|  |
| --- |
| **Lesson Number: 28.3** |
| **Lesson Title: Charge coupled devices** |
| **Specification Reference** | **3.9.1.4** |
| **Learning Objectives** |
| Comparison of the eye and CCD as detectors in terms of quantum efficiency, resolution, and convenience of use.No knowledge of the structure of the CCD is required. |
| **Opportunities for Assessment** |
| Calculations on the final slides; discussion on digital cameras and the CCDs |
| **Starter:** | Slide #1 enables a discussion about how cameras work |
| **Main:** | Slides #2 - #4 go through how a CCD works including a link to an external website animation. Although the details of how the internal structure is not needed for the course a general idea of how they work is usefulSlide #5 is an essential list of the advantages of CCDsSlide #6 explains quantum efficiency – Some calculations comparing eyesight to a CCD can be done hereSlides #7 = #10 go through a series of complex questions – The idea of using ratios in the final step is an essential skill in astrophysics and one the students should practice |
| **Plenary:** | Slide #11 is a brief summary |

|  |  |
| --- | --- |
| **Homework:** | Research CCDs in digital cameras and telescopes |
| **Differentiation / Extension / S&C** |
| The final question is a higher level skills question; discussion of CCDs and their design can be researched for students interested in the field |
| **Numeracy / Literacy** | **SMSC / Fundamental British Values** |
| Use of formulae and ratios | Uses of cameras; Morality and legal issues regarding photographing people |
| **RESOURCES:** |
| None |
| **Risk Assessment** e.g. CLEAPSS card reference |
| None |
| **Working Scientifically (HSW)** |
| Space telescopes and their CCDs |

Pictures courtesy of:

Slide #1 - By © Bill Bertram (Pixel8) 2009 - Pixel8, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=5750189>

Slide #2 - By Ahmed2IQ (Own work) [Public domain], via Wikimedia Commons

Slide #3 - By en:User:Cburnett - Own workThis vector image was created with Inkscape., CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=1496858>

Slide #3 - By D-Kuru - Own work, CC BY-SA 3.0 at, <https://commons.wikimedia.org/w/index.php?curid=8837458>