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Mark Scheme (Results)

Summer 2012

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.
- 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
1(a)	**C** - Mercury	**1**

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

Question Number	Answer	Mark
1(c)	**C** - Saturn	**1**

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

Question Number	Answer	Mark
1(e)	Mars	**1**

Question Number	Answer	Mark
1(f)	Uranus	**1**

Question Number	Answer	Mark
2(a) (i)	Orion	**1**

Question Number	Answer	Mark
2(a) (ii)	(Orion's) Belt	**1**

Question Number	Answer	Mark
2(a) (iii)	Sirius Aldebaran either star for **1** mark	**1**

Question Number	Answer	Do NOT Accept	Mark
2(b) (i)	Any one of: The Plough Big Dipper Charles's Wain Saucepan Question Mark	Great Bear Big Bear Small Bear Ursa Major Ursa Minor	**1**

Question Number	Answer	Mark
2(b) (ii)	X and Y must have both (could be Y and X)	**1**

Question Number	Answer	Mark
2(b) (iii)	arrow drawn close to (3) stars in the 'handle' pointing left or 'arcing' to Arcturus	**1**

Question Number	Answer	Mark
3(a)	**B** - Elliptical	**1**

Question Number	Answer	Mark
3(b)	**D** - Spiral	**1**

Question Number	Answer	Mark
3(c)	**D** - Tuning Fork Diagram	**1**

Question Number	Answer	Mark
3(d) (i)	(Small) group of galaxies close to our own / gravitationally bound to / attracted to ours Must include or imply galaxies and close to ours	**1**

Question Number	Answer	Mark
3(d) (ii)	**C** - The Andromeda Galaxy is moving towards the Milky Way	**1**

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

Question Number	Answer	Mark
4(b)	**D** - 380 000 km	**1**

Question Number	Answer	Mark
4(c)	**B** - 5800 K	**1**

Question Number	Answer	Mark
4(d)	**B** - 4 min	**1**

Question Number	Answer	Mark
4(e)	**A** - 27.3 days and 27.3 days	**1**

Question Number	Answer	Mark
5(a) (i)	**S** drawn on Moon's orbit at '9 o'clock'	**1**
5(a) (ii)	**F** drawn on Moon's orbit at '3 o'clock'	**1**

Question Number	Answer	Mark
5(b)	Disc drawn with circular 'cut out' (with a 'bite'). Allow blank or shaded (Sun). Allow drawing/sketch of annular eclipse. (implied) Moon should be same size as Sun or slightly smaller. Ignore any corona or prominences drawn.	**1**

Question Number	Answer	Reject	Mark
5(c)	Any two of the following descriptions up to a maximum of two marks: • full Moon • red/orange/copper coloured • dimly lit / faint / darker • (sometimes) appears slightly larger (2 x 1)	Corona visible Dark Black Invisible WATCH OUT FOR THESE !	**(2)**

Question Number	Answer	Mark
6(a) (i)	main sequence	**1**
6(a) (ii)	**D** - temperature	**1** **(2)**

Question Number	Answer	Mark
6(b) (i)	R on top right of diagram (within K or M) - be generous as to exact position and allow 'on the line')	**1**
6(b) (ii)	W on bottom left of diagram within O or B (be generous again)	**1** **(2)**

Question Number	Answer	Mark
6(c)	neutron star black hole If more than 2 circled, -1 from total for each 'additional' type of object	**1** **1** **(2)**

Question Number	Answer	Mark
6(d)	use <u>radio</u> telescopes/ receive <u>radio</u> waves... ...in regular <u>bursts/pulses</u> Allow 1 mark only for 'as pulsars'	**1** **1** **(2)**

Question Number	Answer	Mark
7(a)	**B** - Fireball	**1**

Question Number	Answer	Mark
7(b)	**C** - Oort Cloud	**1**

Question Number	Answer	Mark
7(c)	Asteroids/solid bodies that come relatively close to Earth/could strike Earth (not necessary to give an 'official' distance)	**1**

Question Number	Answer	Mark
7(d)	Collision with Earth could cause devastation/ serious climatic change/ threaten life on Earth. Be generous, but don't accept 'they could kill you'.	**1**

Question Number	Answer	Mark
7(e)	25 (2 marks) allow 1 mark for 5	**2**

Question Number	Answer	Mark
8(a) (i)	Order of <u>relative</u> brightness/magnitudes of the stars This must be stated or implied ('alpha is brightest, then beta etc')	**1**
8 (a) (ii)	6.25 (allow 6 – 6.5; allow 2.5 squared)	**1**
8 (a) (iii)	/delta Reject d	**1**
8 (a) (iv)	5.5 good attempt to re-arrange formula 1 mark e.g. (m = M - 5 + 5 log d) or (-4.5 – 5 + 15) -14.5 scores 0 (confused m and M)	**2** **(5)**

Question Number	Answer	Mark
8(b)	10 pc (must have unit)	**1**

Question Number	Answer	Mark
8(c)	Diagram showing Earth's orbit <u>around the Sun</u>, nearby and distant stars (1 mark) OR could be 'photograph' of fixed stars and one (relatively nearby) star in two positions. Parallax angle shown or described (1 mark)	**1** **1** **(2)**

Question Number	Answer	Mark
9(a) (i)	seas / maria (accept singular: sea / mare)	**1**
9(a) (ii)	highlands / terrae (accept singular: highland / terra)	**1** **(2)**

Question Number	Answer	Mark
9(b)	seas / maria / dark grey / i	**1**

Question Number	Answer	Mark
9(c) (i)	space probes/humans have orbited Moon (i.e. some implication that far side has been 'visited')…	**1**
	…and photographed/observed surface	**1**
9(c) (ii)	fewer maria / more highlands or craters Score 0 if more than one difference and contradiction e.g. fewer seas (tick) and fewer craters (cross)	**1** **(3)**

Question Number	Answer	Reject	Mark
9(d)	Any one of the following descriptions: • similar isotopic abundances (of oxygen) • lack of water / volatiles • discovery of KREEP-rich rocks on Moon Tend to be harsh on this item!	Rocks on Moon are/look similar to those on Earth Astronauts returned rocks from Moon	**(1)**

Question Number	Answer	Mark
10(a)	Central dark umbra and surrounding lighter (not necessarily shaded – could be described) penumbra One (either) labelled correctly	**1** **1** **(2)**

Question Number	Answer	Mark
10(b)	Study angle turned through (could be one whole solar rotation)/ track spot as it moves across disc (1) over a period of time (1) Be generous here, but look out for sunspot cycle (score 0)	**2**

Question Number	Answer	Mark
10(c)	**D** - 36 days	**1**

Question Number	Answer	Mark
11(a)	**D** - Tycho Brahe	**1**

Question Number	Answer	Mark
11(b)	Two areas selected at different parts of orbit (1) Similar areas (judge by eye) (1)	**(2)**

Question Number	Answer	Mark
11(c)	82 - 83 (1) years (1) Marks are independent	**2**

Question Number	Answer	Mark
12 (a) (i)	Any one of the following points (must refer to <u>structure</u>): • size/diameter of objective • mirror / lens (as objective) • open / closed tube • secondary mirror	**1**
12 (a) (ii)	Any one of the following: • reflectors can be made larger in diameter / mirrors can be made larger (than lenses) / allow more light in • Adaptive Optics not possible on refractors • better (higher) resolution/more detail seen • mirrors don't suffer from chromatic aberration Look out for waffle (e.g. better images, higher magnification) and ignore!	**1** **(2)**

Question Number	Answer	Mark
12 (b) (i)	X-rays are absorbed by/don't penetrate gases (ignore type of gas) in the (Earth's) atmosphere OR X-rays do not reach sea-level. (Don't accept interference/diffraction etc)	**1**
12 (b) (ii)	In space / <u>above</u> Earth's atmosphere / in orbit around Earth Do not accept 'high up in atmosphere/on a mountain' etc and do not accept multiple answers if one incorrect.	**1**
12 (b) (iii)	Any one of: • Sun's <u>corona</u> • <u>active</u> galaxies • black holes • pulsars • (X-ray) binary stars • quasars • supernova (remnant)	**1** **(3)**

Question Number	Answer	Reject	Mark
13 (a)	Any two of the following examples up to a maximum of two marks: • distant (early) galaxies • high redshifts • emitters of X-rays / radio waves / non-thermal radiation etc (NOT for 2 marks) • jets • star-like on optical mages • AGN at centre • v. luminous • etc (2 x 1)	Discovery Very bright	**(2)**

Question Number	Answer	Mark
13 (b)	Any three of the following examples up to a maximum of three marks: • (strong) radio sources ... • ...linked with stars • precise location of 3C 273 determined... • ...by lunar occultation • spectrum of star obtained • highly redshifted emission lines detected / implied very distant galaxies (3 x 1) QWC Capital letters and full stops; correct grammar (1)	**(3)** **(1)**

Question Number	Answer	Mark
14 (a)	Mean… (1) (dependent on correct Earth-Sun distance) …distance from Earth to Sun (1) Score 1 only if just 150 000 000 km given	**(2)**

Question Number	Answer	Mark
14 (b) (i)	**T** labelled at '9 o'clock' on inside orbit – must be in line with E and Sun	**1**
14 (b) (ii)	Venus and Mercury (must have both)	**1**

Question Number	Answer	Mark
14 (c) (i)	**C** labelled at '12 o'clock' on outside orbit – must be in line with E and Sun	**1**
14 (c) (ii)	4.2 (AU) - ignore unit/lack of unit	**1**

Question Number	Answer	Mark
15(a)	Two ‘fried eggs’ back to back (2) allow 1 mark for ‘good attempt’ Don’t worry about scale No marks if plan view drawn.	**2**

Question Number	Answer	Mark
15 (b) (i) **15 (b) (ii)**	**S** drawn in spiral arms (not in bulge or nucleus) **G** shown in ‘halo’ / central bulge / nucleus Allow ecf if plan view drawn and clear.	**1** **1**

Question Number	Answer	Mark
15 (c)	**B** – 10 kpc	**1**

Question Number	Answer	Mark
15 (d)	Radio waves can penetrate dust/gas whereas visible light can not (ignore any reason given). QWC scientific vocabulary (‘penetrate’, ‘dust’ ‘absorbed’ etc)	**1** **1**

Question Number	Answer	Mark
16 (a) (i)	W or M pattern as dots/asterisks (not just lines)	**1**
16 (a) (ii)	Stars that don't set / always visible… (1) (…above horizon) Do not accept 'visible all year round' / visible for 24 hours	**1**
16 (a) (iii)	**A** $+32^{o}$	**1** **(3)**

Question Number	Answer	IGNORE	Mark
16 (b) (i)	Any 2 of valid points e.g. Help to determine: • what constellations/ stars / nebulae are visible • location of constellations Look for 'what' and 'where' = 2 marks	Planets Moons Comets	**2**

Question Number	Answer	IGNORE	Mark
16 (b) (ii)	Any 2 of valid points e.g. Help to determine: • which nebulae/clusters are visible • location of nebulae • location of (relatively nearby) galaxies • faint 'fuzzy' objects • etc, but must refer to 'extended' objects	Stars Planets Moons Comets Messier Objects	**2**

Question Number	Answer	Mark
17 (a) (i)	any two of: • investigation of radio 'noise' • steady uniform 'hiss' • from all parts of sky • at all times of day / night • etc. (2 x 1)	**2**

Question Number	Answer	Mark
17 (b)	Evidence for the (hot) Big Bang Allow reference to cooling Universe'	**1**

Question Number	Answer	Mark
17 (c)	Any two of the following points, up to a maximum of two marks: • distribution of matter / galaxies • …in early Universe • evidence for dark matter / energy • etc. (2 x 1)	**2**

Question Number	Answer	Mark
18 (a)	Any valid theory e.g. deposit of water by colliding comets early in Earth's history (no other theories really) – must be astronomical Convincing theory (2) involving comet(s) Good attempt (1) involving asteroid/meteoroid etc	**2**
Question Number	Answer	Mark
18 (b)	Diagram showing star and region a certain distance from this (1) Accept alternative representations e.g. graph Distance is not too hot or cold / has correct temperature… (1) …for liquid water / to support life (1)	**3**

Question Number	Answer	Mark
19(a)	12^{o}E (must have both angle and East) – allow 12 E If a plus or minus sign is present, this is incorrect.	**1**
Question Number	Answer	Mark
19 (b) (i)	Star crosses observer's meridian / highest in sky / due South / 'upper transit'	**1**

Question Number	Answer	Mark
19 (b) (ii)	16:18 18:42 allow 1 mark	**2**

Question Number	Answer	Mark
19 (b) (iii)	38^{o} (accept 38 - ignore lack of degree sign)	**1**

Question Number	Answer	Mark
19 (c) (i)	90^{o} / 90 / +90 / $+90^{o}$ Accept same responses but with 89 Reject N or North (score 0)	**1**
Question Number	Answer	Mark
19 (c) (ii)	55^{o} / 55	**1**

Question Number	Answer	Mark
20 (a) (i)	(determine) slope or gradient	**1**

Question Number	Answer	Mark
20 (a) (ii)	67 (range 65 – 70) (2) (Ignore SF) OR... some evidence to show working out of gradient (1) (graph not visible in clip) leading to incorrect value km / s / Mpc (1) Independent mark	**3**

Question Number	Answer	Mark
20 (b)	Convert H into an 'inverse time' /use SI units (1) <u>invert</u> (1) to give a time	**2**

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