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Examiners' Report Summer 2008

GCSE

GCSE Astronomy (1627)

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Paper 01

Overall impressions

Paper 01 included a range of question-types that not only became increasing demanding through the paper but also involved more difficult topics as the paper progressed. This style gave all candidates the opportunity to display their knowledge and understanding of Astronomy in the majority of questions. The mean mark was just 2 marks lower than in 2007, and the overall impression from the examiners was that last year's standard appeared to have been maintained.

There was still concern about the candidates' overall standard of English. Far too often, vague or poorly-written responses masked the true knowledge or understanding of a topic and marks could not be awarded. It is important that candidates realise that, even in those questions in which the quality of written communication is not being formally tested, such woolly answers are likely to include information that is actually incorrect, resulting in a lower mark for that part of the question. Questions for which this point was particularly relevant are highlighted in the comments on individual question below.

The mathematical questions seemed to cause no real difficulties. The two main exceptions were question 15 in which a number of candidates failed to convert 10 Mpc into pc, even though a reminder of the correct distance unit given with the formula, and question 17 in which many candidates calculated correctly the total distance travelled by radio waves but then omitted to halve it to determine the height of the satellite above Venus. It is perhaps worth stressing to candidates that most mathematical questions often include an element of understanding and reasoning (such as those involving the inverse square law) and do not to simply test mathematical skills.

Comments on individual questions

In question 1, parts (a) and (b) were answered correctly by the majority of candidates, but parts (c) and (d) proved difficult for grade C and grade F candidates, many simply guessing at the time difference between solar and sidereal days.

Similarly, parts (a) and (b) in question 2 were generally answered correctly, but (c) proved too difficult for most candidates, many of whom drew an extra ray entering the prism.

There were some good responses to question 3 (a), and most candidates linked the observation of satellites to light from the Sun being reflected in (b). Descriptions of the movement of the satellite into the Earth's shadow were, however, disappointing.

Candidates appeared to have no problem correctly identifying astronomical distances in question 4 (a) and most could state the elliptical shape of the Earth's orbit in (b). Most candidates associated the Astronomical Unit with the Earth – Sun distance but grade F and C candidates often failed to include the mean distance to gain the second mark for (c).

Question 5 asked candidates to link planetary moons to descriptions. Part (ii) was answered correctly (Triton) by the vast majority of candidates. However, many candidates reverted to guesswork for the other three moons, and only grade A candidates were generally able to link all four moons.

In parts (a) and (b) of question 6, candidates were asked to describe features of the Earth and drawbacks of its atmosphere. Brief, one-word answers from grade F and vague responses from grade C candidates tended to hide astronomical knowledge. For example, phrases such as 'it has an atmosphere' and 'hot and cold' are not what many would readily think of as the Earth's distinguishing features. Some responses tended to state the same feature twice!

Parts (a) and (b) of question 7 proved difficult for grade F and many grade C candidates. Part (c) on the Moon's captured rotation proved testing for all candidates, and many referred to the speeds of the Moon's rotation and orbit around the Earth and not the times. Even though some credit was given for this, it is important to point out that on another occasion, examiners might find it difficult to interpret a candidate's true meaning.

The vast majority of candidates correctly placed the Moon in between the Earth and Sun in question 8 (a) and there were some pleasing responses to 8 (b). Grade A candidates were generally able to draw the appearance of the Sun during an annular eclipse and explain its nature in (c), but many others confused an annular eclipse with a partial eclipse.

Question 9 (a) on the celestial sphere was difficult for many candidates and most were unable to sketch the zodiacal band despite a high tolerance on its limits. Clear explanations of why star Y is not circumpolar were given by grade A candidates in (c), but others relied on statements such as 'poor seeing conditions' or incomplete responses such as 'Penzance is too far south'.

Responses to question 10 were generally pleasing, but many candidates confused Galileo's heliocentric discoveries with others. Vague facts on Saturn's rings were again evident in (d), particularly from grade C candidates. It is important to remind candidates that statements merely repeating the wording of the question (such as 'they orbit Saturn') can not gain credit.

Parts (a) and (b) of question 11 on Jupiter attracted some good marks, and most candidates were able to describe at least one piece of evidence for collisions within our Solar System. One-word answers such as 'asteroids' or 'craters' do leave examiners wondering if a candidate is really aware of the evidence, whereas a response such as 'thousands of craters on the Moon and Mercury' is far more convincing (although 'craters' by itself was considered to be credit-worthy on this occasion). The majority of candidates scored at least 1 mark out of 2 on 11 (c).

Question 12 on stellar evolution was rather more open-ended and attracted some pleasing responses. The main comment from the examiners is that many candidates incorrectly referred to supernovae, neutron stars and black holes in (ii), indicating that they had confused the evolution of a solar-mass star with a more massive one, or simply failed to realise that this question referred to the Sun (despite it being stated three times in the question)!

Question 13 proved challenging and responses indicate that there is much confusion between the terms meteor, meteoroid and meteorite (indeed, the question was partly written to test this). Most grade F candidates relied on guesswork in (a) and many grade C candidates used reasons such as 'the Moon is too far away' to explain why meteors could never be observed by an observer on the Moon. Grade A candidates generally explained the differences between meteoroids and meteorites in (c) using simple, clear statements and gained 2 out of 2 marks, but many incorrectly thought that relative size was the key difference.

There were some dangerous methods for safely observing the Sun in question 14 (b) and the use of various forms of sunglasses should be discouraged. It was disappointing that many grade C and grade A candidates incorrectly described the fusion of hydrogen atoms (instead of nuclei) in (c) and failed to score the full 3 marks.

With the exception of those of grade F candidates, most responses to question 15 (a) on magnitudes were correct. Most grade A candidates were able to spot that the distance to the galaxy was quoted in Mpc and not pc, but as mentioned above, many either mis-read the question or did not fully realise that the distance unit is the parsec in (b).

Many responses to question 16 (a) gave the impression that many candidates had misinterpreted 'how' as 'why', describing the uses of a spectrum (tested in (a)). On the other hand, many candidates gave pleasing responses to this challenging question on spectroscopy.

Parts (a) to (c) of question 17 gave all candidates an opportunity to gain marks, but part (d) proved difficult for a number of grade F and grade C candidates, many of whom were unable to re-arrange the given formula. As mentioned above, by testing the understanding of the radar technique in papers in previous years, it had been expected that a larger proportion of candidates would have realised that some halving (of either the given time or the total distance) was necessary in (d). The frequent omission of a unit in the final answer was also disappointing.

Parts (a) and (b) of question 18 on the Milky Way challenged the majority of candidates and it was disappointing that only a few were aware that when we view the Milky Way in the sky, we are looking along the plane of our galaxy's spiral arms. However, candidates of all abilities scored pleasing marks in (c), but a significant number drew a plan view and not a side view as instructed. This unfortunately restricted the awarded mark to a maximum of 3 out of 5 and then made it difficult to locate the position of typical globular clusters in (iii).

Question 19 was difficult and many vague answers suggesting guesswork were evident in (a) from grade C and grade A candidates (many grade F candidates did not attempt questions 19 and 20). The difficult calculation involving Kepler's 3rd law was well-attempted by many candidates, but few completed (b) correctly and here was often confusion between the time periods and mean distances.

In question 20 (a), many grade A candidates indicated an awareness of the nature of an eclipsing binary star but incorrectly explained the dips in terms of the two stars having different sizes and not luminosities. Candidates were generally able to give some indication of the difference between a binary and double star in (b), but (c) on Cepheid variable stars proved too difficult for many and only a small proportion of grade A candidates were able to correctly sketch the light curve or clearly state how such a light curve can be used to determine distance.

Paper 02

Once again, the Moderators were impressed with the overall standard of practical work submitted in this section of the examination. In particular, this year showed a welcome increase in the range of project titles being attempted by students. This is a particularly impressive achievement for the increasing number of centres who are entering several tens of students, where co-ordinating work on a large number of different project titles within the class places a substantial demand on the teacher. Nevertheless, it is clear that the quality of work produced by this approach is much higher than when all students in a class attempt the same pair of project titles.

As always, the wish to extend the range of project titles available to students must be tempered with the need to meet the assessment objectives of this part of the examination. Centres are strongly advised to guide students towards the list of tried and tested project titles available in the Specification. Where a student is keen to complete a slightly different project title, centres **must** obtain confirmation of the suitability of the title from Edexcel **before** the student starts work.

The accuracy of marking, particularly from centres experienced in preparing candidates for this qualification was generally good, although a number of centres would benefit from looking closely at the exemplar pieces of marked work in the Coursework Guide when assessing the quality of students' observational work.

The use of PowerPoint slides to present information for one of the Graphical projects continues to result in generally poor marks for students. Centres should be aware that, in general, a linear sequence of text and images on an astronomical topic does not allow students access to the higher marks for Graphical work. In only a handful of examples did students use the capabilities of this program as the most effective way to present astronomical information. For example, one student produced an interconnected network of slides which allowed the user to explore the various evolutionary paths for stars of differing masses, thus allowing themselves access to the higher marks for Graphical work.

The Sundial project (List B2 No.2) illustrated a couple of important misconceptions amongst many candidates. Firstly, the gnomon of the dial should be aligned with the North Celestial Pole, not with the Earth's north magnetic pole. This can be achieved using the Pole Star or by combining the use of a magnetic compass with information from a local map. Candidates who present photographs showing the sundial aligned with needle of a compass will need to lose marks in the Testing/Use section accordingly. Secondly, when comparing the time shown by the sundial and that of a clock, candidates are expected to include the effect of the Equation of Time. The Moderators were a little concerned at the number of centres who had awarded full marks to the work of students who had not appreciated either of these important astronomical points.

The use of digital photography has now almost completely removed the need to send any large Graphical or Constructional items to the Moderator, with some centres entering all their work as a series of carefully labelled photographs/scans on a single CD. This improves the smoothness of the moderation process considerably and ensures that centres do not incur the now very substantial charges involved in unnecessarily sending items larger than A4 in size.

Unfortunately, a small number of centres were not able to provide their sample of coursework in time for the published deadline. In so doing, they unfairly put the prompt publication of their candidates' results at risk.

Grade Boundaries

The subject is graded out of a maximum of 160 subject marks.

	A*	A	B	C	D	E	F	G
Mark/160	125	104	83	62	51	41	31	21

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