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| **Lesson Number: 28.5 (Two lessons)** |
| **Lesson Title: Magnitude and parallax**  |
| **Specification Reference** | **3.9.2.1, 3.9.2.2** |
| **Learning Objectives** |
| Apparent magnitude, *m*.The Hipparcos scale.Dimmest visible stars have a magnitude of 6.Relation between brightness and apparent magnitude. Difference of 1 on magnitude scale is equal to an intensity ratio of 2.51.Brightness is a subjective scale of measurement.Parsec and light year.Definition of *M*, relation to *m*:  |
| **Opportunities for Assessment** |
| Students should be tested on their ability to use log functions, convert absolute to apparent magnitudes and calculate the distances to different stars using pc and ly |
| **Starter:** | Slide #1 enables and discussion of GCSE star classification and also a thought experiment on what properties describe a star (Radius, Temperature, Luminosity)Slide #2 clarifies the most important part of the discussion and defines magnitude |
| **Main:** | Slide #3 recaps fusion from GCSE – It is worth starting to introduce the idea that the p-p chain they know is only one of several different chains Slide #4 begins linking the different properties of a star together – pupils can now perform a simple experiment to calculate the distance to an object in the classroom using parallax. Uncertainty calculations are useful here and discussion as to the uncertainties in the measuring of stellar distancesSlide #5 explains the measurements of parallax using the Earth’s orbitSlides #6 - #10 explain and give examples of light years and parsec – Students could calculate the ly examples into parsecsSlides #11 - #12 explain the Hipparcos magnitude scale and give examples to show the rangeSlides #13 - #15 link absolute magnitude and apparent magnitude including and example questionSlides #16 - #17 are an extension to the A-Level course linking magnitude to luminosity |
| **Plenary:** | Slide #18 is a summary |

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| **Homework:** | Research Hipparcos and his scale of magnitude; write a report on magnitude of stars in our galaxy or galaxies themselves |
| **Differentiation / Extension / S&C** |
| Linking magnitude to luminosity and then to stellar types for real examples  |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| Use of algebra, trigonometry, unit conversion and logs | Understanding the distances in space and Earth’s place within the universe |
| **RESOURCES:**Set of: |
| * Large protractor (Teacher board version)
* A3 paper
* Selotape
 |
| **Risk Assessment** e.g. CLEAPSS card reference |
| None |
| **Working Scientifically (HSW)** |
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Slide #1 - By NASA, ESA, AURA/Caltech, Palomar ObservatoryThe science team consists of: D. Soderblom and E. Nelan (STScI), F. Benedict and B. Arthur (U. Texas), and B. Jones (Lick Obs.) - http://hubblesite.org/newscenter/archive/releases/2004/20/image/a/, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=7805481>

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Slide #10 - By Adam Evans - M31, the Andromeda Galaxy (now with h-alpha)Uploaded by NotFromUtrecht, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=12654493>

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