

1.

*Is the revised GCSE content in each of these subjects appropriate? Please consider:
whether there is a suitable level of challenge
whether the content reflects what students need to know in order to progress to further
academic and vocational education
whether the amount of content in the qualification is appropriate and, if not, whether
you have any suggestions for removing or adding content*

The Royal Astronomical Society (RAS) is the lead UK body representing astronomers, geophysicists and space science in the UK. Of our more than 3,900 Fellows (members) 2/3 are based in the UK, including a significant number of education professionals.

In preparing this response we have consulted with members of our Education and Outreach Committee, who include serving school science teachers as well as professional outreach staff.

The Society believes that the GCSE Astronomy course is sufficiently challenging both in depth and breadth of topics, and covers topics that enhance the content of GCSE Physics.

The subject content is broader and deeper than that of the current GCSEs, and has taken on board many of the suggestions made during the consultation with Pearson Education. The content has also been selected to minimise the overlap with GCSE Physics.

We are pleased with the new mathematical requirements, meaning that maths skills are incorporated in the subject content, along with the proposal that at least 20% of marks on examination papers should involve the use of mathematics.

The Society is also very glad to see that the observational coursework will remain a part of this qualification, although it is regrettable that the proportion of assessment attributed to this has declined from 25% to 20%, with the other 80% of the marks coming from the final exam. We believe that coursework is absolutely necessary for GCSE Astronomy to provide the practical element of the course, and it sets the course apart from other astronomy courses, e.g. distance learning courses, that do not offer this training.

If required, the Education and Outreach Committee will be able to give further specific examples of what they believe should be included or removed from the course syllabus. Some topics for consideration would be the 'finding our place' and 'theories and origins of water on Earth' sections and it would be beneficial to include additional sections on 'space missions' or 'space engineering'.

There is a risk in increasing the number of things that students are required to learn for a qualification, as it can lead to more superficial learning and less understanding and depth of each element of the specification. Reducing the breadth of a qualification also

can help with ensuring the reliability of assessment as examinations can cover a higher proportion of the specification. This encourages a more complete coverage of the syllabus in teaching, and thus reducing the element of chance in matching what the candidate can do and what they are being tested on.

Some of the elements of the GCSE course are conceptually very challenging at this level, and whilst it is useful to stretch some candidates, it is important that they first have the underpinning knowledge and academic maturity to cope with these concepts.

3a.

Do you think that any of the proposals have the potential to have a disproportionate impact, positive or negative, on specific students, in particular those with 'relevant protected characteristics'?

GCSE Astronomy is a subject which strongly motivates many young people and allows them to apply science in a context which they find particularly interesting. The proposed specification has a good balance of practical observational concerns, facts about the astronomical bodies and structures, and the theoretical underpinning to provide scientific explanations for the observed phenomena. This will equip students not only with the facts about the observed universe but some means of making sense of those observed features. It is particularly pleasing to see references to the manner in which theories gain acceptance (e.g. peer review) and the historical perspective illustrating how our theories may change.

The subject area of astronomy appears to be one that overcomes some barriers to student diversity. For example in 2014 there was an almost equal gender split in students taking the GCSE which certainly is certainly not the case for most other non-compulsory sciences.

Astronomy GCSE is taught quite evenly across state funded and independent schools although there are more opportunities to have the subject as a timetabled lesson in an independent school whereas in state funded education it is often taught within an extra-curricular after school club.

Astronomy can also be relevant to different races and religions; for example the links with the Jewish calendar and definitions of days and months, timings of the sunset link to Muslim religious events such as Ramadan, and the significant role it plays in Hindu culture.

3b.

How could any adverse impact be reduced and how could the subject content of GCSEs and/or A levels be altered to better advance equality of opportunity between persons who share a protected characteristic and those who do not share it?

Many young people have high aspirations for their careers, particularly when they are well supported by teachers and families, yet on the whole few young people aspire to become scientists. There are many reasons for this, identified by projects such as the 'Aspires' project run by Kings College London¹.

One issue is that 'science capital' within a family is influential in student decisions. Students are more likely to take courses like GCSE Astronomy if they come from a family with a science background. This goes beyond the scope of the consultation, as changing a syllabus will not in itself solve this problem. There are though other issues that can be addressed.

For example, many young people do not understand the plethora of jobs that are available to those who have pursued qualifications in astronomy and physics in higher education, with academia just one option. The GCSE course could highlight the key transferable skills acquired by pursuing these courses, and should also include as much relevant careers information as possible.

To ensure a more gender and ethnically diverse range of entrants to GCSE Astronomy, we should re-examine the course content to identify 'quick wins' that can have a positive impact on diversity. These include investigating astronomy in different cultures and background and looking at role models in space science. We also recognise the role of astronomy in being a more general 'STEM attractor', whereby it encourages students to pursue further study and careers in science in general.

[1] <https://www.kcl.ac.uk/sspp/departments/education/research/aspires/ASPIRES-final-report-December-2013.pdf>