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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 star  Draw 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 system  Slide #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 atom  Slides #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 mass  Slides #7 - #8 explain the evidence for these tracks and uses the instability strip to show the evolutionary path of stars after the main sequence  Slides #9 - #10 describe the fusion that takes place after hydrogen fusion; the triple alpha process and beyond  Slide #11 is a quick description of the helium flash – easily overlooked part of the syllabus this has been an examination question  Slide #12 is an optional slide that shows the advanced fusion in very large stars; not needed for the A-Level course but of interest  Slide #13 shows the binding energy per nucleon of atoms and enables a discussion on why fusion ceases if a star begins to create iron  Slides #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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