Pearson

Examiner's Report
Principal Examiner Feedback

Summer 2018

Pearson Edexcel GCSE

In Astronomy (5AS01/01)

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Introduction

The Unit 1 examination paper required candidates to demonstrate knowledge and understanding of a wide range of astronomical phenomena by applying the Specification content in a range of unfamiliar situations.

As always, it was clear from the responses of candidates to this paper that many centres work very hard to ensure that their candidates are not only aware of the key astronomical principles within the Specification but also have a thorough understanding of them. This was clear in questions where students were asked to consider a new or unfamiliar situation, where candidates generally showed considerable flexibility and understanding. It is also clear that a number of centres ensure that their candidates are extremely well-informed on astronomical developments and discoveries. Given that GCSE Astronomy is often delivered as an extra-curricular activity, this is a great credit to those teaching the course.

In addition, this paper identified a number of areas where candidates' grasp of the GCSE Astronomy Specification can be improved, as detailed below.

Recall of Specification Content

Strengths – Many areas of the Specification were very accurately recalled by the majority of candidates. These included:

- **1** (Constellation of Ursa Major)
- **3** (Solar System)
- **5** (Solar features)
- **6** (Lunar features, despite the unusual orientation of the Moon's disc in 6a),
- **7** (Stellar Evolution),
- **10(a)** (Bayer Classification)
- **14(c)(ii)** (Cometary features).

Areas for Improvement – A few areas of the Specification were less accurately recalled by this year's cohort of candidates, including:

- **16(a)** (details of the difference between the sidereal and solar day).
- **15(b) & 18(c)** (These two items both identified a less than secure understanding of important observational technique, with very few candidates able to give adequately detailed descriptions).

Understanding of Specification Content

Strengths – Candidates were able to demonstrate a strong understanding of the astronomical concepts underlying many areas of the Specification, including:

- **4** (Orientation of Sun, Moon and Earth)
- **10(b)** (Conjunction)
- **13(d)** (Discovery of outer planets)
- **15(c)** (Eratosthenes' calculation of the circumference of the Earth, using modern data).

Areas for Improvement – Several questions identified topics which were not fully understood by a significant number of candidates, including:

- **Q8(b)** (**Zodiacal Constellations**)
  The majority of candidates provided answers which did not show an understanding of the meaning of the zodiacal band of constellations as those visited by the Sun on its annual journey along the ecliptic. Some candidates implied this through mention of the Moon or planets passing through the constellation of Sagittarius. Many simply recycled the question by stating that Sagittarius was in the zodiacal band. Almost no candidates drew attention to its celestial coordinates of around -23 ½° declination at 18h right ascension.
- **Q8(c)** (**Visibility of Zodiacal Constellations**)
  Perhaps following on from the issues identified in 8b, only a small number of candidates showed any understanding of the Sun's annual progress along the ecliptic and thus through the zodiacal constellations. Since Sagittarius is close to the Sun's position at the (northern) winter solstice, it will be 'behind' the Sun at this time. Consequently, it is best viewed when the Sun is on the opposite side of the Celestial Sphere i.e. at the (northern) summer solstice- around the month of June.
- **Q9(c)** (**Star Trails**)
  Although most candidates recalled that the Pole Star was not directly at the North Celestial Pole, a surprisingly small number were able to link this to the small curve which the star produced in the photograph. The idea that the Earth's rotation had caused the star to appear to move slightly during the lengthy exposure was not seen in many responses, suggesting that many candidates were perhaps not entirely sure how the star 'trails' in Figure 6 had been formed.
- **Q15(a)** (**Midday Sun in Egypt**)
  Although it was clear that almost all candidates were familiar with Eratosthenes' famous experiment, very few appreciated that the Sun never passes directly overhead in most of the country of Egypt. This perhaps explains why this event in southern Egypt would have been recorded and thus reached the attention of Eratosthenes in the north of the country. A number of candidates identified from Figure 9 that Syene is (with some artistic licence) close to the Tropic of Cancer but, as in

previous years, showed little appreciation of the astronomical significance of this.

- **Q20(a)** (**Evidence for the Big Bang Theory**)
  Despite several similar questions in recent years, very few candidates could provide specific evidence for the Universe beginning in a 'Big Bang', with almost all candidates citing evidence for the expansion of the universe instead.

Application of Specification Content

Strengths – Candidates were able to apply their astronomical understanding to a number of new or unfamiliar situations, including:

- **Q2**
  (Identifying astronomical objects from short descriptions)
- **Q12(a) & Q12(c)**
  (Use of Celestial Sphere to identify circumpolar objects)
- **Q18(a)**
  (Identification of Local Group galaxies).

Areas for Improvement – Several new or unfamiliar situations provided a significant test of candidates' ability to apply their understanding. In particular:

- **Q12(b) & Q12(d)** (**Identifying Non-Circumpolar Objects**)
  These two items caused the greatest difficulties for candidates who otherwise scored highly on question 12. Although most candidates could identify circumpolar and invisible objects, those in the intermediate 'rising and setting' region proved much more problematic.
- **Q14(b)** (**Sketching a Cometary Orbit**)
  Surprisingly few candidates were able to provide an ellipse with all three of the necessary features – high eccentricity, Sun at one focus and an aphelion between Uranus and Neptune.
- **Q18(b)** (**Non-Local Group Galaxy**)
  Although there were many excellent answers to question 18 (a) regarding the Andromeda galaxy, Virgo A's motion as a non-Local Group galaxy was much less widely understood. The balance between the expansion of the universe and local gravitational forces appeared in only a small number of answers.

Graphical and Analytical Skills

Strengths – Several questions identified strengths in candidates' graphical and analytical skills, including:

- **Q8(a)** (**Plotting Positons of Stars**)
  It was pleasing to see that most candidates were able to use the right ascension and declination system to identify the positions of several stars,

successfully negotiating the descending right ascension scale on the horizontal axis.

- **Q14(a)** (**Calculating Period of a Comet**)
  Most candidates appreciated that the comet's orbital period was related to the intervals between the years given in the question, thus gaining the first of the two marks available.
- **Q19(a)** (**Operating the Distance-Modulus Equation**)
  Despite the demands of functions such as logarithms, the majority of candidates were able to substitute values into the supplied equation in order to calculate an absolute magnitude.

Areas for Improvement – Other questions identified graphical and numerical skills which many candidate could improve:

- **Q8(a)** (**Plotting Positions of Stars**)
  Despite generally high scores for this graphical activity, a relatively small number of candidates scored full marks due to carelessness in the precise positioning of each star. Some candidates used large circles or crosses drawn with a blunt pencil or thick pen, which were obviously not consistent with full marks.
- **Q14(a)** (**Calculating Period of a Comet**)
  Although most candidates calculated the intervals between the supplied dates, significantly fewer saw the need to find their highest common factor.
- **Q19(b)** (**Calculating Absolute Magnitude**)
  Candidates' very low success on this question were in sharp contrast to their high success rates with part (a). Clearly, many candidates can operate the algorithm provided by the Distance Modulus equation, without a secure understanding of the link between brightness and distance or the relationship between brightness and magnitude, as required by the Specification.

Summary

Based on the results of this session's examination paper in GCSE Astronomy, the following formative summary points contain suggestions for improving the performance of candidates in the future.

- Ensuring that candidates spend a sufficient amount of time applying their knowledge and understanding in novel situations
- Drawing candidates' attention to the number of marks available for each item as this is always closely related to the points available on the Mark Scheme. On a number of questions, some candidates who clearly knew the correct answer wrote in insufficient depth to achieve full marks

- Encouraging candidates to use appropriate astronomical terms in their answers, as these always form part of the Mark Scheme in questions requiring extended written answers
- Ensuring that candidates set out their working to calculation questions in a clear and logical order so that partial credit can be given where appropriate
- Ensuring that candidates understand the astronomical principles behind the equations in the Specification, as well as being able to use them
- Reminding candidates to draw carefully and accurately when producing diagrams, labelling all key items with their correct astronomical terms.