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Mark Scheme (Results)

Summer 2014

GCSE Astronomy (5AS01/01)
Unit 1: Understanding the Universe

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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.

- 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

Question Number	Answer	Reject	Mark
1(a)	The Plough / Big Dipper / Charles' Wain / Saucepan / Question Mark	Great Bear Ursa Major	**1**

Question Number	Answer	Mark
1(b)	C Polaris	**1**

Question Number	Answer	Mark
1(c)	B Double Star	**1**

Question Number	Answer	Mark
1(d)	A circumpolar stars	**1**

Question Number	Answer	Mark
2 (a)	D Saturn	**1**

Question Number	Answer	Mark
2 (b)	A Jupiter	**1**

Question Number	Answer	Mark
2 (c)	A 1 AU	**1**

Question Number	Answer	Mark
2 (d)	A Ceres	**1**

Question Number	Answer	Mark
2 (e)	B Kuiper Belt	**1**

Question Number	Answer	Mark
2 (f)	D Zodiacal Band	**1**

Question Number	Answer	Mark
3 (a)	D Spiral	**1**

Question Number	Answer	Mark
3 (b)	D NGC 4151, a Seyfert galaxy	**1**

Question Number	Answer	Mark
3 (c)	A 3C 273, a quasar	**1**

Question Number	Answer	Mark
3 (d)	C a super-massive black hole	**1**

Question Number	Answer	Mark
3 (e)	redshift	**1**

Question Number	Answer	Mark
4 (a)	C 29.5 days	**1**

Question Number	Answer	Mark
4 (b)	Moon drawn as more than semi-circle i.e. more than half-full, but less than full Accept either waning or waxing Moon.	**1**

Question Number	Answer	Mark
4 (c)	B South Pole	**1**

Question Number	Answer	Mark
4 (d)	Corona Accept: prominence(s) and chromosphere	**1**

Question Number	Answer	Mark
4 (e)	Earth (observer), Moon and Sun drawn with Sun bigger than Moon (1) Indication of similar angles for Moon and Sun (1)	**2**

Question Number	Answer	Mark
5 (a) (i)	White Dwarf	**1**

Question Number	Answer	Mark
5 (a) (ii)	(Much) smaller Accept: The Sun is bigger (than the star)	**1**

Question Number	Answer	Mark
5 (a) (iii)	Death / post-Main Sequence Anything to suggest that the star is 'dying'	**1**

Question Number	Answer	Mark
5 (b)	Birth / star formation / pre-Main Sequence Anything to suggest that the star is 'forming'	**1**

Question Number	Answer	Mark
5 (c) (i)	radio	**1**

Question Number	Answer	Mark
5 (c) (ii)	X-rays	**1**

Question Number	Answer	Mark
6 (a) (i)	Seas / sea / maria / mare Reject: oceans	**1**

Question Number	Answer	Mark
6 (a) (ii)	Highlands / terrae / terra Reject: Mountains / hills / craters	**1**

Question Number	Answer	Mark
6 (b)	Fewer craters (in dark grey areas) / More craters in light grey areas	**1**

Question Number	Answer	Reject	Mark
6 (c)	Low gravity / mass / Weak gravitational field	No / zero gravity Moon is too small	**1**

Question Number	Answer	Mark
6 (d) (i)	Narrow trenches / grooves / collapsed lava tube accept any other valid description	**1**

Question Number	Answer	Mark
6 (d) (ii)	wrinkle ridges are longer / wider / higher / above the surface accept any other valid description **Insufficient**: bigger / larger / smaller	**1**

Question Number	Answer	Mark
7 (a)	A Copernicus	**1**

Question Number	Answer	Mark
7 (b)	Any 2 of: Changing phases of Venus Changing 'size' of Venus Moons of Jupiter Galilean moons	**2**

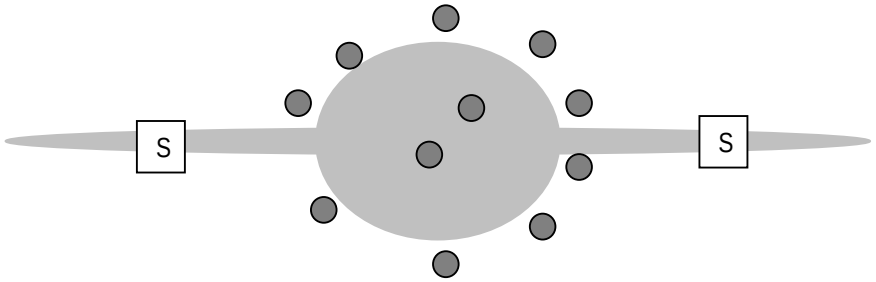
Question Number	Answer	Mark
7 (c)	(Isaac) Newton	**1**

Question Number	Answer	Mark
8 (a)	To maintain dark-adapted eyes accept any other valid answers	**1**

Question Number	Answer	Mark
8 (b)	Any 2 of: Which constellations/stars/nebulae visible Location of constellations/stars/nebulae etc <u>in sky</u> Times of culmination of constellations/stars/nebulae etc **Reject**: reference to planets / comets / Moon / objects	**2**

Question Number	Answer	Mark
8 (c)	Any 2 of: Nebulae (any type) Galaxies (any type) Open Clusters Globular Clusters Must be different types	**2**

Question Number	Answer	Mark
9 (a) (i)	S shown in either position, about 2/3 out from centre (see below)	**1**



Question Number	Answer	Mark
9 (a) (ii)	About 10 small circles showing GCs (see above) not all inside bulge and fairly symmetrical	**1**

Question Number	Answer	Mark
9 (b)	C 30 kpc	**1**

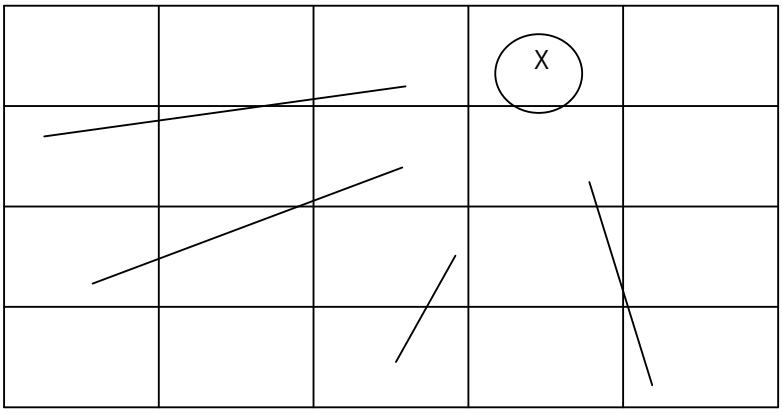
Question Number	Answer	Mark
9 (c) (i)	Disc / spiral arms	**1**

Question Number	Answer	Mark
9 (c) (ii)	Disc / spiral arms	**1**

Question Number	Answer	Mark
9 (d) (i)	A radio waves	**1**

Question Number	Answer	Mark
9 (d) (ii)	Vis. light is unable to penetrate dust / vis.light is absorbed by dust	**1**

Question Number	Answer	Mark
10 (a) (i)	X shown at radiant (see below) i.e. within circle	**1**



Question Number	Answer	Mark
10 (a) (ii)	Radiant is / appears in the constellation Perseus	**1**

Question Number	Answer	Mark
10 (a) (iii)	Earth intercepts (cometary) debris (1) in the same place (1) each year, in its orbit around the Sun	**2**

Question Number	Answer	Mark
10 (b) (i)	PHO in solar orbit (PHO and Sun labelled) 1 Orbit comes close to Earth /intersects orbit of Earth 1	**2**

Question Number	Answer	Mark
10 (b) (ii)	To predict if an impact / collision with the Earth is likely A description of harmful effects is insufficient	**1**

Question Number	Answer	Mark
11 (a) (i)	In space / on a satellite / above the atmosphere	**1**

Question Number	Answer	Mark
11 (a) (ii)	Strong X-ray emitters / very high temperature / site of solar flare / site of strong magnetic storm Reject: hot / sunspot accept any other valid answers	**1**

Question Number	Answer	Mark
11 (b) (i)	Better contrast / shows ionised hydrogen / shows the chromosphere / reduces brightness accept any other valid answers	**1**

Question Number	Answer	Mark
11 (b) (ii)	Any one of: Filaments Prominences Plages Spicules etc	**1**

Question Number	Answer	Mark
12 (a) (i)	Large distances (1) cause severe time delays (1)	**2**

Question Number	Answer	Mark
12 (a) (ii)	Any 2 of: Brittle bones Muscle fatigue Sickness Boredom Exposure to solar radiation Meteroid strike accept any other valid answers Reject: run out of food / fuel / water / air	**2**

Question Number	Answer	Mark
12 (a) (iii)	Any one of: high temperature high pressure atmosphere highly corrosive	**1**

Question Number	Answer	Mark
12 (b)	send a probe (1) anyone of: analysis of atmosphere / soil / rocks / particles / spectra / water (liquid) accept any other valid answers *QWC i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*	**3**

Question Number	Answer	Mark
13 (a)	Label and unit on vertical axis and suitable scales used 1 Points plotted correctly (check 2 of them) 1 Smooth curve through points 1	**3**

Question Number	Answer	Mark
13 (b)	Bottom of curve indicated Correct local noon time read off (12:04)	**2**

Question Number	Answer	Mark
13 (c)	EOT used to give AST = 12:06 1 6 min 'late' corresponds to 1.5^{o} 1 West 1	**3**

Question Number	Answer	Mark
14 (a)	C 13 000 km	**1**

Question Number	Answer	Mark
14 (b)	Any 2 of: Images from space Shadow of Earth during partial lunar eclipse Satellite orbits Ships disappear over horizon etc.	**2**

Question Number	Answer	Mark
14 (c)	Idea of using shadows / solar angles (or lack of them) at two different places 1 Difference in angles /shadow lengths corresponds to distance between 2 locations 1 Extrapolation to a complete circle 1	**3**

Question Number	Answer	Mark
15 (a)	Mercury Venus	**1**

Question Number	Answer	Mark
15 (b)	*Any 1 of:* Relatively thin / few km thick Not solid structure, i.e. lumps of rock, ice, sand, dust or <u>fragments</u> of larger bodies such as asteroids. 1 *Any 1 of:* rock / ice Frozen gases Frozen named gas 1	**2**

Question Number	Answer	Mark
15 (c)	Martian moons are captured asteroids Neptunian moons captured KBO's	**2**

Question Number	Answer	Mark
16 (a)	Any 2 valid points: In 1965 Penzias & Wilson Using Horn antenna Accidently discovered constant' hiss'/noise …at all times …from all areas of sky 2 QWC *ii) select and use a form and style of writing appropriate to purpose and to complex subject matter* 1	**3**

Question Number	Answer	Mark
16 (b) (i)	To study 'ripples' or variations in CMB in more detail .	**1**

Question Number	Answer	Mark
16 (b) (ii)	Refine models of early Universe eg Big Bang Estimate the contributions / proportions of dark matter / dark energy	**1** **1**

Question Number	Answer	Mark
17 (a)	The distance to a star which has a parallax angle of 1 arc second. Correct definition, formally stated (2) OR…attempt including one of: parallax angle (1) one second of arc (1) OR…attempt including one of: Earth-Sun distance subtends (1) One second of arc (1)	**2**

Question Number	Answer	Mark
17 (b) (i)	Diagram showing Earth – Sun baseline 1 nearby star and distant stars 1 Parallax angle correctly shown or described 1	**3**

Question Number	Answer	Mark
17 (b) (ii)	Only nearby stars have a large enough (parallax) angle / apparent movement to be determined / measured accurately.	**1**

Question Number	Answer	Mark
17 (c)	m = 8.0 (2 marks) m = -22 or use of log(d) = 7 (1 mark)	**2**

Question Number	Answer	Mark
18 (a)	Large triangle shown 1 H = 57 (allow range 55 – 59) 2 sig figs given (allow ecf) correct unit: km / s / Mpc (allow ecf)	**4**

Question Number	Answer	Mark
18 (b)	D Age of the Universe	**1**

Question Number	Answer	Mark
19 (a)	*Any 3 of:* Temperature Chemical Composition Radial Velocity magnetic strength of star rotation rate existence of companions / exoplanets variability Size Magnitude Spectral type Redshift Age Luminosity	**3**

Question Number	Answer	Mark
19 (b)	Astronomers compare the relative strength of H, He and metals 1 Relative amounts relate to O, B, A etc 1 *QWC iii) organise information clearly and coherently, using specialist vocabulary when appropriate.* 1	**3**

Question Number	Answer	Mark
20 (a)	A declination	**1**

Question Number	Answer	Mark
20 (b) (i)	order of relative brightness of stars in the constellation	**1**

Question Number	Answer	Mark
20 (b) (ii)	Shows motion / path of the Sun (over the course of one year)	**1**

Question Number	Answer	Mark
20 (b) (iii)	S shown at 0 h, 0^{o}	**1**

Question Number	Answer	Mark
20 (c) (i)	01:36 01:04 or use of 16 minutes scores 1 mark (for 'working')	**2**

Question Number	Answer		Mark
20 (c) (ii)	3 (degrees) north / N	1 mark 1 mark	**2**

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