

Getting Started Guide



GCSE (9–1) Astronomy

**Pearson Edexcel Level 1/Level 2 GCSE (9–1) in Astronomy
(1AS0)**

GCSE (9–1) Astronomy 2017

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1. Introduction

This Getting Started Guide provides an overview of the new GCSE Astronomy specification, to help you get to grips with the changes to content and assessment, and to help you understand what these mean for you and your students.

We are providing a package of support to help you plan and implement the new specification. This will include:

- a course planner and schemes of work that you can adapt to suit your department to help with planning
- support for mathematical skills that form part of the new GCSE Astronomy course
- a guide to the observational skills that you will need to develop alongside the taught content of the GCSE Astronomy specification
- topic booklets for some topic areas in the new specification to help you get up to speed with new content.

These support documents will be available on the GCSE Astronomy (9–1) 2017 pages:

qualifications.pearson.com/en/qualifications/edexcel-gcses/astronomy-2017.html

We can also give you ongoing support through your local Pearson curriculum support team, and through our Science Subject Advisor, Stephen Nugus.

2. What's changed?

2.1 What are the changes to the GCSE qualification?

The GCSE Astronomy specification is changing for first assessment in May/June 2019. Therefore, changes to the specification will apply to you if you start a 2-year Astronomy GCSE course in September 2017.

Note that there is no overlap between the existing GCSE and the new one: the May/June 2018 series will be the final assessment opportunity for the current GCSE Astronomy and the May/June 2019 series will only have opportunities to sit the revised GCSE Astronomy (9–1) specification.

The main changes – most of which apply to all GCSE subjects – are:

- there will be a new 9–1 grading system, with 9 being the top level (see Section 4.5)
- there will be no coursework or controlled assessment component: all assessment will be through external examinations
- there will be a fully linear structure, with all exams sat at the end of the course
- GCSE Astronomy continues to be untiered (unlike GCSEs in Combined Science or Separate Sciences, which have Foundation and Higher Tier options).

Changes to content requirements for GCSE Astronomy specifications

The content requirements for GCSE Astronomy specifications have been revised by the Department for Education and Ofqual. All awarding organisations' specifications for GCSE Astronomy must meet these requirements (currently only Pearson provide a GCSE in Astronomy).

Other than the Astronomy subject content laid down by the Department for Education, GCSE Astronomy (9–1) specifications must also:

- assess mathematical skills, with a weighting of at least 20% in written examination papers
- require students to undertake at least two astronomical observations – one unaided and one aided – which teachers will be required to certify have been carried out
- assess observational skills, with a weighting of at least 15% in written examination papers.

Our specifications have been designed to ensure these subject requirements are fully covered.

Changes to Assessment Objectives

The GCSE Astronomy Assessment Objectives have been revised. There continue to be three AOs: AO1, AO2 and AO3.

AO1 and AO2 retain broadly the same aims as in the currently specification of assessing knowledge and understanding (AO1); and application of that knowledge and understanding (AO2). The change in the method for assessing observational skills means that the wording of AO3 has been revised. The weighting of these Assessment Objectives has also been revised to reflect the new performance standard for GCSE qualifications.

The table shows the new Assessment Objectives:

AO1	Demonstrate knowledge and understanding of: <ul style="list-style-type: none"> • scientific ideas • scientific techniques and procedures. 	40%
AO2	Apply knowledge and understanding of: <ul style="list-style-type: none"> • scientific ideas • scientific enquiry, techniques and procedures. 	40%
AO3	Analyse information and ideas to: <ul style="list-style-type: none"> • interpret and evaluate astronomical observations and methods • make judgements and draw conclusions • develop and improve observational procedures. 	20%

One other change to note is that the range of percentage values for each Assessment Objective in the existing (2011) specification has been replaced by a single value for each Assessment Objective. This should help make the demand of the assessments more comparable year-on-year.

The wording of the old AO3 was fairly broad (“Practical, enquiry and data handling skills”) so that it could be assessed on the written paper as well as in the controlled assessment activity. The new AO3 outlines more clearly the skills which will be assessed: these include evaluating information and ideas, making judgements and drawing conclusions. These skills may be assessed in observational or other content areas of the specification. The requirement in the existing controlled assessment to plan an observational activity is replaced, through the new AO3, with a requirement to develop and improve observational procedures.

Observational skills

Although there are no controlled assessments in the new GCSE Astronomy qualification, observational skills should still form an essential and integral part of any Astronomy course.

The specification contains a number of references to observational activities, both within the specification statements and, more importantly, within the ‘Observational Skills’ section starting on page 42 of the specification. This section of the specification outlines the different skills that form the basis of the cycle of astronomical observations: Design, Observation, Analysis and Evaluation.

Although there are many opportunities to undertake simple activities to target individual skills within this cycle, it is important that students experience the whole cycle. For this reason, all students must undertake two observational activities – one unaided and the other aided – which allow them to use the full set of observational skills. Completion of these two observational activities forms part of the subject criteria for GCSE Astronomy – in other words, they are a mandatory part of the course.

To meet this requirement, set out by Ofqual, you will need to confirm that reasonable steps have been taken to secure that each learner has completed the two observational activities, and has made a contemporaneous record of the knowledge, skills and understanding derived from those activities. We have

suggested a number of possible activities to meet this requirement within the specification. Although centres can choose other activities, we would recommend using those in the specification, which are suitable for a range of learners and a range of resources.

In addition to these observational activities, carried out as part of the requirements for the course, there will also be questions on written examination papers which test knowledge and understanding of observational skills. A minimum of 15% of marks in exam papers will be for knowledge, understanding and application of observational skills. These questions may be set within the context of an observational activity outlined in the specification content; or within a novel context, requiring students to apply the observational skills they have gained during the course.

Mathematical skills

The Department for Education has defined a list of mathematical skills that should be taught as part of the new GCSE Science qualifications, including in GCSE Astronomy. These mathematical skills are mapped in our specifications in a column on the right-hand side, indicating where there are good opportunities to cover this content. A complete list of the mathematical requirements can be found in Appendix 1 of the specification.

Questions assessing students' use of mathematical skills will make up 20% of the marks in written examination papers.

There is no requirement for students to learn astronomical equations and data. Question papers will contain a Formula and Data Sheet which will provide students with key equations and astronomical data. A copy of this Sheet can be found in the Sample Assessment Materials, and also in Appendix 2 of the specification.

2.2 Changes to the specification

Specification overview

The content of the specification has been split into a number of topics. There are 16 topics in total and they are arranged so that the first eight topics will be assessed in Paper 1; and the remaining eight topics in Paper 2.

Paper 1: Naked-eye Astronomy	Paper 2: Telescopic Astronomy
Topic 1 – Planet Earth	Topic 9 – Exploring the Moon
Topic 2 – The lunar disc	Topic 10 – Solar astronomy
Topic 3 – The Earth-Moon-Sun system	Topic 11 – Exploring the Solar System
Topic 4 – Time and the Earth-Moon-Sun cycles	Topic 12 – Formation of planetary systems
Topic 5 – Solar System observation	Topic 13 – Exploring starlight
Topic 6 – Celestial observation	Topic 14 – Stellar evolution
Topic 7 – Early models of the Solar System	Topic 15 – Our place in the Galaxy
Topic 8 – Planetary motion and gravity	Topic 16 – Cosmology

Taken as a whole, the topics cover all the mandatory content in the DfE revised subject criteria for GCSE Astronomy.

Changes to specification content

The revised specification content for GCSE Astronomy, as outlined in the DfE subject criteria, changes the existing content in three ways.

Firstly, there is an increase in breadth of subject coverage, as some topic areas are introduced to the specification. For example, students are now expected to learn about tides. Many of these additions restore topics which had been present in the GCSE before the revisions in 2011.

Secondly, many topics see an increase in depth of coverage. The aim of this, coupled with the change in Assessment Objective weightings already noted in Section 2.1, will reduce the amount of simple rote learning in the specification; and increase the importance of student understanding of astronomical ideas and principles.

Lastly, to ensure that observational skills can be fairly tested within the written examinations, a number of key observational skills and principles are now included within the specification content.

A mapping document on the [GCSE Astronomy homepage](#) gives more details on the changes in content, when compared with the current GCSE Astronomy (2011) specification. You can find this in the “Course Materials” section, under the tab called “Teaching and Learning Materials”.

Changes to assessment

There are important changes in two areas of assessment for GCSE Astronomy.

The first of these is the assessment of observational skills. The requirement to undertake observational activities under controlled conditions, and with a proportion of the final subject grade depending on the outcomes of these activities, have both been removed. The requirement to undertake at least two observational activities – one aided and one unaided – still remains, but these do not have to be supervised under controlled conditions. Although teacher marking and feedback on these activities will still be important, no mark from these activities will contribute towards the final subject grade in GCSE Astronomy. Instead, knowledge of observational skills and techniques, gained during observational activities, will form at least 15% of the final written examination papers.

The other major change involves the written examination papers. Here, the total length of assessment changes to bring it in line with other GCSE subjects; and to reflect the shift in assessment of observational skills from controlled assessment to written examination. The current single, 2 hour, examination paper will therefore be replaced by two examinations, both 1 hour 45 minutes in length.

There will also be some changes to the style of the question papers. A range of question types will still be present – multiple choice, short answer, mathematical questions and longer response questions. However, question papers are likely to contain fewer simple short answer questions of 1 or 2 marks based on simple recall. There will also be a greater number of questions, worth 4 – 6 marks, which are more open-ended and will require a more extended student answer. In common with GCSE Science papers, the 6-mark questions on written examination papers will be marked using a levels-based mark scheme.

3. Planning

3.1 Planning for delivery of the course

GCSE Astronomy is currently delivered in a number of different ways in schools. In many schools it is taught out-of-timetable as an additional activity, at lunchtime or after school; but some schools do have the subject within a standard timetable block. We also know that schools deliver GCSE Astronomy to students of very different age ranges, from KS3, through GCSE and A level students, as well as to adult learners.

There is no “correct” way to deliver the course – each centre will have its own way of ensuring that the content of the course is covered and students are supported in their learning. It should be noted, however, that the changes to the specification content do make delivery of the subject in only 1 year, with 1 hour per week contact time with students, more challenging – unless the students are learning in such a way (e.g. ‘flipped’ learning) which encourages them to undertake much of the learning outside classroom time.

To help you organise the delivery of the course in the way that fits in with your timetabling needs, we have produced some simple planning documents, which you can edit to fit your own requirements. These documents are therefore available as Word documents, for ease of editing by you in your school. The documents that we have produced are:

- course planner
- scheme of work.

These documents can be found on the GCSE Astronomy (2017) page on our website (<http://qualifications.pearson.com/en/qualifications/edexcel-gcses/astronomy-2017.html>), along with a range of other support materials and teaching documents.

3.2 Overview of documents available

Course planner

The course planner is a high-level overview, showing how the teaching content for GCSE Astronomy can be split up over a number of weeks. Experienced teachers of GCSE Astronomy should note that the new GCSE (2017) contains an increase in content compared with the previous specification, so that delivery over a single year may prove difficult, unless students are able to spend some time learning content independently of their teacher.

Our course planner gives guidance to the number of teaching weeks that should be spent on each of the 16 topics in the new GCSE specification; as well as a suggested teaching order. The course planner assumes that teaching takes place over a series of 12-week terms and therefore divides the specification content over five terms of 12 weeks (60 weeks in total) plus a final short term of 4 weeks (making 64 weeks in total). Note that the course planner does not build in time for end-of-topic assessment or final revision sessions. Please note that the teaching order in the course planner is only a suggestion: you are free to deliver the content in whichever order you wish.

In common with other GCSE courses, the GCSE Astronomy course has a recommendation of around 120 teaching hours. Some of this time allocation will be needed to develop and deliver observational skills, and so each week in the course planner assumes an allocation of around 90 minutes.

Of course, this time allocation does not have to be entirely teacher-contact time, and could be used for individual study and learning, or home-based learning and observational activities. It is also worth noting that many students taking GCSE Astronomy have a motivating interest in the subject; and their willingness to engage with the subject may help reduce delivery time.

We are aware that schools have very different models for delivering GCSE Astronomy, and that many schools teach the subject as a subject “out-of-timetable”, either at lunchtimes or after school. In these circumstances, you will need to look at the course planner and decide the best method of delivery for your students, and work out how long delivery of the course is likely to take, and how to split the time between teacher-guided learning and independent student learning.

Scheme of work

The scheme of work is based on the course planner and, effectively, adds more detail, on a week-by-week basis, to the course planner, therefore helping you to plan each of your lessons effectively.

The scheme of work assumes the same pattern of delivery as the course planner i.e. the same order of topic delivery and the same time allocation for each topic.

The format of the scheme of work helps to provide guidance on:

- the specification points covered
- exemplar activities to be covered in the lesson
- suggested resources that can be used
- opportunities for covering mathematical skills
- opportunities for covering observational skills.

4. Assessment guidance

4.1 Assessment Objectives

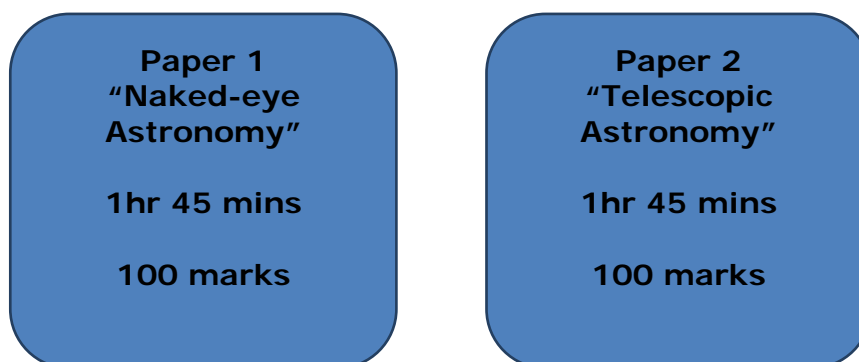
The table shows the new Assessment Objectives, along with their weightings within question papers.

AO1	Demonstrate knowledge and understanding of: <ul style="list-style-type: none"> • scientific ideas • scientific techniques and procedures. 	40%
AO2	Apply knowledge and understanding of: <ul style="list-style-type: none"> • scientific ideas • scientific enquiry, techniques and procedures. 	40%
AO3	Analyse information and ideas to: <ul style="list-style-type: none"> • interpret and evaluate astronomical observations and methods • make judgements and draw conclusions • develop and improve observational procedures. 	20%

Both question papers will reflect these weightings of the Assessment Objectives, that is both papers will test AO1, AO2 and AO3 in the proportions 40 marks : 40 marks : 20 marks.

4.2 Assessment model

The new GCSE Astronomy (2017) course is, in common with most GCSEs, 100% externally assessed. Students will take two examination papers to gain the GCSE Astronomy qualification:



The new assessment model is different from the one used for the GCSE Astronomy (2011). These differences mostly stem from the removal of controlled assessment activities from GCSE Astronomy, in accordance with the new subject criteria from the Department for Education and Ofqual.

The removal of controlled assessment means that observational skills have to be tested within written papers. This, in turn, leads to an increase in assessment time. To accommodate this increase in assessment time, it was decided to replace the single long question paper from GCSE Astronomy (2011) with two shorter papers.

The model used for these papers follows the same assessment model that we use for our GCSEs in Biology, Chemistry and Physics, with each paper lasting 1 hour 45 minutes and being worth 100 marks.

The papers are split according to topic, with half the content being assessed in one paper (“Naked-eye Astronomy”) and half the content in the second paper (“Telescopic Astronomy”). The specification clearly lists the topics which will be assessed in each question paper: it is also in Section 2.2 of this document.

Remember that the split of topics on question papers does not need to influence your teaching. Both papers will be sat by students at the end of the course, so your teaching may integrate ideas from across both papers.

The question papers are not tiered, so questions will target the whole range of grades from Grade 1 to Grade 9. A typical question paper will contain 10 questions, usually split into smaller question parts. Question papers are usually ramped, so that questions tend to increase in demand from the start of the paper through to the end. Students can also expect the number of marks per question to increase through the question paper, so that initial question may be worth only 6–8 marks; and the final questions may be worth 12–14 marks in total.

4.3 Assessing maths

The subject criteria for GCSE Astronomy require Awarding Bodies to ensure that examination papers allocate a minimum of 20% of marks to the assessment of mathematical skills.

The range of mathematical skills to be tested has been specified, as part of the subject content, by the Department for Education and can be found in Appendix 1 of the GCSE Astronomy specification. The right-hand column for each Topic in the main body of the specification shows where mathematical skills can be introduced alongside the astronomical content.

Ofqual has specified that the level of mathematics should be, at the lowest level, equivalent in demand to KS3-level mathematics; and, at the highest level, to be equivalent in demand to KS4 Foundation tier-level mathematics.

Not all the mathematics in Appendix 1 is at the appropriate standard to count towards the 20% requirement set by Ofqual; however, as it forms part of the DfE-specified content, it will still be assessed. Therefore, there will be questions that use simple mathematics (e.g. simple arithmetic) at a lower level than that specified by Ofqual.

Note that, for Astronomy, there are two areas of mathematics that may be assessed at a higher level than that equivalent of GCSE Foundation tier Mathematics: these are logarithms and indices (cubes).

Use of equations and data

Students are not required to recall any astronomical equations.

The equations that students are expected to be able to use are listed in the specification points and in Appendix 2: Formulae and data sheet. The formulae and data sheet for each examination will be given in the examination paper. The formulae sheet will also contain key astronomical data and constants. This formulae sheet will be the same for each exam series.

4.4 Assessing observational skills

As part of their study of GCSE Astronomy, students should develop their observational skills. With this in mind, students must undertake at least one unaided and one aided observation as part of the GCSE Astronomy course.

As part of this requirement, students need to record the work that they have undertaken for these observations. The observation record must include the knowledge, skills and understanding they have derived from the observational activities.

Astronomical observation is an iterative cycle. Through the evolution of each set of observations, students suggest improvements that form the basis of the design of the next set of observations. Astronomical observations require students to:

- design observations
- make observations
- analyse observations
- evaluate observations.

Further details about these skills and their assessment is available in the Observational Skills document on the website.

Centres must confirm that each student has completed at least one unaided and one aided observation by completing and submitting an Observation Statement. It is important to realise that these mandatory observations are the minimum number of observations that should be taken during the course.

Within the specification, a number of possible Observational Tasks are given as examples. Centres are recommended to choose from this list, although it might be possible to develop your own tasks, as long as these meet all the requirements of the specification. A successful task needs to set out a problem, which can be solved by a programme of observations. Completion of these tasks will give students an understanding of the cycle of astronomical observation and help them to develop the key observational skills.

Unaided tasks	Aided tasks
A1 Demonstrate the changing appearance of lunar features	B1 Demonstrate the changing appearance of lunar features
A2 Finding the radiant point of a meteor shower	B2 Finding the radiant point of a meteor shower
A3 Assess the accuracy of stellar magnitude estimates	B3 Assess the accuracy of stellar magnitude estimates
A4 Estimate a celestial property using drawings of a suitable event	B4 Measure a celestial property using telescopic drawings or photographs of a suitable event
A5 Estimating levels of light pollution	B5 Measuring levels of light pollution
A6 Estimate the solar rotation period using drawings of sunspots	B6 Determine the solar rotation period using photographs of sunspots
A7 Estimating the period of a variable star	B7 Measuring the period of a variable star
A8 Comparing stellar density estimate	B8 Comparing stellar density measurements
A9 Finding longitude using a shadow stick	
A10 Assess the accuracy of a sundial	
	B11 Demonstrate the range of objects in the Messier Catalogue
	B12 Calculation of the length of the sidereal day

Students may **not** select both of their Observational Tasks (unaided and aided) from the same row on the Observational Task table – for example, not **A1** and **B1**.

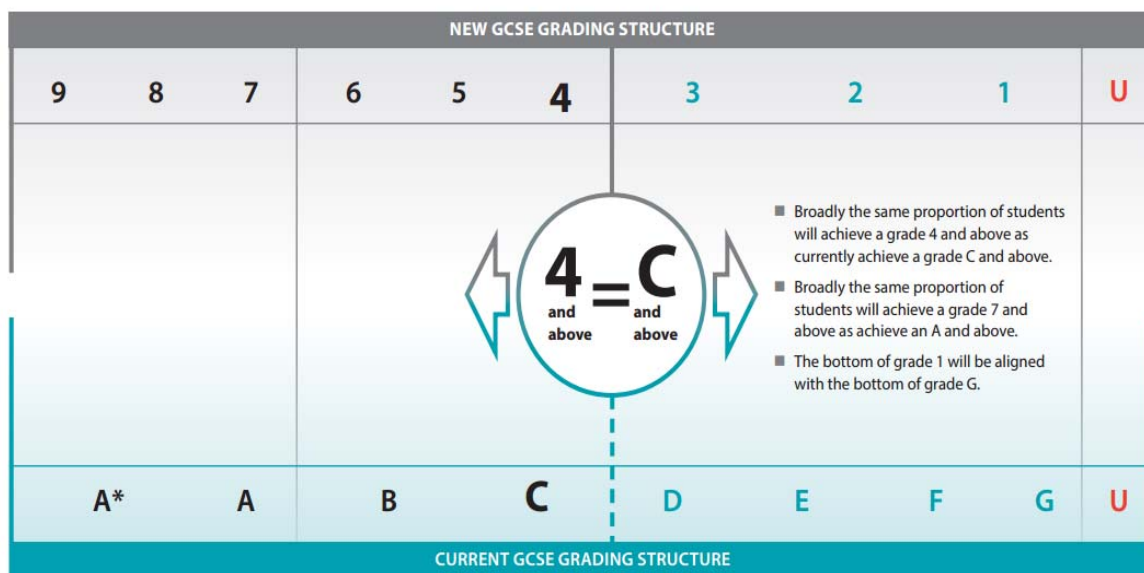
Safety is an overriding requirement for all observational work. Centres are responsible for ensuring appropriate safety procedures are followed whenever their students complete observational activities.

Students will need to use their knowledge and understanding of observational techniques and procedures in the written assessments.

4.5 9–1 grading scale

In common with all new GCSE subjects, GCSE Astronomy will now be graded on a 9–1 scale, which replaces the existing A*-G scale.

Ofqual has provided some initial guidance about the transition from the existing grading scale to the new one. Note that this guidance is correct at the time of writing, but is subject to change during the lifetime of the specification.



As the diagram shows, the new grades 1, 4 and 7 will have an approximate relationship to grades in the current scale, such that the proportion of students who currently achieve an A grade may expect to achieve a Grade 7; and the proportion of students who currently achieve an C grade may expect to achieve a Grade 4. The new Grade 1 will be equivalent to the bottom of the current G grade.

Although the new Grade 4 is approximately equivalent to the old C grade, schools should note that the reporting of GCSEs, for performance measures, will use Grade 5 to represent the 'good pass' standard. The new GCSE (9 – 1) Astronomy (2017) will count in the "open" Group (Group 3) for performance measures from 2019.

Note that the new Grade 9 represents a level of student performance above the current A* grade. The number of candidates awarded Grade 9 is determined as a proportion of those achieving Grade 7.

Further information on the setting of grade boundaries, including for Grade 9, can be found on our website.

5. Support

A range of further resources to help you deliver the new GCSE Astronomy (9-1) specification can be found on our website. This will include details of any published resources, for which endorsement has been sought.

The website also contains contact details for our Science Advisor team, who are here to help you with any questions you have about this, or any of our other Science qualifications.

