

# Star Color and Magnitude

## Background Information

This lesson will introduce the concept of star color and magnitude to your students. *These are areas where students can carry a lot of misconceptions. Many students believe that stars have different colors because of what they are made of or because of the air in Earth's atmosphere. When students learn that stars have different colors due to varying temperature, they can get confused about which colors are hot and which colors are cooler.*

Star Color – Stars have different colors because different stars burn at different temperatures. Stars can be red, orange, yellow, white, or blue. There are no green or purple stars. Red stars are actually the “coolest” stars, but they are still very hot with a surface temperature of about 3000 degrees Celsius. Yellow stars are hotter with a surface temperature of about 6000 degrees Celsius. Stars with a surface temperature of 20,000 degrees Celsius or more are a blue color.

Magnitude – The brightness of stars that are visible from Earth is expressed in units called magnitude. The stars that appear brightest to the naked eye are called "stars of the first magnitude," while stars that can barely be seen are called "stars of the sixth magnitude." The difference in brightness between each level of magnitude is about 2.5 times. Many stars have a more precise rating with a decimal point, such as magnitude 1.5, etc. Stars brighter than magnitude 1 are classed as magnitude 0, or -1, etc. However, as each star is a different distance from the Earth, "absolute magnitude", which expresses the "apparent magnitude" of a star at a fixed distance from the Earth (32.6 light years) is used to express its actual brightness.

## Objectives

By the end of this activity, students will be able to:

- transfer knowledge of star colors for creating a constellation.
- understand apparent magnitude.
- Work successfully in cooperative groups.

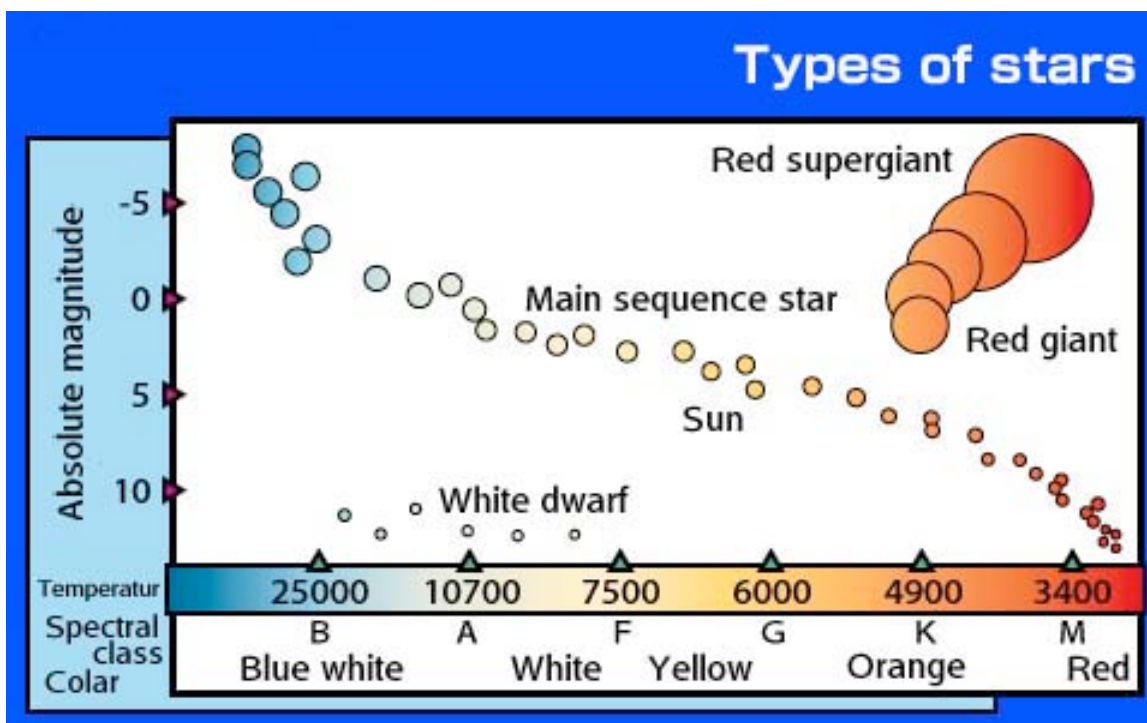
## Instruction Time

45 Minutes

## Materials

- Astronomer Journal pages 25 - 27
- M&M's (mini work best) or another small, colorful candy
- Crayons
- Candle

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## Procedure

1. Ask students why they think stars might have different colors. Brainstorm a list of possible reasons.
2. Light a candle and ask students to discuss the different colors in the flame of the candle.
3. Ask students where the flame is blue? Red? Yellow?
4. Ask students why they think there might be different colors at different parts of the flame.
5. Discuss that the different colors happen because the different parts of the flame have different temperatures. The hottest (blue) part is in the center. The coolest (reddish-glow) part is at the edge of the flame.
6. Tell students that stars have different colors because they are different temperatures. Blue being hottest and red being coolest. White, yellow, and orange in the middle.
7. Tell students that some stars are brighter than other stars and that brightness is called **magnitude**.
8. Explain that magnitude is “backwards” – that small magnitude numbers are actually brighter objects and that larger magnitude numbers are dimmer objects.
9. Have students use the charts on their Astronomer Journals page 25 to fill out the colors and M&M numbers of the seven stars listed on page 26 of the Astronomer Journal.
10. Pass out M&Ms to each student.

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11. Students should use the information that they filled out on page 26 of the Astronomer Journals to cover the seven labeled stars of Orion with the appropriate color and number of M&Ms.
12. Walk around and approve the student M&M diagrams of Orion.
13. When you approve a student's diagram, that student should remove the M&M's, using crayons to color the stars.
14. When the diagram is colored appropriately, students may eat their M&Ms.

### **Expected Results & Explanations**

Upon completion of this activity, students would have used prior knowledge to recall the story of the constellation. Then, students will use the new knowledge of star colors to create a constellation that they know. This leads them to the next activity of creating a constellation and explaining the colors of the stars they use to make the constellations.