**Big Bang Theory**

Individually, 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.

Using the CER format (claim, evidence and reasoning) will help develop your explanation whether it’s a short paper, slide show, movie, comic, drawing/painting, song, etc. The CER guidelines will be posted on Schoology.

*Claim*

Your explanation must include a description of how astronomical evidence from numerous sources (at least 3 different credible sources) is used collectively to support the Big Bang theory, which states that the universe is expanding and that thus it was hotter and denser in the past, and that the entire visible universe emerged from a very tiny region and expanded.

*Evidence*

Be sure to identify and describe the following evidence in your explanation:

* + Composition of stars
  + The ratio of Hydrogen and Helium in stars and interstellar gases
  + Relationship between redshift and distance with majority of galaxies
  + Existence of cosmic background radiation

Use a variety of valid and reliable sources for the evidence, which may include students’ own investigations, theories, simulations, and peer review.

Describe the source of the evidence and the technology used to obtain that evidence.

*Reasoning*

Use reasoning to connect evidence, along with the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future, to construct the explanation for the early universe (the Big Bang theory). You should be able to describe the following chain of reasoning in your explanation:

* Redshifts indicate that an object is moving away from the observer, thus the observed redshift for most galaxies and the redshift vs. distance relationship is evidence that the universe is expanding
* The observed background cosmic radiation and the ratio of hydrogen to helium have been shown to be consistent with a universe that was very dense and hot a long time ago and that evolved through different stages as it expanded and cooled (e.g. the formation of nuclei from colliding protons and neutrons predicts the hydrogen-helium ratio, Later formation of atoms from nuclei plus electrons, background radiation was a relic from that time.
* An expanding universe must have been smaller in the past and can be extrapolated back in time to a tiny size from which it expanded.

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| NGSS Strand | Emerging | Progressing | Meets | Exemplary |
| HS-ESS1-2 | Identifies or otherwise applies irrelevant content OR relevant content with major errors or omissions. | Identifies or otherwise applies relevant content with minor errors or omissions. | Explains or otherwise applies relevant and accurate content. | Explains and applies relevant and accurate content. |
| Controlling Idea | Addresses prompt.  Makes a general claim with unclear focus. | Addresses prompt.  Establishes a clear claim with an uneven focus. | Addresses prompt.  Establishes and maintains a clear, specific, and credible claim. | Addresses prompt.  Establishes and maintains a precise, substantive claim. Acknowledges limitations and/or the complexity of the issue or topic. |
| Selection & Citation of Evidence | Includes minimal details from sources.  Sources are used without citation. | Includes details, examples, and/or quotations from sources that are relevant to the claim.  Inconsistently cites sources. | Includes details, examples and/or quotations from sources that support the claim and supporting ideas.  Consistently cites sources with minor formatting errors. | Includes well-chosen details, examples, and/or quotations from sources that fully support the claim and supporting ideas.  Consistently cites sources using appropriate format. |
| Development/  Explanation of Sources | Explanation of source material is irrelevant, incomplete, or inaccurate. | Explains sources material to support the argument, with some incomplete reasoning or explanations. | Accurately explains source material and how it supports the argument. | Thoroughly and accurately explains source material, using logical reasoning to support and develop the argument. |