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| **Lesson Number: 28.1** | | |
| **Lesson Title: Lenses and telescopes** | | |
| **Specification Reference** | | **3.9.1.1** |
| **Learning Objectives** | | |
| Ray diagram to show the image formation in normal adjustment.  Angular magnification in normal adjustment.    Focal lengths of the lenses. | | |
| **Opportunities for Assessment** | | |
| Assess the mathematics in the lesson and the student’s ability to draw lens diagrams | | |
| **Starter:** | Slide #1 enables a recap of lenses from GCSE and / or AS level Physics – Try to get pupils to extend their diagram to that on slide #2 without prompting | |
| **Main:** | Slide #2 - #4 build up a methodology of the manner in which ray diagrams are drawn for telescopes – These appear step by step and each step should be taught along with a rule as to why the ray is where it is. Ensure that they appear in the correct place on your resolution of screen!  Slide #5 explains magnifying power – students often misunderstand the wording *subtending from the eye to…*  Slide #6 is an optional look at the lens formula and it’s simplification in telescopes  Slides #7 - #9 explain chromatic aberrations and how to avoid them | |
| **Plenary:** | Slide #10 is a summary | |

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| **Homework:** | Research early telescopes / modern telescopes / space telescopes | |
| **Differentiation / Extension / S&C** | | |
| Extension can be to create the ray diagrams themselves, design a telescope doing all calculations prior to construction. | | |
| **Numeracy / Literacy** | | **SMSC / Fundamental British Values** |
| Use of lens formula | | * History of astronomy * Why is astronomy important? * Persecution of astronomers in the past |
| **RESOURCES:** | | |
| Group sets of:   * Several spherical convex lenses * Small eyepiece lens * Lens holders and scale (metre rule or fixed scale) | | |
| **Risk Assessment** e.g. CLEAPSS card reference | | |
| If lenses are dropped and broken then follow procedure for sweeping up glass and disposal in broken glass bin | | |
| **Working Scientifically (HSW)** | | |
| Use of telescopes in everyday life; chromatic aberrations and coloured filters in microscopes | | |

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