



# The Life Cycle of a Massive Star **Mark Scheme**

Explain the life cycle of a star much more massive than our Sun.

<b>Level 3:</b> All stages of the life cycle (including either black hole or neutron star) are named and correctly sequenced. The transition between most of the stages is explained.	5-6
<b>Level 2:</b> All stages of the life cycle (including either black hole or neutron star) are named and correctly sequenced. There is a simple description for most of the stages.	3-4
<b>Level 1:</b> Relevant statements are made. Two marks can be awarded for two correct statements.	1-2
<b>No relevant content.</b>	0
<b>Indicative Content</b> <b>nebula</b> <ul style="list-style-type: none"><li>• formed from dust/gases</li><li>• gravity pulls them together</li><li>• so, the cloud gets hotter and denser</li></ul> <b>protostar</b> <ul style="list-style-type: none"><li>• the particles cause friction when they brush past each other</li><li>• increasing the thermal energy store</li><li>• starts to emit light</li></ul> <b>main sequence star</b> <ul style="list-style-type: none"><li>• hydrogen nuclei have enough energy</li><li>• to fuse/for nuclear fusion to start</li><li>• energy/heat/temperature causes the star to expand</li><li>• expansion forces are equal to gravitational forces</li><li>• stable (for a long period)</li></ul> <b>super red giant</b> <ul style="list-style-type: none"><li>• larger nuclei fuse to form heavier elements</li><li>• nuclei as large as iron can fuse here</li><li>• causes an increase in thermal energy (in the core)</li><li>• rapid expansion</li><li>• as it expands it cools (and glows red)</li></ul>	

**supernova**

- heavy elements cause a dense core
- which pulls the outer layers of the star towards its centre/causes the star to collapse/contract
- (shockwaves) cause the star to explode outwards
- elements heavier than iron are produced

**neutron star**

- most supernovas
- very dense core
- no fusion

**black hole**

- largest supernovas
- strong gravity
- not even light/nothing can escape