

Mark Scheme (Results)

Summer 2013

GCSE Astronomy (5AS01)  
Paper 01

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

### Placing a mark within a level mark band

- The instructions below tell you how to reward responses within a level. Follow these unless there is an instruction given within a level. However, where a level has specific guidance about how to place an answer within a level, **always** follow that guidance.
- **2 mark bands**  
Start with the presumption that the mark will be the higher of the two.  
An answer which is poorly supported gets the lower mark.
- **3 mark bands**  
Start with a presumption that the mark will be the middle of the three.  
An answer which is poorly supported gets the lower mark.  
An answer which is well supported gets the higher mark.
- **4 mark bands**  
Start with a presumption that the mark will be the upper middle mark of the four.  
An answer which is poorly supported gets a lower mark.  
An answer which is well supported and shows depth or breadth of coverage gets the higher mark.

- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

*i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*

*ii) select and use a form and style of writing appropriate to purpose and to complex subject matter*

*iii) organise information clearly and coherently, using specialist vocabulary when appropriate.*

Question Number	Answer	Mark
<b>1(a) (i)</b>	B North	<b>1</b>

Question Number	Answer	Mark
<b>1(a) (ii)</b>	D Zodiacal Band	<b>1</b>

Question Number	Answer	Reject	Mark
<b>1(a) (iii)</b>	Any one of: <ul style="list-style-type: none"> <li>• newspaper</li> <li>• astronomical magazine</li> <li>• planisphere</li> <li>• star chart</li> <li>• sky map</li> </ul>	<ul style="list-style-type: none"> <li>• internet</li> <li>• mobile phone</li> <li>• computer</li> <li>• laptop</li> <li>• app</li> <li>• any other electronic gizmo!</li> <li>• book/astro. book</li> </ul>	<b>1</b>

Question Number	Answer	Mark
<b>1(b)</b>	C Their eyes could remain dark-adapted	<b>1</b>

Question Number	Answer	Mark
<b>1(c)</b>	B Cygnus	<b>1</b>

Question Number	Answer	Mark
<b>2(a) (i)</b>	A Neptune	<b>1</b>

Question Number	Answer	Mark
<b>2(a) (ii)</b>	A Ceres	<b>1</b>

Question Number	Answer	Mark
<b>2(a) (iii)</b>	B Jupiter	<b>1</b>

Question Number	Answer	Mark
<b>2(a) (iv)</b>	A Mars and Jupiter	<b>1</b>

Question Number	Answer	Mark
<b>2(a) (v)</b>	B Jupiter and Neptune	<b>1</b>

Question Number	Answer	Mark
<b>2(b) (i)</b>	D Uranus	<b>1</b>

Question Number	Answer	Mark
<b>2(b) (ii)</b>	C Pluto	<b>1</b>

Question Number	Answer	Mark
<b>3(a) (i)</b>	B Fomalhaut	<b>1</b>

Question Number	Answer	Mark
<b>3(a) (ii)</b>	X close to and to the right of 'top' star (no further away than the star below)	<b>1</b>

Question Number	Answer	Mark
<b>3(b) (i)</b>	Orion drawn correctly (must have at least 7 stars).	<b>1</b>
	Orion drawn in correct place i.e. Belt stars pointing to Aldebaran.	<b>1</b>
	No ecf if Orion drawn incorrectly.	<b>(2)</b>

Question Number	Answer	Mark
<b>3(b) (ii)</b>	P drawn up and to the right of Aldebaran	<b>1</b>

Question Number	Answer	Mark
<b>3(c)</b>	Any one of the following: <ul style="list-style-type: none"> <li>• fuzzy appearance</li> <li>• faint (blue in colour)</li> <li>• a few bright stars visible</li> <li>• patch of many stars</li> </ul>	<b>1</b>

Question Number	Answer	Mark
<b>4(a)</b>	D The Moon's phase cycle	<b>1</b>

Question Number	Answer	Mark
<b>4(b)</b>	4 (minutes)	<b>1</b>

Question Number	Answer	Mark
<b>4(c)</b>	B corona	<b>1</b>

Question Number	Answer	Mark
<b>4(d)</b>	5800 K (allow 5600 K – 6000 K) or 5600 degree C (allow 5400 – 5800) MUST have correct unit.	<b>1</b>

Question Number	Answer	Mark
<b>4(e)</b>	<b>C</b> June	<b>1</b>

Question Number	Answer	Mark
<b>4(f)</b>	June	<b>1</b>



Question Number	Answer	Mark
<b>5(a) (i)</b>	(waxing) <u>gibbous</u>	<b>1</b>

Question Number	Answer	Mark
<b>5(a) (ii)</b>	10 (days) Allow 8 – 12 inclusive	<b>1</b>

Question Number	Answer	Mark
<b>5(a) (iii)</b>	Gibbous waning Moon sketched	<b>1</b>

Question Number	Answer	Mark
<b>5(b)</b>	Full	<b>1</b>
	Orange/copper/red/brown (or combinations of)	<b>1</b> <b>(2)</b>

Question Number	Answer	Mark
<b>5(c)</b>	Any one of the following: <ul style="list-style-type: none"> <li>• Earth's shadow larger (than Moon's)</li> <li>• Moon's shadow smaller (than Earth's)</li> <li>• Moon is more likely to be in Earth's shadow</li> <li>• Moon is smaller than Earth</li> <li>• Earth is larger than Moon</li> </ul> (Answer basically compares sizes) Reject 'more common'	<b>1</b>

Question Number	Answer	Mark
<b>6(a)</b>	Faint/fuzzy/indistinct	<b>1</b>
	Band/arch of light stretching across the sky	<b>1</b>
		<b>(2)</b>

Question Number	Answer	Mark
<b>6(b)</b>	Any different two of the following:	<b>2 x 1</b>
	<ul style="list-style-type: none"> <li>• any form of light eg street lights</li> <li>• the Moon</li> <li>• aurora</li> <li>• bonfire</li> </ul>	
	Reject: torch, phone, lamp post, city, fire	<b>(2)</b>

Question Number	Answer	Mark
<b>7(a) (i)</b>	53°N Allow +53°  Must have some indication of northern hemisphere (N or +), but ignore missing degree symbol	<b>1</b>
<b>7(a) (ii)</b>	48°  Ignore N, +, or lack of degree symbol  No ecf	<b>1</b>

Question Number	Answer	Mark
<b>7(b)</b>	Diagram showing Polaris as a dot and at least one arc  Correct explanation in terms of measuring angles...  ...and time exposure (last 2 points could be written in an equation).  Reject 24h observations or 'tracking' stars	<b>1</b>  <b>1</b>  <b>1</b>  <b>(3)</b>

Question Number	Answer	Mark
<b>8(a)</b>	<p>Space probe (not necessarily named)...  ...visiting comet and analysing water ('grabbing material')...  ...to compare isotopes/composition/elements with those found on Earth</p> <p>QWC Clarity of expression (reads well)</p>	<p><b>1</b></p> <p><b>1 (dependent on 1<sup>st</sup> mark)</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>(4)</b></p>

Question Number	Answer	Mark
<b>8(b)</b>	<p>Any two of the following examples up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>• number of stars in the galaxy</li> <li>• fraction of stars with planetary systems</li> <li>• fraction of planets capable of sustaining life</li> <li>• fraction of life forms that are intelligent</li> <li>• fraction of intelligent life-forms that wish to communicate</li> <li>• fraction of a planet's lifetime during which civilisations can live</li> </ul> <p>or words to that effect (accept number instead of fraction)</p> <p>NB Must be <u>numerical</u> (fraction, number, probability, chance etc)</p> <p style="text-align: right;">(2 x 1)</p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>(2)</b></p>

Question Number	Answer	Mark
<b>9(a) (i)</b>	11 years (allow 10 – 12 years)	<b>1</b>

Question Number	Answer	Mark
<b>9(a) (ii)</b>	1981 (allow 1979 – 1983)	<b>1</b>

Question Number	Answer	Mark
<b>9(a) (iii)</b>	In the range of 20 – 35 degrees (inclusive) Allow negative values.	<b>1</b>

Question Number	Answer	Mark
<b>9(b) (i)</b>	Any one of the following: <ul style="list-style-type: none"> <li>• electron</li> <li>• proton</li> <li>• ion</li> <li>• alpha particle</li> <li>• nucleus</li> <li>• etc.</li> </ul>	<b>1</b>

Question Number	Answer	Mark
<b>9(b) (ii)</b>	charged particles <u>excite/ionise/react with atoms/molecules/particles</u> in atmosphere (1)  which de-excite/fluoresce <u>emitting light</u> (1)	<b>2</b>

Question Number	Answer	Mark
<b>10(a) (i)</b>	C labelled on Mars' orbit at '3 o'clock	<b>1</b>

Question Number	Answer	Mark
<b>10(a) (ii)</b>	O labelled on Mars' orbit at '9 o'clock	<b>1</b>

Question Number	Answer	Mark
<b>10(b) (i)</b>	1.8(37) (1) (ignore SF)  years (1)	<b>2</b>

Question Number	Answer	Mark
<b>10(b) (ii)</b>	0.5 (AU)	<b>1</b>

Question Number	Answer	Mark
<b>10(b) (iii)</b>	Any one of the following: <ul style="list-style-type: none"> <li>• closest to Earth</li> <li>• fully-illuminated by Sun / Sun is 'facing' Mars</li> <li>• opposite the Sun in the sky</li> <li>• largest angular size/diameter</li> <li>• visible for most of night</li> <li>• etc.</li> </ul>	<b>1</b>

Question Number	Answer	Mark
<b>11(a)</b>	6.25	<b>1</b>

Question Number	Answer	Mark
<b>11(b)</b>	$\delta$ (delta)	<b>1</b>

Question Number	Answer	Mark
<b>11(c) (i)</b>	$\gamma$ (gamma) Allow Y	<b>1</b>

Question Number	Answer	Mark
<b>11(c) (ii)</b>	$\varepsilon$ (epsilon) Reject K	<b>1</b>

Question Number	Answer	Mark
<b>11(c) (iii)</b>	$\gamma$ (gamma) Allow Y	<b>1</b>

Question Number	Answer	Mark
<b>12(a) (i)</b>	X coma	<b>1</b>
	Y ion tail/gas tail	<b>1</b>
	Z dust tail	<b>1</b>
		<b>(3)</b>

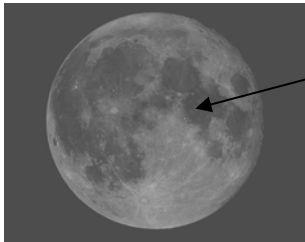
Question Number	Answer	Mark
<b>12(a) (ii)</b>	Oort Cloud (any spelling)	<b>1</b>

Question Number	Answer	Mark
<b>12(a) (iii)</b>	Dust particles spread out due to independent orbits (allow reference to comets curved path or solar radiation pressure)  Reject 'points away from the Sun'	<b>1</b>

Question Number	Answer	Mark
<b>12(b)</b>	4.8 (AU)	<b>2</b>
	or	<b>or</b>
	0.3 (AU) – i.e. distance factor of 4 but wrong way	<b>1</b>
		<b>(2)</b>



Question Number	Answer	Reject	Mark
<b>13(a)</b>	<p>Any two of the following examples up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>• study of <u>solar</u> wind</li> <li>• study of moonquakes</li> <li>• monitor Earth-Moon distance</li> <li>• study Moon's magnetic field</li> <li>• study of lunar gravity</li> <li>• detect presence of micrometeorites</li> <li>• testing for an atmosphere</li> </ul> <p>(2 x 1)</p>	<p>search for life</p> <p>analyse soil</p> <p>environment</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>13(b)</b>	<p>One sea only labelled</p> 	<b>1</b>

Question Number	Answer	Reject	Mark
<b>13(c)</b>	<p>Any two of the following examples up to a maximum of two marks:</p> <ul style="list-style-type: none"> <li>• collision between Earth and Mars-sized object</li> <li>• early in formation of Solar System</li> <li>• merging and melting of Earth/impactor (Theia)</li> <li>• debris ejected and condensed</li> <li>• etc</li> </ul> <p>(2 x 1)</p> <p>OWC (Capital letters, full stops i.e. proper sentences)</p> <p>1</p>		<b>(3)</b>

Question Number	Answer	Mark
<b>14(a) (i)</b>	C Edwin Hubble	<b>1</b>

Question Number	Answer	Mark
<b>14 (a) (ii)</b>	Any of: E4, E5, E6 or E7	<b>1</b>
	Sa and Sc labelled at top of diagram in that order	<b>1</b>
	SBa, SBb and SBc labelled at bottom in that order	<b>1</b>
		<b>(3)</b>

Question Number	Answer	Mark
<b>14 (a) (iii)</b>	Irregular (allow lenticular, SO)	<b>1</b>

Question Number	Answer	Mark
<b>14(b) (i)</b>	barred spiral (accept SB etc)	<b>1</b>

Question Number	Answer	Mark
<b>14(b) (ii)</b>	elliptical (accept E1, E2 etc)	<b>1</b>

Question Number	Answer	Mark
<b>15(a) (i)</b>	Ultraviolet (UV)	<b>1</b>

Question Number	Answer	Mark
<b>15(a) (ii)</b>	any one of:  visible radio Infrared (IR)  Reject: Microwave	<b>1</b>

Question Number	Answer	Mark
<b>15(b) (i)</b>	any one of:  ozone/O <sub>3</sub> oxygen/O <sub>2</sub>	<b>1</b>

Question Number	Answer	Mark
<b>15(b) (ii)</b>	any one of:  carbon dioxide (CO <sub>2</sub> ) water (vapour) (H <sub>2</sub> O) methane (CH <sub>4</sub> )	<b>1</b>

Question Number	Answer	Mark
<b>15(c)</b>	any two of:  instruments on spacecraft (Explorer 1/Pioneer 3) discovered by Geiger counter in 1958 etc.	<b>2</b>

Question Number	Answer	Mark
<b>16(a) (i)</b>	$\varepsilon$	<b>1</b>

Question Number	Answer	Mark
<b>16 (a) (ii)</b>	$\varepsilon$	<b>1</b>

Question Number	Answer	Mark
<b>16 (b) (i)</b>	any one of:  star reaches highest altitude/elevation/point in its path is due south crosses observer's meridian	<b>1</b>

Question Number	Answer	Mark
<b>16 (b) (ii)</b>	19:48	<b>1</b>

Question Number	Answer	Mark
<b>16 (b) (iii)</b>	19:44	<b>2</b>
	allow 20:16 (correct working out of 16 min but added not subtracted)	<b>1</b>  <b>(2)</b>

Question Number	Answer	Mark
<b>17(a)</b>	any one of: <ul style="list-style-type: none"> <li>• astrometry</li> <li>• transit method</li> <li>• radial velocity (Doppler shift) method.</li> <li>• Micro (gravitational) lensing</li> <li>• direct observation</li> </ul> correct description related to named method: <ul style="list-style-type: none"> <li>• one valid point</li> <li>• second valid point</li> </ul>	 <b>1</b>  <b>1</b>  <b>1</b>  <b>(3)</b>

Question Number	Answer	Mark
<b>17(b)</b>	Diagram showing star and Zone (range of distances from star)  <u>Temperature</u> range correct... ...to allow <u>liquid water</u> to exist	 <b>1</b>  <b>1</b>  <b>1</b>  <b>(3)</b>

Question Number	Answer	Mark
<b>18(a)</b>	<p>one of:</p> <ul style="list-style-type: none"> <li>• CMB</li> <li>• relative abundances of light elements</li> <li>• existence of QSO's</li> </ul> <p>correct explanation related to named method:</p> <ul style="list-style-type: none"> <li>• temp. during BB has cooled to 3K</li> <li>• observations match theory</li> <li>• early Universe very different from current universe</li> </ul> <p>reject any reference to Doppler/Red shift/Hubble expansion</p>	<p><b>1</b></p> <p><b>1 (dependent on first mark)</b></p> <p><b>(2)</b></p>

Question Number	Answer	Mark
<b>18(b)</b>	<p>any one of:</p> <ul style="list-style-type: none"> <li>• Steady State</li> <li>• Cyclic/oscillating</li> </ul> <p>etc</p> <p>correct description related to named method</p> <p>QWC Clarity of expression (reads well)</p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>1</b></p> <p><b>(3)</b></p>

Question Number	Answer	Mark
<b>18(c)</b>	<p>Dark Matter: could slow down the expansion of the Universe / future closed Universe / Big Crunch</p> <p>Dark Energy: introduced to explain why Universe appears to be accelerating / future open Universe / Big Rip</p>	<p><b>1</b></p> <p><b>1</b></p> <p><b>(2)</b></p>

Question Number	Answer	Mark
<b>19(a)</b>	<u>change</u> in wavelength/frequency (of waves)...	<b>1</b>
	...due to relative <u>motion</u> between source and observer	<b>1</b> <b>(2)</b>

Question Number	Answer	Mark
<b>19(b)</b>	100 000 / 100 000 000	<b>2</b>
	km/s / m/s	<b>1</b>
	allow c/3 for three marks	<b>(3)</b>
	or some attempt at calculation giving 75 000 km/s	<b>1</b> <b>1</b>
	allow c/4 for two marks	
	or some attempt at correct substitution $\frac{680 - 510}{510}$	<b>1</b>
	km/s	<b>1</b>

Question Number	Answer	Mark
<b>19(c)</b>	2000	<b>2</b>
	Mpc	<b>1</b>
	Mpc alone does score one	<b>1</b> <b>(3)</b>

Question Number	Answer	Mark
<b>20(a) (i)</b>	10 pc (unit must be included)	<b>1</b>

Question Number	Answer	Mark
<b>20(a) (ii)</b>	larger (than 1.8)	<b>1</b>

Question Number	Answer	Mark
<b>20(b)</b>	(+)2.7	<b>3</b>
	or -3.3	<b>2</b>
	or some attempt to use inverse square law i.e. is 16 times fainter	<b>1</b>
		<b>(3)</b>





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