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| **Lesson Number: 28.8** |
| **Lesson Title: Fusion and the life of stars** |
| **Specification Reference** | **3.9.2.5** |
| **Learning Objectives** |
| Stellar evolution: path of a star similar to our Sun on the HR diagram from formation to white dwarf. |
| **Opportunities for Assessment** |
| Create a timeline of the life of a starDraw the timeline of the Sun onto a Hertzsprung-Russell diagram |
| **Starter:** | Slide #1 recaps the p-p chain from GCSE – Higher level students can discuss the particle conservation laws of charge, lepton and baryon numbers |
| **Main:** | Slides #2 - #3 explain the end of the main sequence and the start of the red giant phase. The C-N-O cycle is described – students need not memorise this however they must understand it. Baryon and lepton conservation can be considered as can the recycling of the elements in this systemSlide #4 is an optional slide that reiterates that fusion is only the nucleus of the atoms and can be used as practice of ratios to remind pupils of the model of the atomSlides #5 and #6 explain the movement off the main sequence on the H-R diagram and towards the red giant phase – students should be able to draw this for stars of about 1 solar massSlides #7 - #8 explain the evidence for these tracks and uses the instability strip to show the evolutionary path of stars after the main sequenceSlides #9 - #10 describe the fusion that takes place after hydrogen fusion; the triple alpha process and beyondSlide #11 is a quick description of the helium flash – easily overlooked part of the syllabus this has been an examination questionSlide #12 is an optional slide that shows the advanced fusion in very large stars; not needed for the A-Level course but of interestSlide #13 shows the binding energy per nucleon of atoms and enables a discussion on why fusion ceases if a star begins to create ironSlides #14 - #17 describes the Chandrasekhar limit and the link between the mass of a star, the mass of the remnant after supernova and the end result of a neutron star or a black hole  |
| **Plenary:** | Slide #18 is a summary |

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| **Homework:** | Research the history of the detection of neutron stars; research the supernova in the crab nebula |
| **Differentiation / Extension / S&C** |
| Discussion of the p-p2 and p-p3 chains and the CNO cycle in detail; create nuclear formulae of eh stages |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| None | Changing ideas of astronomy and science over time |
| **RESOURCES:** |
| None |
| **Risk Assessment** e.g. CLEAPSS card reference |
| None |
| **Working Scientifically (HSW)** |
| None |

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