

# Student Activity 1

## The Evolution of Stars

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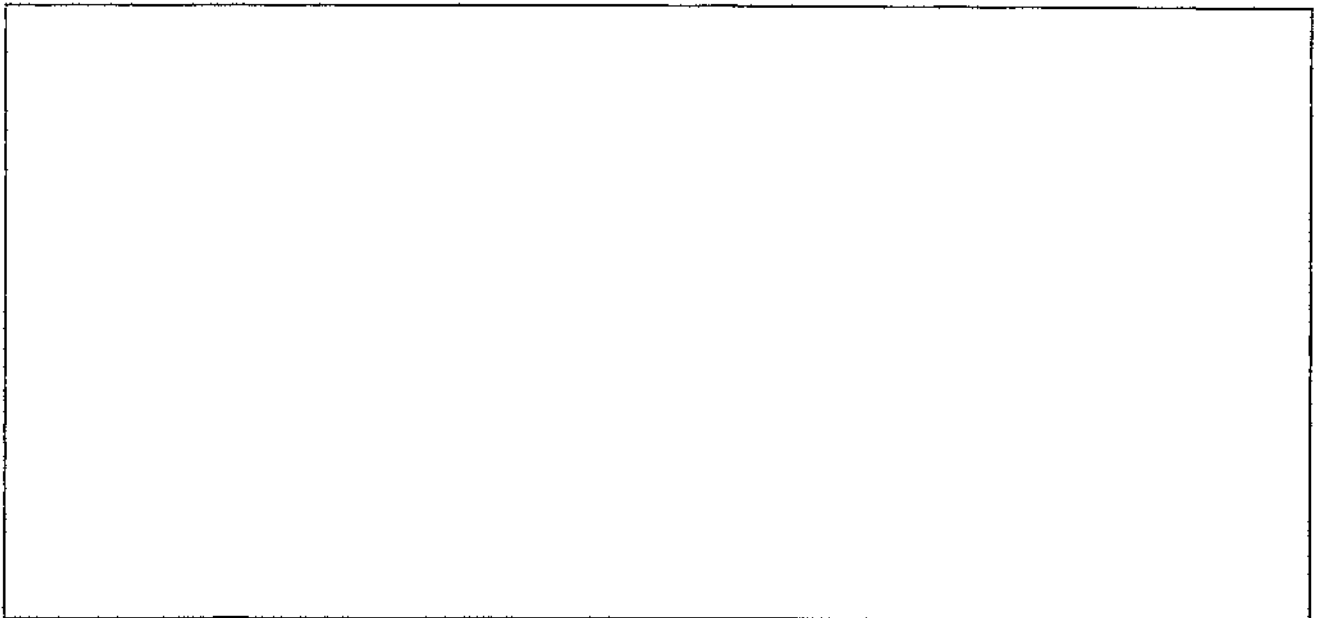
### Part 1: What are the stages in the life cycle of stars?

1. Form groups of four or five. Assign each group member a letter: A, B, C, D (and E for groups of five).
2. Randomly pass out the Stellar Life Cycle Stages sheets so that each member of your group has at least two of the sheets (some may have three). Individually, read your sheets and identify the key properties of each object. Be prepared to discuss these key properties within your group.
3. Beginning with student A, each group member should show one of their information sheets to the group and describe the object, focusing on key properties. Rotate through the group until all of the information sheets have been presented.
4. Then, working collaboratively, analyze the information sheets and determine the correct order of the life cycle of stars. *Hint: The stages do not necessarily form one straight line.* When completed, check your work by visiting the other groups to compare the ordering. Resolve any differences.
5. Ask your teacher for a copy of the Stellar Life Cycle Summary and check your work.

### Summarize Your Learning

1. In the space below, draw a diagram to summarize the life cycle of stars. Be sure to sketch and label the correct order for the stellar evolution of each object from your results in Step 4 above.

*Life Cycle of Stars*



2. Explain why the stages could not be arranged in a single straight line.

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Name: \_\_\_\_\_ Date: \_\_\_\_\_

3. Answer the following questions with the appropriate term. Review the descriptions on the information sheets to help you.
- (a) Stellar nebulas produce these in various sizes and colours. \_\_\_\_\_
  - (b) Stars shine by fusing this element to form helium. \_\_\_\_\_
  - (c) When average stars like our Sun run out of fuel, they expand to become this. \_\_\_\_\_
  - (d) Average stars like our Sun will end their life as this. \_\_\_\_\_
  - (e) Massive stars explode as supernovas, leaving behind either of these two objects.  
\_\_\_\_\_

## Part 2: How do stars die?

1. Obtain Set 1: Star Cards (set of 14 cards) from your teacher. (Note that  $M_{\text{SUN}}$  stands for *solar mass*. It is a mass equal to the mass of our Sun. Therefore, our Sun has a mass of  $1.0 M_{\text{SUN}}$  and a star with a mass twice that of our Sun would have a mass of  $2.0 M_{\text{SUN}}$ .)
2. Deal out the cards to your group. Working collaboratively, group the cards based on the death outcome of each star.

## Summarize Your Learning

1. Based on how you grouped the cards, what property determines whether a star becomes a white dwarf, a neutron star, or a black hole?  
\_\_\_\_\_
2. Ask your teacher for Set 2: Tester Cards (set of 5 cards).
  - (a) Test the property you identified in question 1 above by placing the tester cards in the appropriate group. Confirm your understanding by checking results with another group.
  - (b) Were you unsure about how to place any of the cards? Explain why, if so.  
\_\_\_\_\_  
\_\_\_\_\_
3. Suppose you are an astronomer in charge of examining stars to determine whether they will produce a white dwarf, neutron star, or black hole when they die. How will you use the property you identified in question 1 above to determine the death outcome of a star?
  - (a) A star will become a white dwarf at the end of its life if \_\_\_\_\_.
  - (b) A star will become a neutron star at the end of its life if \_\_\_\_\_.
  - (c) A star will become a black hole at the end of its life if \_\_\_\_\_.

## Post-Activity Assessment

Answer the following questions to check your understanding of the evolution of stars.

- Below is a set of data cards for six stars. Use your knowledge from the previous activity to predict the death outcome for each of these stars: white dwarf (WD), neutron star (NS), or black hole (BH). Write your prediction on each card.

Star 1	
Object:	Star
Mass:	12.6 $M_{\text{SUN}}$
Temperature:	22 000°C
Colour:	Blue
Death Outcome:	_____

Star 2	
Object:	Star
Mass:	2.02 $M_{\text{SUN}}$
Temperature:	9670°C
Colour:	Blue
Death Outcome:	_____

Star 3	
Object:	Star
Mass:	1.42 $M_{\text{SUN}}$
Temperature:	6230°C
Colour:	Yellow
Death Outcome:	_____

Star 4	
Object:	Star
Mass:	28 $M_{\text{SUN}}$
Temperature:	35 000°C
Colour:	Blue
Death Outcome:	_____

Star 5	
Object:	Star
Mass:	33 $M_{\text{SUN}}$
Temperature:	28 000°C
Colour:	Blue
Death Outcome:	_____

Star 6	
Object:	Star
Mass:	20 $M_{\text{SUN}}$
Temperature:	3230°C
Colour:	Red
Death Outcome:	_____

- Briefly explain how you made your predictions.

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### Extension: What are you wondering about?

- When you think about the life cycle of stars, what do you still wonder about? In the space below, record a question that you have after completing this activity. For example, scientists have long wondered, "What is inside a black hole?" Use this question or create your own. Then, either in class or at home, research online by reading an article you find interesting, watching a video, or both. Then, at the beginning of your next class, share informally with others what you have learned by answering your question.

*My question:*

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