

Content Standard	Performance Standard
<ol style="list-style-type: none"> 1. The formation of the elements during the Big Bang and during stellar evolution. 2. The distribution of the chemical elements and the isotopes in the universe 	Make a creative representation of the historical development of the atom or the chemical element in a timeline

Learning Competencies/Skills:

1. Give evidence for and explain the formation of the light elements in the Big Bang theory.

Objectives:

At the end of the lesson, the students are able to:

- a. understand the historical development of theories that explains the origin of the elements
- b. give evidence and describe the formation of heavier elements during star formation and evolution.
- c. observe and describe nuclear fusion reactions that take place in stars, which lead to the formation of new elements; and
- d. create instructions on how to properly identify the origin of the samples.

Content I:

HOW THE ELEMENTS FOUND IN THE UNIVERSE WERE FORMED.

Lesson Covered:

1. Big bang theory on the origin of elements
2. Formation of light and heavy elements (nucleosynthesis)

Expected Skills:

To do well in this lesson, you need to remember and do the following:



Lesson 1:

1. Analyze the series of events.
2. Evaluate the accuracy among facts.
3. Works independently in home-based experiment
4. Organizer series of instructions
5. Organize information by paragraph completion.



PRE-ASSESSMENT

Let's find out how much you already know this lesson. Answer the following questions....

MULTIPLE CHOICE. WRITE THE LETTER OF YOUR CHOICE ON THE BLANK PROVIDED.

- _____ 1. During the main sequence stage, how is energy generated in a star's core?
 - a. Hydrogen fuses into Helium
 - b. Carbon fuses into Hydrogen
 - c. Helium fuses into hydrogen
 - d. Carbon fuses into oxygen
- _____ 2. After its temperature rises to 10,000,000 C, a protostar becomes a star when.
 - a. Nuclear fusion ends
 - b. Nuclear fusion begins
 - c. Nuclear fission begins
 - d. Nuclear fission ends
- _____ 3. The Big Bang occurred about _____.
 - a. A billion years ago
 - b. 14 million years ago
 - c. 5 billion years ago
 - d. 14 billion years ago
- _____ 4. What is the most element found in stars?
 - a. Hydrogen
 - b. Helium
 - c. Sodium
 - d. Calcium
- _____ 5. What happens when a star exhausts its core hydrogen supply?
 - a. Its core contracts, but its outer layers expand and the star becomes bigger and brighter.
 - b. It contracts so it becomes smaller and dimmer
 - c. It contracts so it becomes hotter and brighter
 - d. It expands so it becomes bigger but dimmer.

SCORE: _____ / 5



MY LEARNING GOALS

By now, you must have a bird's eye view of what concepts, skills, understanding and performances you are expected of this module. Before you go further, establish your own goals for learning by accomplishing the **My Smart Goal** worksheet below:

My Smart Goal
<p>I want to _____</p> <p>by _____</p> <p>So I will meet my goal.</p>

You are now ready to take on Lesson 1. From time to time you may need to revisit your Learning Goals to assess how far you have reached them at some point in this module.



EXPLORE

ACTIVITY NO.1 | A Big Bang and Expanding Universe Experiment

Objectives: Demonstrate and explain the concept of the big bang theory and the expansion of the universe.

Materials: A round black balloon, colored pens (at least 5 different colors) a piece of string (50cm long), ruler or tape measure, stopwatch or another timer.

Procedures:

1. Setting up of the balloon
 - a. Inflate and hold the balloon. Blow up the balloon slowly and close the opening, but do not tie it up.
 - b. Randomly mark five different colours of dots over the whole balloon. Each of the dots represents a whole galaxy, with the balloon being the space that they exist in.
 - c. Choose one of the dots to be your point of reference. You can choose any of them.
2. Measuring the distances
 - a. Use tape measure to determine the distance between two dots.
 - b. When you have measured the distance, write it down in your table in the D1 column.
 - c. Measure the distances from the "reference" dot to all the other dots as well and fill in that column of the table. Note: The distance from your "reference" dot to itself is zero,
3. Now carefully blow the balloon right up, using the stopwatch to time how long it takes. Write down the time in seconds.
4. Repeat procedure 1-c and write them down in the D2 column of your table.
5. You now need to work out the speed of each galaxy. $\text{Speed} = \text{Distance} / \text{Time}$.
6. Here, the Distance travelled is the difference between D1 and D2, so calculate $D2 - D1$ for each of our dots and write them in the 4th column on the table.
7. The Time taken is the time to blow the balloon up. Work out the speed (v) for each dot and put it into the 5th column. Because your "reference" dot has not moved, its speed will be zero.

Table 1.1 Distance and speed of the dots in every balloon

Colour of Dot	First Distance D1 in cm	Second Distance D2 in cm	Change in Distance D2- D1 in cm	Speed (v) in cm/second
Yellow				
Blue				
Green				
White				
Orange				
Time to fully inflate the balloon: _____ seconds.				

Questions:

1. How do the dots move relative to one another as the balloons expands?

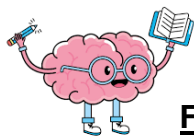
2. How does the inflated balloon serve as a good model for the expanding universe?

3. Cite ways in which this ballon may not be a good model.

End of Explore**Essential Question:**

- Why can elements be produced in the sun but not in the Earth's atmosphere ?

Initial Answer:



FIRM-UP

ACTIVITY NO.2 | “Organizing Information”

Complete the paragraph by choosing from the list of words given in the box.

Collisions	energy	hot	heavy	carbon
Bright	nuclear fusion	helium	life	nuclei
Hydrogen	nucleosynthesis	small	size	oxygen

Stars are _____ and _____ because of the _____ taking place at their centers. These collisions alter their atomic structure causing the release of an enormous amount of _____.

_____ is the reaction that fuel the stars. The _____ of different atoms combine to form a larger nuclei of a different _____. The nuclear fusion happening in the core of the stars converts _____ into _____. This process of producing new elements through nuclear reaction is called _____. The elements that can be produced depend on the _____ of the star.

The _____ stars can only convert hydrogen into helium. The medium stars like the sun can convert helium into _____ and carbon once the hydrogen becomes depleted. The massive stars, which are five times greater than the sun convert helium atoms into _____ and oxygen once the hydrogen becomes depleted. This is followed by the fusion of carbon and oxygen into neon, sodium, magnesium, sulfur, and silicon. Later reactions transform these elements into calcium, iron, nickel, chromium, copper, and others. When stars become old supernova, the _____ elements are created and form the basis for _____.

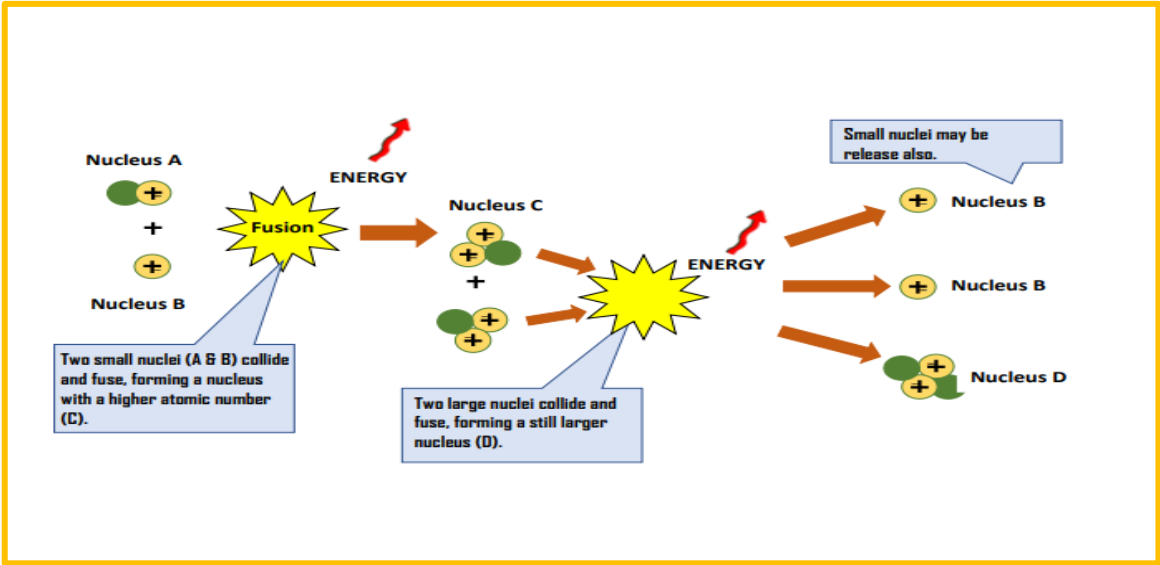
End of Firm-up

<p>Essential Question:</p> <p>▪ Why can elements be produced in the sun but not in the Earth’s atmosphere ?</p>
<p>Revised Answer:</p>



ACTIVITY NO. 3 | **NUCLEAR FUSION**

Guide Question: How can nuclear fusion result in the formation of heavier elements?



Task: Study the figure above and answer the following questions.

- a. What particles make up nucleus A?

_____.
- b. What results from the fusion of nucleus A and nucleus B?

_____.
- c. If this nuclear reaction occurs in the sun, what elements are A, B, C and D?

_____.

End of Deepen

Essential Question:
▪ Why can elements be produced in the sun but not in the Earth's atmosphere ?
Final Answer:



TRANSFER

ACTIVITY NO. 4

“Take me to the SKY”

Suppost you are the science officer on a spaceship. Your mission is to collect and analyze samples of matter from various sites as the ship travels around the Milky Way Galaxy. You and your assistants are able to identify the elements present in a sample. You want to know whether the sample could have come from a star like the sun, a more massive star, or a supernova. Write a set of instructions telling your assistants how to decide on the origin of the samples.

Scoring Rubrics

Points	Criteria
4	Exceeds Criteria that include complete and highly accurate instructions for differentiating among the three origin of the samples.
3	Meet criteria
2	Include adequate instructions for differentiating between at least two of the origin and/ or contains minor errors.
1	Include adequate instructions for at least on of the origins and/ or constains serious errors.



POST-ASSESSMENT

Task: List down 15 concept you have learned about the topic, show your understanding by making a concept map.



END OF THE LESSON 1

