**Star Life Cycle Discovery Activity:**

Teacher Materials:

Star Data Chart:



Star Cutouts:

Cut out stars below, color them according to data chart (or print in color), laminate:

-8 Draw this or something similar on board

-7

-6

-5

-4

-3

-2

-1

0

1

2

3

Absolute Magnitude

4

5

6

7

8

9

10

11

12

13

14

15

 30,000 20,000 10,000 9,000 8,000 7,000 6,000 5,000 4,000 3,000 2,000

Temperature (°C)

**Star Life Cycle Discovery Activity:**

**Name: Date: Period:**

**Objective:**

By the end of the lab period, students will be able to:

* describe the life cycle of stars (nebulae, protostar, red giants, white dwarfs, neutron stars, pulsars, supernovas, black holes) and the role of gravity in their stellar evolution
* explain the relationship between absolute magnitude and surface temperature of stars using the Hertzsprung-Russell Diagram

**Background Information:**

Astronomers use a special term to talk about the brightness of stars. The term is "magnitude". The magnitude scale was invented by the ancient Greeks around 150 B.C. The Greeks put the stars they could see into six groups. They put the brightest stars into group 1, and called them magnitude 1 stars. Stars that they could barely see were put into group 6. So, in the magnitude scale, bright stars have lower numbers.

A star that is one magnitude number lower than another star is about two-and-a-half times brighter. A magnitude 3 star is 2.5 times brighter than a magnitude 4 star. A magnitude 4 star is 2.5 times brighter than a magnitude 5 star.

A star that is five magnitude numbers lower than another star is exactly 100 times brighter. A magnitude 1 star is 100 times brighter than a magnitude 6 star.

Astronomers had to add some numbers to the magnitude scale since the times of the ancient Greeks. We now have lower, even negative, magnitudes for very bright objects like the Sun and Moon. We also have magnitudes higher than six for very dim stars that can be seen with telescopes.

The brightest star in the sky is Sirius. It has a magnitude of minus 1.4. The planet Mars is sometimes as bright as magnitude -2.8. Another planet, Venus, can shine as bright as magnitude -4.4. The Full Moon is a brilliant magnitude -12.6. And don't ever look at the Sun. At magnitude -26.8 the Sun's rays can damage your eyes!

Without a telescope, your eyes can just barely see magnitude 6 stars. The distant planet Pluto is magnitude 14, so you definitely need a telescope to see it. The best telescopes on Earth can spot stars with magnitudes between 25 and 27. The Hubble Space Telescope can sometimes "see" magnitude 30 stars.

There are two kinds of magnitudes for stars. One kind is apparent magnitude. The other is absolute magnitude. Apparent magnitude is how bright stars look to us in the sky from here on Earth. Remember, some stars are closer to us than other stars. A dim star that is nearby looks bright, while a very bright star that is far away looks dim. What if we could line up all of the stars the same distance away to do a fair test of their brightnesses? That is what absolute magnitude is all about.

Astronomers "pretend" to line up stars exactly 10 parsecs (about 32.6 light years) away from Earth. They then figure out how bright each star would look. They call that brightness the star's absolute magnitude. Our Sun is not an especially bright star. The Sun has an absolute magnitude of 4.83. (http://www.windows2universe.org/the\_universe/Stars/magnitude\_scale.html)

**Activity 1:**

1. Your teacher is going to hand out 27 stars. Each star will have its name, absolute magnitude (brightness), and surface temperature (in degrees Celsius) on it.
2. Take your star, and when called upon, tape it to the board using the graph that your teacher has drawn on the chalkboard.

**What are your initial observations of the completed graph? What trends do you see?**

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**Activity 2:**

Using the table and graph on the next page, plot where you would find each of the stars. Use the appropriate colors to make the dots





**Analysis Questions:**

Answer the following questions. You can use the following diagram when answering questions.



1. What relationship do you see between absolute magnitude/luminosity and surface temperature?

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1. Describe how stars generate energy and as a result light?

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Answer questions 3 and 4 based on the following diagram:



1. What determines what path or life cycle that a star will follow:

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1. Based on the diagram, describe the life cycle our Sun:

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1. Find *Betelgeuse, Procylon B, the Sun, and Bernard’s Star* on the initial diagram from the Earth Science Reference Table. Describe which is most likely to form a Supernova and why. In your answer describe the life cycle that the star took.

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