

The Big Bang

A Community in the Classroom Presentation for Grade 5

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STANARDS CONNECTION

Grade 5 Physical Science: Elements and their combinations account for all the varied types of matter.

INSPIRATION AND INVOLVEMENT

We are all made of star dust. How can that be? Where did it come from? We will discuss this and other aspects of chemistry as we look at the period table of elements and play periodic table bingo.

VOCABULARY

Atoms
Elements
Supernova
Periodic Table of Elements

LEARNING EXPERIENCES

Through lively discussion, demonstrations and playing “Periodic Table Bingo,” students will be able to identify elements that are found in stars, planets, supernovas and people.

Title or Topic: Stardust and the Elements

Grade Level 5

- **Introducing Lesson**

So what are we going to talk about today?

Do you know what elements are? How many of you know where the elements come from? Did you know that all the elements in your body were created from stardust? Did you know that all the stars and planets and galaxies were created from a single event that started smaller than pinhead? Pretty amazing stuff

Approximate time – 5 minutes

- Inspiration and Involvement

In eighth grade I wrote a report on the origin of stars and how different stars behave. Ever since I have a deep interest in the origin of the universe, the elements, chemistry and nuclear physics. I know many of you might think this is pretty brainy stuff (boring); however the elements make up everything around that and us is important.

Approximate time – couple of minutes

- Background

Vocabulary

Atom – The smallest particle of a chemical element that has all the properties of that element.

Big Bang – what scientists call the event that started the universe.

Element – One of the materials from which all other materials are made. Each element has its own kind of atom.

Star – A heavenly body that shines by its own light, which comes from burning gases. Our sun is the nearest star to earth.

Supernova – a very large star that explodes when it collapses from its own gravity

Universe – Everything that exists, including the earth, the planets, the stars, and all of space.

1. Main Presentation

- Introduction to the periodic table

I want you to think of some of the wackiest, craziest things imaginable. I will write some of them on the board and I will tell you what they all have in common. (Let kids interact for a while and list 4 or 5 things on the board).

What do they all have in common? They are all made from stuff that contain different types of atoms called elements.

Put up slide of the table and hand out Hall of Science Periodic Table

The periodic table is used by scientists to organize elements in useful ways. It is a picture showing the symbols of all the known elements in the universe. Scientists have either found the elements here on Earth or created the elements in laboratories.

So what are elements? We begin with “ What are atoms?” (See definition above.)

(Hold up bowl of different colored marbles and ask children what is different about the marbles).

Just like these marbles have different colors, different atoms have very different ways of behaving in a chemical sense. Atoms that behave differently from a chemical sense are called elements

Use example of a lump of pure iron and a lump of pure gold in the rain. After awhile the iron rusts and nothing happens to the gold. This is an example of the difference in chemical properties of elements.

Put up slide of smooth stones.

If we ignore the different colors of the stones, what is different about the stones? Size and weight. So just like these stones, atoms have different sizes and weights.

So the periodic table organizes elements by the different chemical properties of atoms and by the size and weight of atoms.

So the smallest and lightest elements are near top of the table and each element is different chemically.

There are about 122 elements. The first 92 occur naturally in nature. The rest are man-made in science labs.

Put up slide of 10 most common elements of the human body and hand out a simplified periodic table coded for this exercise.

To learn a little more about the elements and where they are located on the table we are going to play periodic table bingo.

First I want to point out that the human body contains over 60 elements. This slide just shows the most common elements. We will talk about some of the less common elements in the human body a little later.

What I would like you to do is mark up the handout I gave you by circling each element symbol on the periodic table you see on the slide.

Allow a few minutes and put up slide with answers.

- **Where did the elements come from?**

So we now know that different types of atoms are called elements and that the human body has many different elements and you have marked up the periodic table showing the most common elements in the human body.

So where did the elements come from? We are going to learn about the Big Bang (**show balloon**), about very large stars that suffer from severe gas pains (**show whoopee cushion**) and some very special stars that have a really bad hair day.

How did this all start? First some interesting facts about our universe. Our galaxy (a galaxy is a very large collection of stars held together by gravity) contains about 300 billions stars of all colors and sizes. Our sun is one of them and it is slightly smaller than the average star. There are also about 300 billion galaxies in the universe.

About 16 billion years ago there was no light, no space and no time (sound familiar to some?) Then an incredible thing happened. Scientists do not know what started it, but do understand a lot about what has happened since.

Hold up the balloon and a pin.

What happened was a colossal event known as the Big Bang. **(Pop the balloon)**. All the galaxies and stars came from this happening. In fact all the stuff of the universe came from matter that was squeezed together smaller than this pinhead **(show pin)**.

This event still boggles the minds of scientists because it is so very, very difficult to imagine and explain. Because of the Big Bang 16 billion years ago our universe has expanded from something smaller than this pinhead to everything astronomers can see in the largest and best telescopes.

Put-up slide Of 400,000-year-old universe

This is a picture from a very special telescope on a French satellite showing the universe when it was very young. (One day old if you are a ten year old). At this time the universe was incredibly hot with all the stuff those galaxies were about to made of.

About this time the element hydrogen came into existence.

Put-up slide of periodic table.

Remember we found the element hydrogen during periodic table bingo.

2. Elements in the Sun

Put-up slide of the sun

This is a picture of our sun also made from a telescope on a satellite

As the universe continued to expand gravity caused the hydrogen to lump into stars. All stars shine and most stars shine from “burning” hydrogen and changing this hydrogen into new heavier elements. Most stars last a long time – about 10 billion years. As stars get older they burn some of the new heavier elements made from hydrogen into even heavier elements. When a star converts all of its elements to iron, it stops shining because it cannot burn iron.

Put-up slide of the most common elements in the sun and handout new periodic table for the students to mark-up.

This is a table of the most common elements found in the sun. Most of the sun contains hydrogen and helium and very little iron. This tells scientists that the sun is still pretty young since there is so little iron.

We are going to play bingo again. Mark-up your periodic tables with these elements while I clean up my mess.

After a few minutes put up the slide with answers.

One thing you may notice is that most of the common elements found in the sun can also be found in the human body.

So now we have learned that the Big Bang created the first element hydrogen and as the universe expanded stars made of hydrogen were created by gravity and that stars create the elements through iron.

3. How the Earth and its' elements came to be

Put up picture of the Earth

You probably seen pictures similar to this one. You might remember that I said all the elements on the periodic table can be found on Earth or have been created in laboratories. We are now going to talk about elements found on or in the Earth.

Put up table with the ten most common elements on the earth and handout that includes bingo solutions.

Rather than playing bingo one more time I am going to show you where the most common elements on Earth are located on the periodic table.

Notice that none of the most common elements go past iron. How did all the elements heavier than iron find their way to Earth? Did they come from the sun or a star like the sun? No, scientists know that stars like the sun can only make the elements through iron and then fizzle out. Did these elements come from the Big Bang? No only the element hydrogen was created by the Big Bang.

So where did all the elements come from?

Well we are going to talk about a very unpleasant subject – stellar gas, indigestion – you know what I am getting at - stellar farts (hold up whoopee cushion)

Ask student for demonstration.

Seriously there a certain very large stars that burns very brightly and very quickly. And they use up their fuel very quickly. Since the star uses it source of energy so fast and it weighs so much, it starts to cool off and gravity takes over in a big way.

Put up picture of star about to go super-nova

This is picture made by the Hubble telescope. This star is many times larger than the sun and has used fuel very quickly and has started to collapse. And just like the whoopee cushion it is jetting off gas (only from both ends). This star may eventually become what is known as a super-nova.

A super-nova is when a very large star burns off its' fuel, starts to cool and collapse and jets off some of its' material. This gas has lots of hydrogen and other elements. This off gassing causes the star to cool even more quickly and collapses so fast from gravity that it explodes very violently.

An instant before it explodes a very small portion of its atoms are converted to elements heavier than iron. The explosion flings the stellar material including the elements heavier than iron into deep space.

Put up the first picture of the super-nova

This is a picture of the leftovers of a super-nova. There is a bright center – what remains of the star – and a ring of hot gas and stuff around it.

I want you to notice the arrow showing a bright spot. I get back to that shortly.

So where do think all the elements in the Earth heavier than iron came from? Right a super-nova.

The sun is about 4.5 billion years old. Scientists believe that the sun was born from the hydrogen left over from a super-nova. Remember that the original star was much larger than the sun. As gravity caused the hydrogen gas to form into the sun, the sun's gravity attracted the heavy elements left over from the explosion to form the rocky planets like the Mercury, Venus, Mars and the Earth. The giant plants Jupiter, Saturn, Uranus and Neptune were formed from left over gas from the super-nova

Put-up second picture of super-nova

This is the same remains of the super-nova four years later. Look at the arrow. See how much brighter the spot is. Perhaps this is a new star forming from the death of giant star.

4. Trace Elements in the Human Body and Conclusion

We now know that the Big Bang formed hydrogen, normal stars created the elements through iron and that super-nova created all the elements that are not man-made.

Put up slide of some trace elements in the human body and hand-out table

Remember I mentioned that would talk about other elements in the human body. This is table of some of the trace elements in our bodies. Trace means small amounts. I also listed why these elements are important to us.

Put up the periodic table again

The last thing we are going to do is I am going to ask a few of you to come up and use my light pen to show your classmates where these elements are in the periodic table. Do not worry I will help you. And remember not to shine the light pen in anyone's eyes because it is very bright.

Notice that some of the elements do not have a known reason for keeping us healthy. Perhaps some of you will help medical find out what the reasons are for these elements and how they keep us healthy.

Things you should remember

All stuff is made from atoms

Atoms that have different chemical functions are called elements

Elements are listed in the periodic table based on size and weight

The element hydrogen was created in the Big Bang

Normal stars make all the elements up to iron when making heat and light

Super-novas make all elements heavier than iron.

The sun and planets were formed from the remains of a super-nova, and

That each of you are made of stardust