Examiner's Report

Q1.

(i) Local Sidereal Time is equal to the right ascension of any object's on the observer's meridian. In this question it will therefore be equal to the right ascension of Aldebaran.

(ii) Since Local Sidereal Time starts when the First Point of Aries crosses the meridian it will also be equal to the hour angle of the First Point of Aries, giving the same answer as in part (i). Credit was given to candidates who had the wrong answer for (i) but had identical answers for parts (i) and (ii).

Q2.

This question provided an accessible but demanding test of candidates' ability to use their understanding of the Celestial Sphere to predict the visibility of various objects from differing locations on the Earth.

Most candidates were able to get at least two of the six cells correct and thus gain one mark. Fewer candidates were able to give the correct answers to all six cells and thus score full marks.

Q3.

The overall quality and clarity of the evaluation were the principal determinants of the mark awarded for this question, as set out in the Mark Scheme.

Once again, many candidates did not score as highly on the Mark Scheme as their answers contained only general points about producing accurate observations and did not focus on the specifics of the situation presented in the question.

A surprisingly small number of candidates noticed that the calculation of latitude presented in the question is incorrect. The astronomer has calculated the altitude of the Celestial Equator, which is equal to their co-latitude, not their altitude.

Evaluate the accuracy of the astronomer's value for his ship's latitude, based on the observational procedures he has used.

(6)

I think that the astronomers accuracy ~~could~~ should be improved because he measured Altitude of the sun every 15 minutes and so when he got his maximum value, there isn't enough data close enough to the value at 12:00 to be sure that the peak altitude of the sun that day was 42°. He should have recorded the altitude of the sun every 5 mins, which would have produced a much more accurate curve of best fit and so would have shown a better peak altitude. looking at the points either side of the peak altitude, you can ~~deduce that it~~ deduce that ~~would have~~ the Peak altitude of the sun would have occured after 12:00, therefore I think that his result of latitude is too low and that it should be higher. Also his Altitudes were measured to 2 significant figures, which could be improved to 3 sig

Results Plus: Examiner Comments

This candidate has identified one of the 'major inadequacies' of the astronomer's results and has 'linked it to a particular shortcoming of the method used' – characteristic of a Level 2 answer. The Level 2 status of the answer is strengthened by their use of 'relevant astronomical theory', along with feasible suggestions for improvement.

The candidate could have gone on to explore other issues with the latitude calculation.

Q4. No Examiner's Report available for this question

Q5. No Examiner's Report available for this question

Q6. No Examiner's Report available for this question

Q7.

The calculation which would yield Aldebaran's declination was less obvious from the data in the question, making this question rather more difficult.

Rome's co-latitude (48°N) gives the altitude of the Celestial Equator on the meridian. For Aldebaran to have an altitude of 64° 30' it must therefore lie 64° 30' – 48° = 16° 30' above the Celestial Equator.

The angles in this question are probably best represented in a diagram as distances up the observer's meridian. Many candidates had great difficulty drawing a convincing diagram of the situation.

The astronomer waits until Aldebaran is due south and measures its angle above the horizon as 64° 30′.

Show that Aldebaran has a declination (Dec) of 16° 30′.

Use the observational data given above.

Include a carefully labelled diagram in your answer.

(2)

Altitude – latitude which Aldebaran would culminate = declination

64°30' – 48 = 16° 30'

Results Plus: Examiner Comments

Although this candidate has not given the correct relationship between altitude, latitude and declination in this case, they have correctly used Rome's co-declination to produce the correct declination. This response therefore scored one mark out of two.

Q8.

A large number of candidates spotted that Aldebaran's right ascension can be obtained by subtracting its hour angle from the local sidereal time and thus gained the first mark in this question. However, only a small proportion of these candidates were able to give an astronomical reason for this and even fewer could provide a clearly labelled diagram to illustrate it.

Drawing diagrams to illustrate quantities such as hour angle and right ascension is not straightforward and is clearly a skill which future candidates would be well advised to practise beforehand. As the examples below show, even the highest scoring candidates had some

difficulty achieving this third mark.

Candidates are advised to ensure that they have labelled all relevant parts of their diagrams such as the observer's horizon and meridian, Aldebaran's hour circles and position of the First point of Aries. All angular distances between these items should then be clearly and unambiguously marked so that the relationships between them are firmly established.

Judging by the efforts of candidates this year, trying to draw diagrams such as these in '3-D' is probably best avoided. Imagining the area of sky above the horizon either side of the observer's meridian as a large sheet of graph paper is probably the best technique in questions of this kind.

An astronomer observing from Rome sees the star Aldebaran setting. The local sidereal time (LST) is 10:42 and the star's hour angle (HA) is 06h 06min.

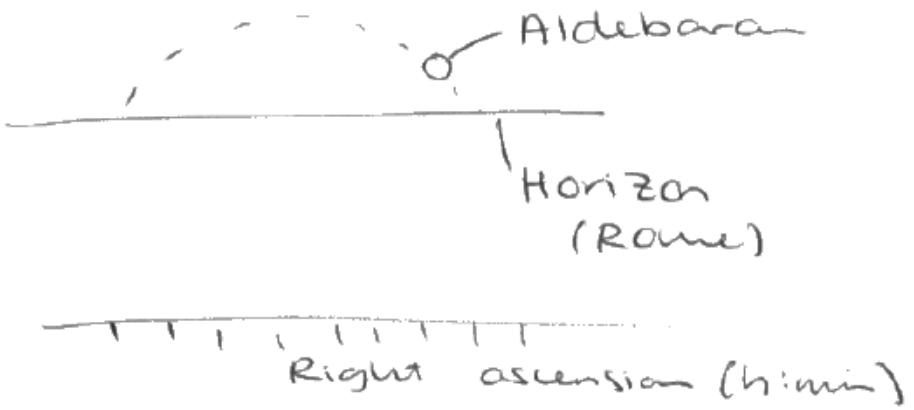
Rome has a latitude of 42°N and a longitude of 12°30′E.

Show that Aldebaran has a right ascension (RA) of 04h 36min.

Use the observational data given above.

Include a carefully labelled diagram in your answer.

(3)



Hour Angle = LST − RA

= 10:42 − RA

RA = 10:42 − 06:06

= 04:36 → 04h 36 min

Results Plus: Examiner Comments

In common with the work of many candidates on this question, this response shows the correct relationship between LST, HA and RA and has used it to produce the correct Right Ascension for Aldebaran. However, the diagram (required by the question) does not show how these three angles relate to each other.