

# GCSE Astronomy Coursework

## A3 & B3 Lunar or Solar Eclipse

Using a suitable method of observation (lunar - direct, solar - pinhole projection (A3), solar – telescope projection (B3)), produce a series of drawings (A3) or photographs (B3) showing the progress of a lunar or solar eclipse.

During a lunar eclipse the full moon turns a reddish brown colour as it enters the Earth's shadow. A solar eclipse happens when the Moon moves in front of the Sun. There are 3 types of solar eclipse: total (all of the Sun is blocked), partial (part of the Sun is covered) and annular (Moon is at apogee and a bright ring is seen around the smaller Moon). The next total solar eclipse from the UK will be in September 2090.

For project A3 solar eclipse observations project an image of the Sun on a piece of card by using a pinhole in another piece of card. For project B3 use a telescope to project an image of the Sun on a piece of card held 15 cm behind the eyepiece. Telescopes with apertures less than 100 mm should be used to minimise heat passing through. The finder should be covered up as a precaution and only low-power eyepieces (long focal length) should be used (no plastic barrels as these might melt). Use the shadow cast by the telescope to determine where the Sun is - NEVER LOOK AT THE SUN DIRECTLY.

Alternatively for B3 use a solar telescope with an appropriate filter such as a hydrogen alpha ( $H\alpha$ ) which only transmits light through a narrow band of wavelengths centred on 656.3 nm (red light). Photograph the Sun through the eyepiece.

For a list of upcoming lunar and solar eclipses go to <http://eclipse.gsfc.nasa.gov/eclipse.html>

To locate the Moon use [www.stellarium.org](http://www.stellarium.org) or alternatively download an app for your mobile: [http://downloads.bbc.co.uk/tv/guides/BBC\\_Stargazing\\_Live\\_2012\\_Mobile\\_App\\_guides.pdf](http://downloads.bbc.co.uk/tv/guides/BBC_Stargazing_Live_2012_Mobile_App_guides.pdf)

For weather try [www.metoffice.gov.uk](http://www.metoffice.gov.uk)

See our useful guides for help on how to carry out observations and take photographs of various objects:  
[http://www.rmg.co.uk/upload/pdf/APY\\_guide.pdf](http://www.rmg.co.uk/upload/pdf/APY_guide.pdf)  
<http://www.rmg.co.uk/whats-on/exhibitions/astronomy-photographer-of-the-year/how-to-photo-guides/>



For examples of reports with moderator comments visit the Edexcel GCSE Astronomy website: <http://www.edexcel.com/quals/gcse/gcse09/astronomy/Pages/default.aspx>

Here you will find two documents that will help you write a report: Under 'Controlled assessment' download 'Controlled Assessment Teacher Support Book' and under 'Teacher Support Materials' download 'GCSE Astronomy Teachers Guide'.

Below is a checklist of points that you should include in your report. Remember to reference all sources of information and to label all images, diagrams and tables and refer to them in the text e.g. Table 1, Figure 1 etc.

### Design (5 marks)

- > All equipment listed
- > **B3 only:** All set-up details of telescope/camera listed (field of view, ISO, f-stop, exposure time, focal length/zoom, tripod)
- > Astronomical terms explained with diagrams
- > Rise and set times of the Sun or Moon
- > Date and time of eclipse and type of eclipse observed (partial, total, annular)
- > Limits of location noted
- > Alternative locations suggested
- > Mention of the weather forecast

Edexcel marking guidelines:

0	No procedure designed.
1	Outline a simple procedure for the observations, using basic astronomical terminology.
2-3	Astronomical knowledge and understanding used to decide on the most appropriate site,time, equipment for observations. Spelling, punctuation and grammar used with reasonable accuracy. Limited use of astronomical terminology.
4-5	Detailed astronomical knowledge and understanding used to design the most appropriate observing programme with a range of sites, times and instruments evaluated. Spelling, punctuation and grammar used with considerable accuracy. Good range of astronomical terminology used correctly.

### Observation (5 marks)

- > Number of recorded observations presented over duration of eclipse
  - > **B3 only:** All camera settings listed for each image
  - > Duration of eclipse noted and charted
  - > Location stated (latitude & longitude)
  - > Date and time stated
  - > Weather
  - > Seeing (during lunar eclipse)
- Antoniadi scale**

A five-point scale to indicate the quality of seeing:

I – perfect seeing, without a quiver

II – slight undulations, with moments of calm lasting several seconds

III – moderate seeing, with larger tremors

IV – poor seeing, with constant troublesome undulations

V – very bad seeing, scarcely allowing the making of a rough sketch.

> Position of Moon or Sun

> Proximity to meridian (hour angle/altitude)

> All figures labelled and referenced in text

Edexcel marking guidelines:

0	No observations completed.
1	Simple observations completed, providing some data. A few observational details included.
2-3	Sound observations completed and recorded, providing adequate data for the task. Clear and accurate observational details included.
4-5	Excellent programme of observations completed and recorded, providing conclusive data for the task. Full observational details included clearly and accurately.

### Analysis (5 marks)

> Drawings labelled and explained correctly at each stage of eclipse

> **B3 only:** Photographs labelled and explained correctly at each stage of eclipse

> Calculation of the speed of the Moon determined from duration of eclipse

> Comparison with theoretical value

> Uncertainties stated

Edexcel marking guidelines:

0	No analysis on the observations.
1	Simple comments on what is shown by the observations, using basic astronomical terminology.
2-3	Conclusions or calculations derived from observational data used to address the task set. Spelling, punctuation and grammar used with reasonable accuracy. Limited use of astronomical terminology.
4-5	Full analysis of the observational data, resulting in clear conclusions related to the task set. Spelling, punctuation and grammar used with considerable accuracy. Good range of astronomical terminology used correctly.

### Evaluation (5 marks)

> Accuracy of drawings evaluated

> **B1 only:** Quality of photos evaluated

> Limitations of project explored

> Suggested improvements to project

> Suggested extension to project

Edexcel marking guidelines:

0	No evaluation of the observation.
1	Simple comment on the accuracy of the observations, using basic astronomical terminology.
2-3	Supported statement of the accuracy of the observational data obtained. Feasible suggestions for improvements or extensions to the observations. Spelling, punctuation and grammar used with reasonable accuracy. Limited use of astronomical terminology.
4-5	Clearly reasoned quantitative assessment of the accuracy of the observational data obtained. Detailed suggestions for improvements or extensions to the observations. Spelling, punctuation and grammar used with considerable accuracy. Good range of astronomical terminology used correctly.