

Life Cycle of Stars

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Describe the life cycle of a star about the same mass Sun. (4 marks)

Step 1 · Birth

Nebula → protostar: gravity pulls dust and gas together, which heats up.

Step 2 · Main sequence

When hydrogen fusion starts, it becomes a stable main sequence star.

Step 3 · Old age

When the core hydrogen runs low, it swells into a red giant.

Step 4 · End

It throws off its outer layers, leaving a white dwarf, which cools to a black dwarf.

Answer: Nebula → protostar → main sequence → red giant → white dwarf → black dwarf

Check: Our Sun is about halfway through its main sequence stage.

2. Now try one with the steps

Explain why a main sequence star stays the same size for billions of years. (3 marks)

Step 1 · Inward

Step 2 · Outward

Step 3 · Balance

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Name the cloud of dust and gas from which stars form. [1]

2. Describe how a protostar becomes a main sequence star. [2]

3. State the nuclear reaction that releases energy in a main sequence star. [1]

4. List the stages in the life cycle of a star about the mass of the Sun. [4]
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5. Explain why a main sequence star is stable. [2]
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6. List the stages in the life cycle of a star much more massive than the Sun. [4]
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7. State where elements up to iron are produced. [1]
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8. State where elements heavier than iron are produced. [1]
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9. Explain why the Sun will not become a supernova. [1]
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10. The Sun's main sequence stage lasts about 10 billion years and it is now about 4.6 billion years old. [1]
Estimate how many billion years it has left on the main sequence.
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11. Describe what happens when a Sun-sized star runs low on hydrogen in its core. [2]
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12. Describe a black hole. [1]
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13. Explain how elements made in stars end up in planets like Earth. [2]

14. Explain why a white dwarf eventually becomes a black dwarf. [2]

4. Before you hand it in

"Stars burn hydrogen like a fire."

Stars release energy by nuclear fusion: hydrogen nuclei join to make helium.

"The Sun will explode supernova."

Sun-sized stars become red giants, then white dwarfs. Only much more massive stars become supernovae.

Mixing up the order: white dwarf before red giant

Main sequence → red giant → white dwarf → black dwarf.

"All elements are made by fusion in stars."

Elements heavier than iron are made in supernovae.