Investigating Stars Name:_____ Block:_____

The Lives of Stars **E3:A6**

Stars vary in their life cycles for one reason—their initial mass, which determines a star's temperature, color, and rate of "burning," or fusion. The hotter the star, the faster it burns, and the shorter the life span experienced by the star. A star's life is a perpetual balancing act among several opposing forces. Understanding the interplay of these forces will lead you to an appreciation of why stars evolve and change over time. In this activity, you will play a card game that will help you better understand the lives of stars.

1. Read FYI: *Forces Inside a Star* and FYI: *The Lives of Stars.* Complete the reading guide and questions after reading. When everyone has completed this, go on to #2.
    - Keep the readings handy for reference during the game.

2. Prepare to play the *Evolution of Stars Matching Game*, which traces the evolution of low- and high-mass stars.

    - NOTE: A one-solar-mass star is used to represent low-mass stars, and a 10-solar- mass star is used to represent high-mass stars. Since the evolution of stars is based on theoretical models, all characteristics such as surface temperatures and size are approximations.
    - In this deck, there are three kinds of cards:

Card Type 1: Object Card	**Card Type 2: Process Card**	**Card Type 3: Characteristics Card**
O	**P**	**C**
Describes what the star looks like during this period of its life.	Describes the forces at work and the type of energy production experienced by the star during this period of its life.	Describes the characteristics of the star during this period of its life.

    - Each star's life is broken into 9 stages. Stars, like humans, progress from youth to old age in a continuous fashion, so you can consider the stages to be snapshots of the star at various times of its life, similar to snapshots of you at various times in your life.
    - The Object and Process cards are numbered 1 through 9. The Characteristics cards are not numbered.

3. Play the *Evolution of Stars Matching Game.*

    a. Begin the game by sorting your cards into two stacks: low-mass and high-mass.

    b. Arrange the Object and Process cards for low-mass stars only, in a vertical sequence from 1 (at the top) to 9 (at the bottom).

    c. The object of the game is to place the correct Characteristics card with its matching Object and Process cards. Consult your FYIs or other materials supplied by your teacher to accomplish this task.

    d. Repeat the process for the high-mass stars.

Investigating Stars Name:_____Block:_____

4. Construct the evolutionary tracks of low- and high-mass stars on an H-R diagram.

    a. Write LM1, LM2, and so on through LM9 on a series of round sticky labels to represent the evolutionary stages of a low-mass star.

    b. Referring to your matched Characteristics card for each stage, paste each LM label in the appropriate place on an H-R diagram to map the evolutionary track of a low- mass star.

    c. Use a black marker to draw lines connecting the evolutionary stages, placing an arrow in the middle of each line to indicate the direction of the path the star follows between stages.

    d. Repeat the process for the high-mass star on another blank H-R diagram, using the labels HM1 through HM9 to represent the evolutionary stages.

Pause and Reflect

(NOTE: Have your completed evolutionary sequences for low- and high-mass stars in front of you as you answer these questions.)

1. How does the fusion process differ between low- and high-mass stars as the stars evolve?

2. Describe what causes low- and high-mass stars to be stable or unstable at different stages of their evolution.

3. What is the major difference in the manner of "death" of high- and low-mass stars?

4. Why can't a star like our sun supernova?