

# Big Bang – Unit Assessment

Name: \_\_\_\_\_ Hour \_\_\_\_\_ Date: \_\_\_\_\_

Date Packet is due: \_\_\_\_\_ Why late? \_\_\_\_\_ Score: \_\_\_\_\_  
Day of Week Date If your project was late, describe why

**Overview:** You will be demonstrating your capacity to address the driving questions from this unit through a group presentation. You can choose from a variety of presentation formats (slideshow, podcast, mock interview, multimedia presentation, etc.).

## Main Questions

1. How can we determine the size of the universe?
2. How can expansion determine the age of the universe?
3. What evidence do we have for the Big Bang?

## Weekly Schedule

### Part 1: Introduction

- Intro to the Stars Unit Project
- Review of Key Concepts

### Part 2: Work Time

- Time allotted for completing the project.

### Part 3: Peer Review

- Acquiring peer feedback on your first draft

### Part 4: Final Preparation

- Determining specifics about your presentation.

### Part 5: Presentation

- Presenting your work



### NGSS Standard:

HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

## Semester Schedule

### **How the Sun Works**

Week 1: What is matter? What is energy?

Week 2: What's inside the sun?

Week 3: How can we measure the sun?

Week 4: Where does the sun's energy come from?

Week 5: Unit Assessment

### **The Life of Stars**

Week 1: How long do stars last?

Week 2: Why do stars die?

Week 3: What happens after stars die?

Week 4: Unit Assessment

### **How It All Began**

Week 1: How can we determine the universe's size?

Week 2: How can expansion determine the universe's age?

Week 3: Unit Assessment

### **Navigating Space**

Week 1: How and why do things orbit in space?

Week 2: How can we predict orbits?

Week 3: Unit Assessments

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# Part 1: Introduction to the Project

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**Introduction:** You will work in groups of 2-4 to develop a presentation based on the driving questions below. You can choose from a variety of presentation formats (slideshow, podcast, mock interview, multimedia presentation, etc.). Begin by reviewing and self-assessing each of the following. Prioritize underlined items.

## Week 1 – Determining the Changing Size of the Universe

1. What is a Cepheid variable? How can this be used to determine astronomical distances?
2. How do luminosity, apparent magnitude, and distance relate to the pulsation rate in Cepheid variables?
3. Summarize Harlow Shapely's work, his findings, and his errors.
4. How did Hubble confirm that the Milky Way was just one galaxy among many in the universe?
5. Summarize the concept of redshift and how it relates to the distance of the object emitting the light.
6. What is Hubble's Law & Hubble's Constant? What do these concepts indicate about the universe?
7. Define a megaparsec and use it to explain the concepts underlying Hubble's Constant.
8. What is CMBR and how does its existence provide evidence for the Big Bang?
9. True or false: further objects are moving faster, so earth must be at the center of the universe. Explain.
10. How is an expanding universe, redshift, & Hubble's Law summarized by the inflating balloon analogy?
11. How is the expansion of the universe and Hubble's Law supported by Einstein's Theories of Relativity?
12. What was Einstein's cosmological constant and what made it erroneous?

## Week 2 – Determining the Age & Origins of the Universe

1. What is a singularity? How does this relate to the underlying premise of the Big Bang Theory?
2. How does a scientific theory differ from more common usage of the term "theory"?
3. Summarize the four main forces and how these forces were different at the start of the Big Bang.
4. Summarize how elementary particles (quarks, leptons, bosons, & photons) affect matter & energy.
5. What is antimatter? How do matter and antimatter interact with each other?
6. How have CERN and the Large Hadron Collider enabled us to better understand the Big Bang?
7. How did conditions 100 seconds after the Big Bang change interactions between matter and antimatter?
8. How did conditions change roughly two minutes after the Big Bang? How did this affect matter?
9. How do the current ratios of hydrogen and helium in the universe provide evidence for the Big Bang?
10. How does primordial nucleosynthesis relate to the amount of helium & deuterium in the universe today?
11. How can deuterium be used to determine the concentrations of matter throughout the universe?
12. What is dark matter? How do we know it exists?
13. How did interactions between neutrons, protons, and electrons change during the Matter Era? How did this affect the interactions between matter and energy? Why is this point known as the Dark Ages?
14. Why did stars start forming during this era? How did this affect the production of heavier elements on the periodic table?
15. How did data from the Hubble Telescope change our understanding of how the universe is changing?
16. What is dark energy and how does this relate to the findings from the Hubble Telescope?
17. What is the James Webb Space Telescope (JWST)? What kind of data will be collected by JWST?
18. Why does the JWST use infrared radiation? Wouldn't visible light be more useful?

## Part 2: Work Time

**Introduction & Directions:** Use this time to complete your group presentation. You can choose from a variety of presentation formats (slideshow, podcast, mock interview, multimedia presentation, etc.). Whatever your choice of format, **your presentation needs to fully reflect your comprehension of the unit’s content.**

Remember that you’re not done until your group is completely finished. If you finish your portion of the presentation, help other group members complete their portion, check the presentation for errors, or add additional components to your presentation to improve its professionalism and appeal.

## Part 3: Peer Review

**Overview:** You will be critiquing another group’s presentation. For each of the items on the previous page, provide a score based on their work. Use the rubric below to determine if each item should receive +, ✓, or -.

An item needs a “+” for all the criteria above to receive an overall “plus” score. For example, if you notice a particular item has a spelling error, is missing a key consideration, or could be delivered in a more appealing manner, that item should receive a ✓ or -. A + is reserved for items that could not be reasonably improved.

Item	Plus (100%)	Check (70-90%)	Redo (0%)
<b>Accuracy</b> – <i>Are all components factually correct?</i>	This presentation is 100% factually accurate without any errors or omissions.	Overall, the presentation was mostly factually accurate.	Students are still making progress towards a final draft.
<b>Thoroughness</b> – <i>Did you address all aspects?</i>	Addresses all information needed for each objective.	Almost all required information was included for each objective.	Students are still making progress towards a final draft.
<b>Professionalism</b> – <i>Does this look like the work of professionals?</i>	This presentation reflects the work of a group of adult professionals.	This is acceptable work for high school students.	Students are still making progress towards a final draft.
<b>Comprehension</b> – <i>Do you have a strong grasp of this content?</i>	Provided complete, accurate, and precise responses to each question without assistance.	Help was needed on at least one occasion to provide complete, accurate, and precise responses to questions.	Help was repeatedly needed to provide complete, accurate, and precise responses to questions.
<b>Effort</b> – <i>How much work went into this presentation?</i>	Effort exceeds what would be expected of a high school student.	Effort is acceptable for a high school student.	Students are still making progress towards a final draft.



# Part 4: Final Preparation

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**Overview:** Use this time to make corrections and improvements based on your peer review. You should also prepare your speaking notes and determine who is primarily responsible for each section.

Note that your instructor may assign a group to present only on a specific topic or on specific questions; if so, your group should be prepared to discuss each item as a group. Remember - if only one person from your group delivers the entire presentation, you would not score as well based on the rubric below compared to a group where everyone presents.

Use the space below to prepare notes and/or make plans for how you will present. Be sure to consult the attached rubric to ensure your performance meets all expectations.

# Part 5: Presentation & Project Rubric

Please provide your names below and give to your instructor when you present.

Names: \_\_\_\_\_

**Grading:** Your grade for both the project and the presentation will be determined using the following:

Item	Plus (100%)	Check (70-90%)	Redo (0%)
<b>Accuracy</b> – <i>Are all components factually correct?</i>	This presentation is 100% factually accurate without any errors or omissions.	Overall, the presentation was mostly factually accurate.	Students are still making progress towards a final draft.
<b>Thoroughness</b> – <i>Did you address all aspects?</i>	Addresses all information needed for each objective.	Almost all required information was included for each objective.	Students are still making progress towards a final draft.
<b>Professionalism</b> – <i>Does this look like the work of professionals?</i>	This presentation reflects the work of a group of adult professionals.	This is acceptable work for high school students.	Students are still making progress towards a final draft.
<b>Group Involvement</b> – <i>Was everyone involved?</i>	Every member was involved with the development of the presentation as well as its delivery.	Most of the time, all group members were fully involved in the development and delivery of this presentation.	A portion of the group was fully involved in this project.
<b>Effort</b> – <i>How much work went into this presentation?</i>	Effort exceeds what would be expected of a high school student.	Effort is acceptable for a high school student.	Students are still making progress towards a final draft.
<b>Comprehension</b> – <i>Do you have a strong grasp of this content?</i>	Provided complete, accurate, and precise responses to each question without assistance.	Help was needed on at least one occasion to provide complete, accurate, and precise responses to questions.	Help was repeatedly needed to provide complete, accurate, and precise responses to questions.

**Remember** – use the resources provided to you to make sure you are not missing any items. Your presentation should demonstrate your comprehension - *i.e., don't just read off a document – clearly demonstrate that you understand the core concepts related to this project and can discuss these ideas in your own words.*

## Feedback & Comments: