

# The Fate Of A Star

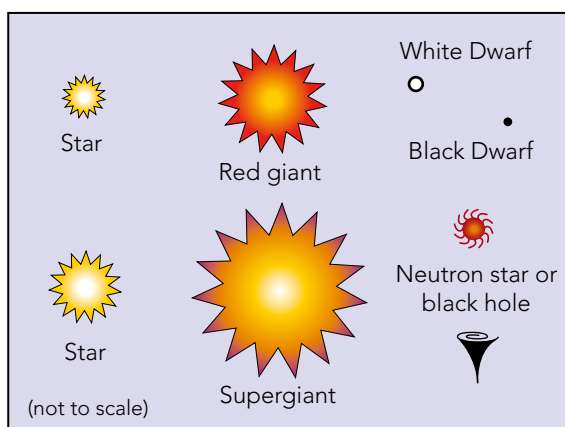
At some point a star's fuel runs out and, without it, fusion reactions will cease. Gravity continues to pull everything inwards, producing a dense mass. At this point many new, heavier, elements are forming, such as neon (Ne), iron (Fe), oxygen (O) and silicon (Si). The star 'does not give up without a fight'. As the main sequence of events draws to a close, and the remaining fuel decreases, stars of average size swell, expanding hugely in size, a process which captures more fuel material. If the star is between 1.4 times and 3 times the size of our Sun, when it expands, an enormous red giant is produced. As a result of being spread so thinly, red giants have relatively cool surface temperatures. The red giant cannot expand continually. When all fuel is used up, the remaining white-hot 'embers' can collapse into a white dwarf. White dwarfs are difficult to observe because they have a very low luminosity. Over time, the white dwarf cools, producing a cold, dead black dwarf.

- 1 What is meant by 'very low luminosity'? \_\_\_\_\_
- 2 Why do you think that astronomers use terms like 'dwarf' and 'giant' to describe stars? \_\_\_\_\_  
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As fuel is exhausted by larger stars (those greater than three times the mass of our Sun) those stars follow a different sequence of events after the red giant phase. An even larger supergiant develops and can (depending on size) form a neutron star or, in some Circumstances, a black hole.

A neutron star is a very dense, rotating, object that emits electromagnetic radiation and is called a pulsar.

A black hole is a body with an immensely strong gravitational field.



- 3 How can astronomers observe neutron stars? \_\_\_\_\_
- 4 Copy the diagram above of the sequence of how stars change.
- 5 Why isn't the diagram drawn to scale? \_\_\_\_\_
- 6 State one way that astronomers could differentiate a pulsar from a 'normal' star. \_\_\_\_\_
- 7 What is the major fuel used by stars in the process of fusion? \_\_\_\_\_
- 8 What is the chemical symbol for iron? \_\_\_\_\_
- 9 What is the chemical symbol for oxygen? \_\_\_\_\_
- 10 What is the chemical symbol for neon? \_\_\_\_\_
- 11 What is the chemical symbol for silicon? \_\_\_\_\_
- 12 What is the force that pulls the materials of a star inwards? \_\_\_\_\_
- 13 Arrange in the correct order: main sequence star ~ black dwarf ~ white dwarf ~ red giant
- 14 'Our sun is a "main sequence" star.' True or false? \_\_\_\_\_
- 15 'Red giants are larger than supergiants: True or false? \_\_\_\_\_
- 16 'Black holes are areas where gravity doesn't exist: True or false? \_\_\_\_\_
- 17 'The lifetime of a main sequence star is measured in thousands of years: True or false? \_\_\_\_\_
- 18 'Black dwarfs are stars that emit little or no radiation: True or false? \_\_\_\_\_