ROYAL OBSERVATORY GREENWICH

GCSE Astronomy Coursework

A9 & B9 Light Curve of a Variable Star

Use a series of naked-eye estimates (A9) or telescopic estimates (B9) of the magnitude of a suitable variable star over a sufficient period of time to determine the period of the star.

Variable stars change magnitude over time. Plotting a light curve of a regular variable will show cyclical brightening and dimming of the star (y-axis) against time (x-axis). The time period can be calculated from this curve. You can find a list of variable stars here **www.aavso.org/variable-stars-main**. Choose those with a regular period.

Choose a time to view your chosen variable star when it is at its highest point in the sky (if this is reasonable) and the Moon is below the horizon. Compare the magnitude of your variable star over time with reference stars. Weather may disrupt your observations so you may need to do repeat observations of a short-period star (until you have enough to estimate the period) or choose a longer-period star and track its magnitude over the course of its period.

To locate a variable star and the Moon use **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

To find sunrise, sunset, moonrise and moonset times and the phase of the Moon use **www.timeanddate.com**

Check the weather forecast - **www.metoffice.gov.uk**

See our useful guides for help on how to carry out observations and take photographs of various objects: **www.rmg.co.uk/discover/astronomy-photographer-competition/how-to-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'.

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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
> **B9 only:** All set-up details of binoculars/telescope listed (aperture size, magnification - eyepiece, field of view, tripod)
> Astronomical terms explained
> Rise and set times of the Moon
> Phase of Moon and position of Moon taken into account
> Limits of location noted
> Alternative locations suggested
> Appropriate regular variable star chosen
> Reference stars chosen for magnitude estimates
> Explanation of why they were chosen
> Mention of the weather forecast
> Range of dates and times to observe & why (Moon, altitude and hour angle of variable star, period of star with reference)

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.**

Observation (5 marks)

> Variable star magnitude recorded over its total period
> **B9 only:** all camera settings listed (if used)
> Limiting magnitude stated
> Location stated (latitude & longitude)
> Date and time stated
> Night vision acquired & maintained (red light used)
> Weather
> Seeing

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.

> Positions of variable star and reference stars
> Magnitudes of reference stars stated
> Proximity of all stars to meridian (hour angle/altitude)
> Position of Moon and phase (if above horizon)
> 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)

> Estimated magnitude of variable star plotted over time (light curve)
> Suitable precision of estimates for magnitudes
> Comparison to actual magnitudes of variable star
> Period of variable star determined

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.**

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Evaluation (5 marks)

> Accuracy of measurements evaluated
> Error in measurements stated
> 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.**