NGSS assessment for the H-R Diagram: A Window to the Stars

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| **NGSS Assessment Rubric** | Novice  1 point | On the way  2 points | Competent  3 points | Advanced  4 points |
| **Practices** |  |  |  |  |
| 1 Developing and using models |  |  |  |  |
| 2 Analyzing and interpreting data |  |  |  |  |
| 3 Obtaining, evaluating, communicating info |  |  |  |  |
| 4 Using mathematical & computational thinking |  |  |  |  |
| 5 Engaging in argument from evidence |  |  |  |  |
| **Disciplinary Core Ideas** |  |  |  |  |
| [HS-ESS1-1 1.A](https://www.nap.edu/read/13165/chapter/11#173) |  |  |  |  |
| **Crosscutting Concepts** |  |  |  |  |
| 1 Patterns |  |  |  |  |
| 2 Scale, proportion and quantity |  |  |  |  |
| 3 Energy and matter |  |  |  |  |

*This rubric has been designed to match the learning outcomes of this investigation. To   
 customize your own version of this rubric, go to LSST Assessment on the Education Hub.*

Scale for scoring:

0 Student demonstrates no growth, application or understanding, even with major prompting and assistance.

1. Student demonstrates partial or incomplete growth, application or understanding, but only with major prompting and assistance.

2 Student demonstrates partial or incomplete growth, application or understanding, with only minor prompting and assistance.

3 Student demonstrates competency in application or understanding without   
 assistance.

4 Student demonstrates outstanding mastery of application and understanding.

Sample Questions for assessment

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| **Standard** | **Score (0-4)** |
| Sketch and analyze a typical HR diagram. Label the axes and major regions of your diagram. P1 |  |
| Select one star near each of the four corners of the graph. Label the properties of each of the four stars (Hot/cool bright/dim small/large). P2, P3 |  |
| Summarize the characteristics of stars on the main sequence. Be sure to describe their trends in terms of energy output, luminosity, temperature, size, and lifetime. P3, DCI |  |
| Describe the characteristics of the most common type of main sequence star. P1, P2 |  |
| Suppose a main sequence star has a temperature three times greater than the Sun’s. How much more luminous than the Sun is the hotter star? P4 |  |
| Two supergiant stars that have the same luminosity. One is yellow and the other is orange. Explain which one is larger. What is your reasoning? P5 |  |
| The white main sequence star Altair has 11 times the sun’s luminosity and the white dwarf Sirius B only has about 3% of the Sun’s luminosity yet they have almost the same surface temperature. Explain how this is possible. P5, C1, C2 |  |
| There are two groups of white stars on the H-R Diagram. Compare and contrast them. P1 |  |
| Explain how the luminosity of a star would change if its size decreased. P2 |  |
| How would a star’s luminosity change if its temperature decreased? P3 |  |