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Mark Scheme (Results)

June 2011

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 (The Moon)	**1**

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

Question Number	Answer	Mark
1(c)	C (Pluto)	**1**

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

Question Number	Answer	Mark
2(a)	B (150 million km)	**1**

Question Number	Answer	Mark
2(b)	D (ellipse)	**1**

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

Question Number	Answer	Mark
2(d)	23 (hours) 56 (min) Both correct	**1**

Question Number	Answer	Mark
2(e)	A (27.3 days)	**1**

Question Number	Answer	Reject	Mark
3(a)	Gibbous (accept waxing gibbous, waning gibbous)	Waning Waxing Half-full	**1**

Question Number	Answer	Mark
3(b)	B (10 days)	**1**

Question Number	Answer	Mark
3(c)	Full	**1**

Question Number	Answer	Mark
3(d)	• Sun Earth and Moon in alignment (ignore sizes) • Earth in middle	**1** **1** **(2)**

Question Number	Answer	Mark
4(a)	C (Sea of Crises)	**1**

Question Number	Answer	Mark
4(b)	D (Tycho)	**1**

Question Number	Answer	Mark
4(c)	**A** (any label) correctly labelled to left of Sea of Serenity (in between two large dark areas at top)	**1**

Question Number	Answer	Reject	Mark
4(d)	• Space probes/astronauts/lunar satellites (have orbited the Moon and photographed the far side)	Rockets…	**1**

Question Number	Answer	Reject	Mark
4(e)	Any two of the following examples (or other sensible piece of information): • more craters • more highlands / mountains • lighter in appearance • no/fewer (major) maria/rilles (2) QWC – Cap. letters, spelling and punctuation (1)	Darker Invisible from Earth	**(3)**

Question Number	Answer	Mark
5(a)	Any two of the following examples up to a maximum of two marks: • Jupiter • Uranus • Neptune (2 x 1)	**(2)**

Question Number	Answer	Mark
5(b)	Mars	**1**

Question Number	Answer	Reject	Mark
5(c)	Any two of the following examples up to a maximum of two marks: • large quantity of carbon dioxide / CO_2 • extremely high temperature on surface • prevention of IR radiation from 'escaping' into space/'traps heat' • dense atmosphere / clouds (2 x 1)	Temperature (by itself) Greenhouse effect	**(2)**

Question Number	Answer	Mark
6(a) (i)	A (North)	**1**
6(a) (ii)	(+) $\underline{90}^{o}$ (accept 90^{o}N)	**1**
6(a) (iii)	55^{o}	**1**
		(3)

Question Number	Answer	Reject	Mark
6(b) (i)	5 stars in 'W' or 'M' shape (any orientation)	Just lines without 'stars'	**1**
6(b) (ii)	Stars that do not set/rise/go (below the horizon)	Orbit Polaris Visible all day/night/for 24h Always visible Visible all year	**1**
6(b) (iii)	Yes (**1**) Reason given in terms of formula or by explanation (**1**) IF RESPONSE IS Yes i.e. if No, score 0 for 6 (b) (iii)		**2** **(4)**

Question Number	Answer	Mark
7(a) (i)	Dark(er) patches (on surface of Sun)	**1**

Question Number	Answer	Reject	Mark
7(a) (ii)	Any one of: • solar flare • prominence • filament • plage • active region	Corona Photosphere	**1**

Question Number	Answer	Reject	Mark
7(a) (iii)	Better contrast / ideal narrow-band filter	Less bright	**1**

Question Number	Answer	Mark
7(b)	Sensible diagram showing sunspots Correct description of method related to observing movement of sunspots across the solar disc	**1** **1** **(2)**

Question Number	Answer	Mark
7(c) (i)	Glowing coloured (curtains/streamers) lights in the sky	**1**

Question Number	Answer	Mark
7(c) (ii)	Charged particles in solar wind … …excite/interact with (gas) molecules in atmosphere	**1** **1** **(2)**

Question Number	Answer	Mark
8(a)	B (Kuiper Belt)	**1**

Question Number	Answer	Mark
8(b) (i)	Whole (complete) ellipse drawn (fairly eccentric)	**1**
	Sun at focus of ellipse i.e. NOT symmetrical	**1**
8 (b) (ii)	P indicated at any ONE point of intersection (ignore >1 intersection)	**1** **(3)**

Question Number	Answer	Reject	Mark
8(c) (i)	radiant		**1**
8(c) (ii)	Perseus	Perseid	**1** **(2)**

Question Number	Answer	Mark
8(d)	Fireball is a <u>bright</u> / magnitude < -3 meteor	**1**

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

Question Number	Answer	Mark
9(b) (i)	S labelled approx 2/3 of way out from centre within spiral arm	**1**
9(b) (ii)	F labelled in spiral arm (any position but not in bulge)	**1**
9(b) (iii)	G labelled anywhere in or close to 'bulge'	**1**
		(3)

Question Number	Answer	Mark
10(a)	Any two of the following examples (or other sensible piece of information) up to a maximum of two marks: • weather forecast • magazine/newspaper • internet • astronomical software • planisphere (2 x 1) MUST BE <u>SOURCES</u> OF INFORMATION	**(2)**

Question Number	Answer	Mark
10(b)	Arrow drawn downwards from two right-hand stars in the square	**1**

Question Number	Answer	Mark
10(c)	A (Andromeda galaxy)	**1**

Question Number	Answer	Reject	Mark
10(d)	Observing slightly to the side of the object / don't look directly at the object	'corner of the eye'	**1**

Question Number	Answer	Reject	Mark
10(e)	Any one of: • dark-adapted eye • relaxed eye • use of a red torch/filter	Any optical aid	**1**

Question Number	Answer	Reject	Mark
10(f)	Any two of the following examples (or other sensible piece of information): • clear images / 'better pictures' / higher resolution • data in computer file format / able to store • images in colour • spectroscopy (or other analysis) possible (2 x 1)	Higher magnification (without justification(More accurate Similar vague statements	**(2)**

Question Number	Answer	Mark
11(a)	B A D C (correct sequence – mark as below) B first C last A followed by D	 **1** **1** **1** **(3)**

Question Number	Answer	Mark
11(b)	<u>White</u> Dwarf	**1**

Question Number	Answer	Reject	Mark
11(c) (i)	Supernova / SNR / supernova remnant	Explosion	**1**
11(c) (ii)	Neutron star / black hole / pulsar	White/red dwarf	**1** **(2)**

Question Number	Answer	Mark
12 (a) (i) **12 (a) (ii)**	Any two of the following points, up to a maximum of two marks: • astrometry – look for small 'wobbles' in position of a star • radial velocity method - look for Doppler-shifts in star • transit dimming of star • gravitational microlensing (2 x 1) Any two of the following points, up to a maximum of two marks: • small masses of planets do not affect parent star's position • atmospheric turbulence prevents precise measurements of star's position • star much brighter than planet(s) • dist/gas around star • exoplanets not shining by their own light (only reflected light) (2 x 1)	**2** **2** **(4)**

Question Number	Answer	Mark
12(b)	Any two of the following examples up to a maximum of two marks: • number of stars in the galaxy • fraction of stars with planetary systems • number of planets capable of sustaining life • fraction of life forms that are intelligent • fraction of intelligent life-forms that wish to communicate • fraction of a planet's lifetime during which civilisations can live (2 x 1)	**(2)**

Question Number	Answer	Mark
13(a) (i)	(Ori)	**1**

Question Number	Answer	Mark
13(a) (ii)	(Ori)	**1**

Question Number	Answer	Mark
13(b)	Due to Earth's orbit around the Sun ('seasonal' reference) Orion would be in line with Sun and so not visible / be visible in 'daylight' OR sensible answer mentioning RA and dec of Sun during June	**1** **1** **(2)**

Question Number	Answer	Mark
13(c) (i)	(Imaginary) line due south running overhead Accept more formal Great Circle N, zenith, S. Must imply observer i.e. no ref. to longitude	**1**

Question Number	Answer	Mark
13(c) (ii)	40 min time difference… (stated or implied by correct answer) so time = 17:20 (allow 1 mark for 16:00)	**1** **1** **(2)**

Question Number	Answer	Mark
14(a)	Name of probe (e.g. Giotto, Deep Impact, Apollo, Cassini) Correct 'target' (e.g. Halley's Comet, Moon.) Statement of one finding/result of mission (e.g. structure/composition)	**1** **1** **1** **(3)**

Question Number	Answer	Reject	Mark
14(b)	Any two of the following examples up to a maximum of two marks: • brittle bones • muscle fatigue • psychological problems associated with other crew members • nausea • communication (time delay) problems • exposure to radiation from Sun • impact • (health problems due to) low gravity (2 x 1)	Food running out Not enough fuel Lack of oxygen Hostile atmosphere Long journey	**(2)**

Question Number	Answer	Mark
15(a)	12:10	**1**

Question Number	Answer	Mark
15(b)	12:04 Allow ECF here i.e. response to (a) minus 6 min or 12:16 Allow ECF here i.e. response to (a) plus 6 min	**2** **or** **1** **(2)**
Question Number	Answer	Mark
15(c)	1^{o}W Must have some indication of direction	**1**
Question Number	Answer	Mark
15(d)	8 min later so 12:18 GMT No ECF from (a) (i)	**1**

Question Number	Answer	Mark
16(a)	Binary star involves common centre of mass / gravitationally associated / physically close Optical double is a 'line of sight' / co-incidental effect / 'they only appear close together' If candidate mixes up names, 1 max.	**1** **1** **(2)**

Question Number	Answer	Mark
16(b) (i)		**1**

Question Number	Answer	Mark
16(b) (ii)	6.25 (allow 6.2 – 6.3) / 2.5^2	**1**

Question Number	Answer	Mark
16(b) (iii)	- 0.6 or some sensible attempt at working (log d = 2)	**2** **1**

Question Number	Answer	Mark
17(a) (i)	any one of: • street/motorway lights • the Moon • sports stadiums • supermarket lights • security lights • etc.	**1**

Question Number	Answer	Mark
17(a) (ii)	any one of: • reduces contrast • makes fainter stars invisible • makes background sky orange/yellow • prevents observations of 'true' sky • affects night vision • etc.	**1**

Question Number	Answer	Mark
17 (b)	Any two of the following points, up to a maximum of two marks: • use angles of <u>shadows</u>... • at two different <u>latitudes</u> (may be implied on diagram) • at Alexandria and Syene • no shadow at one latitude but shadow at the other (2 x 1) Any two of the following points, up to a maximum of two marks: • find <u>difference</u> in 'angle' • use known <u>distance</u> between two cities (2 x 1) QWC (logical explanation)	**2** **2** **1** **(5)**

Question Number	Answer	Mark
18(a)	Radio waves will <u>penetrate dust</u> in spiral arms / visible light unable to <u>penetrate dust</u>	**1**

Question Number	Answer	Mark
18(b)	Any three of the following points, up to a maximum of three marks: • discovered in 1965 by Penzias and Wilson (one of these) • detection of uniform noise from all areas of sky using radio waves / horn antenna • confirmed presence of CMB suggested by other team (Dicke at Princeton University) • irregularities / ripples in CMB • 'echo' of Big Bang • corresponds to 3 K temperature (3 x 1)	**3**

Question Number	Answer	Mark
18(c)	• Convert value of H into inverse of time units • Invert to give the age of the Universe	**1** **1** **(2)**

Question Number	Answer	Reject	Mark
19(a) (i)	Spiral / S / Sa / Sb / Sc	Barred spiral SB	**1**
19(a) (ii)	Irregular / Irr		**1** **(2)**

Question Number	Answer	Reject	Mark
19(b)	Any two of the following examples up to a maximum of two marks: • Milky Way • SMC / Small Magellanic Cloud • Triangulum galaxy / M33 • Pisces Dwarf • Aquarius Dwarf • etc (2 x 1)	LMC / Large Magellanic Cloud Andromeda galaxy	**(2)**

Question Number	Answer	Mark
19(c)	Any two of the following examples up to a maximum of two marks: • lots of non-thermal emission • strong X-ray emitters • strong radio emitters • (active) massive black hole at centre (AGN) • jets / lobes • etc (2 x 1)	**(2)**

Question Number	Answer	Mark
20(a)	Strong radio sources… matched to faint star-like objects by optical astronomers	**1** **1** **(2)**

Question Number	Answer	Mark
20(b)	0.33 or 33% or 1/3 or 15/46 or 150/460 (decimal or fraction allowed) or 0.25 or 25% or some attempt to use formula correctly / correct substitution -1 if unit is given or final answer gives actual velocity of quasar	**3** **or** **2** **(3)** **or** **1**
Question Number	Answer	Mark
20(c)	B (the galaxy is moving towards us)	**1**

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