

## 3. Learning Experience(s):

30-40 Minutes

*Demonstrations, hands-on activities, images, games, discussion, writing, measuring... What will you do, what will kids do? Describe in order, including instructions to kids.*

**Activity 1:** How can small numbers of elements make up very different matter? Pass out marshmallows of 2 different colors and toothpicks to students. Explain that the 2 different colored marshmallows represent 2 different elements – sodium and chlorine. Explain properties of these elements alone (sodium by itself will explode when it touches anything wet and chlorine by itself is an extremely toxic gas); write on board in a chart form. Ask if anyone knows what these 2 elements form when mixed together? Show model of salt molecules and add properties of salt to chart. Then demo 3-dimensional model of how sodium likes to "bond" to chlorine in cubic structure. Ask students to use toothpicks for bonds and to make a model of the salt crystal. Show example of how much salt is in a human. Concept: Elements can form compounds by bonding together; these compounds can have very different properties from the original elements. This is how the elements can make up everything we know.

**Demonstration 1:** Once elements join to form new compounds, are they changed forever or are original elements still there? Let's see if we can break a compound back down to its original elements. Inside a protective clear Plexiglas chamber, place beaker of sugar. Explain sugar [show sugar] contains carbon, along with hydrogen and oxygen mixed together – but it doesn't look like charcoal [show charcoal], so is the carbon really still there? Let's do an experiment to find out. We know that with enough chemical energy, we can "pull" hydrogen and oxygen away from compounds to form water. So, car battery acid [note that this is very dangerous] can be used to provide this energy. Add strong battery acid to the sugar in protective chamber and mix. While waiting 2-4 minutes for reaction, draw elements and compound on board. After some time, the mixture will turn brown, bubble and fume, and then a "black snake" will appear to grow from inside the beaker and a funny smell will be in the air. What is going on and what is the black material? Make predictions based on elemental description. Concept: Compounds may have very different properties, but the constitutive elements are still there. Just like you can take all of the words in the dictionary and divide them into the 26 known letters.

**Activity 2 & Activity 3:** What elements make up the human body? Draw an outline of a human on board to fill based on compositional percentage. Our bodies are made of lots of different elements in different compounds, but some elements are more common than others. If I tell you that the body is about 70% water, can anyone figure out what the two most common elements in our bodies are? [Prompt answer for hydrogen and oxygen (H<sub>2</sub>O) if necessary.] How many other elements do you think can be found inside of us? [Write down guesses on board and then fill in proper percentage on human figure – hydrogen (60%), oxygen (25%), carbon (10%), and nitrogen (3%).

All the rest make up only about 2% of us! This is the same for most plants and animals on earth! What makes us different from plants? [How the elements come together.] What do these elements do? [Discuss.] What do the other elements in your body do (the remaining 2%)? Does anyone know what important element is found in milk and cheese that is good for our bones? [Prompt for calcium.] Does anyone know what important element is found in green leafy veggies that is good for our immune system? [Prompt for magnesium & show amount.] Does anyone know what important element is found in meat and some veggies like spinach that is good for our blood & muscles? [Prompt for iron & show amount.] Good nutrition is really about getting the right amounts of the right kinds of

elements in our food. So paying attention to what you eat is important. Since we're made of lots of different elements, let's look at the most common elements in our body by drawing a picture.

**Activity 4:** How about some of the other elements. Do you know what they are? What they do? Where you can find them? Use the element flashcards to prompt for some of the more unusual elements. Point out elements that can be toxic. Ask if anyone has a favorite element or a question about elements that they have heard of.

#### **4. Wrap-up: Sharing Experiences and Building Connections**

**5 Minutes**

Prompt discussion points about what was learned today.

- How can some elements be bad for us (like sodium & chlorine) but their compounds (like salt) be good? [When they combine, their properties can change in very big ways.]
- If elements make a compound (like sugar), are the elements still there? How do we know? [Yes because they can be broken down into their elements.]
- Why is nutrition important? [It helps us get the elements we need to live and grow.]
- What are some of the most common elements inside us? [hydrogen, oxygen, carbon, and nitrogen]
- What do some of the elements do inside our bodies? [varied tasks, list as previously described]
- What element(s) were you surprised to find in an everyday item?

#### **5. Close:**

**5 Minutes**

- 1: Everything that we can see and feel is made from the elements on the periodic table, this includes the sun, air, desks, and everyone in this room.
- 2: Some elements can look and act very different based on natural form. For example, charcoal, pencil "lead", and diamonds are all made out of exactly the same thing (carbon), but the forms are different. Also, when elements combine, their compounds can have radically different properties. Table salt is needed for our proper nutrition, but component elements are very toxic.
- 3: Nutrition is the process of getting the right amounts of elements in our bodies. Our bodies are like machines that constantly need special parts to work correctly.

**TOTAL: 50-60 Minutes**

#### **6. Extended Discussion:**

**As Time Allows**

- Elemental content varies depending on whether you talk by number or by mass (weight). By numbers, it's hydrogen (60%), oxygen (25%), carbon (10%), and nitrogen (3%). By weights, it's oxygen (65%), carbon (18%), hydrogen (10%), and nitrogen (3%). All the rest is only about 2%. Why is this different?
- Sometimes elements come together to make compounds quite violently. Look online (e.g. YouTube) for video of what happens when sodium metal is put into water. Why does this happen?
- What element(s) can you find in an everyday item? Some are surprising. Everyday examples include iPods, microwaves, smoke detectors, fire sprinklers, etc have unusual elements inside.
- "The dose makes the poison." Too much or too little of any of the needed elements can cause diseases. For example, you have to have water and salt everyday or you will get sick; however, you can also get very sick of more than a gallon of water or 2 tablespoons of table salt. It is critical to have the right "elemental balance". Nutrition is really just making sure that our body gets the right balance of elements from the periodic table.

### **Follow-up – After The Presentation**

Possible activities to follow presentation:

- Write a letter about what you learned in this presentation - include drawings of an object with component elements labeled or an experiment that we did together.
- Write a report on your favorite element. Identify the properties of the element, like metal or non-metal, solid or liquid or gas, stable or radioactive, abundant or rare, light or heavy, etc. What is the normal color? Where is the element found in nature? What everyday items is this element used in?
- Write a report on an element needed for human nutrition. How much is in a healthy person? What happens if you don't get enough of it? What happens if you get too much? What foods is it found in?

**Learn more about elements:** <http://www.webelements.com>