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Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCSE in 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.

Question Number	Answer	Mark
1(a)	**C** The Moon	**(1)**

Question Number	Answer	Mark
1(b)	**D** The Sun	**(1)**

Question Number	Answer	Mark
1(c)	**C** 150 000 000 km	**(1)**

Question Number	Answer	Mark
1(d)	**D** X-rays	**(1)**

Question Number	Answer	Mark
1(e) (i)	Nitrogen, N or N_2	**(1)**

Question Number	Answer	Mark
1(e) (ii)	Carbon Dioxide or CO_2	**(1)**

Total for Question 1 = 6 marks

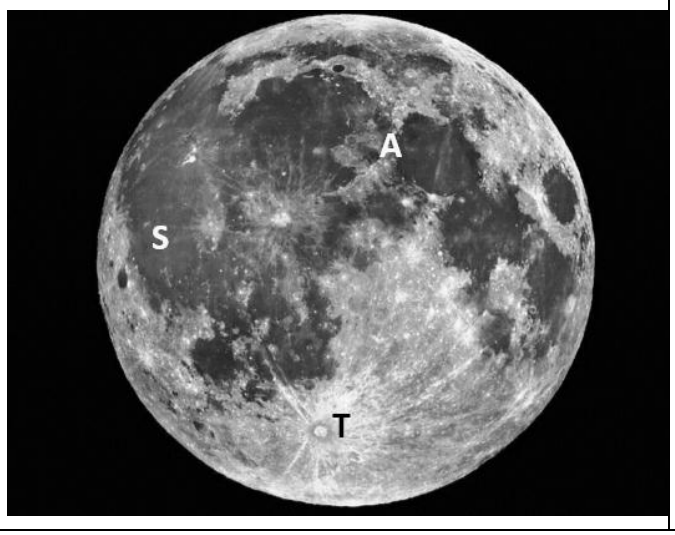
Question Number	Answer	Mark
2(a) (i)	**A** dust tail	**(1)**

Question Number	Answer	Mark
2(a) (ii)	arrow drawn pointing to the left	**(1)**

Question Number	Answer	Mark
2(b) (i)	**C** meteoroids	**(1)**

Question Number	Answer	Mark
2(b) (ii)	at same point in its orbit (1) Earth intersects dust/meteor stream /cometary tail debris (1)	**(2)**

Total for Question 2 = 5 marks

Question Number	Answer	Mark
3(a)(i) **(ii)** **(iii)**	S labelled correctly; see diagram A labelled correctly; see diagram T labelled correctly; see diagram  	**(3)**

Question Number	Answer	Mark
3(b) (i)	**C** space probe	**(1)**

Question Number	Answer		Mark
3(b) (ii)	Any **one** of: more highlands fewer (no) maria more craters higher albedo	reject lighter / darker	**(1)**

Question number	Answer	Mark
3 (c)	**A** 27.3 days	**(1)**

Total for Question 3 = 6 marks

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

Question Number	Answer		Mark
4 (b) (i)	Any two of: quasar; BL Lacerta object; blazar; Seyfert galaxy; N galaxy Radio galaxy etc.	Reject 3C 273	**(2)**

Question Number	Answer		Mark
4 (b) (ii)	Any one of: higher luminosity emits EM radiation (might be named e.g. X-rays) at all wavelengths; Radio lobes; Active nucleus(AGN) radiation is not thermal;	**Insufficient:** mention of black holes brightness	**(1)**

Question Number	Answer	Mark
4 (c) (i)	**A** barred spiral	**(1)**

Question Number	Answer	Mark
4 (c) (ii)	**D** Spiral	**(1)**

Total for Question 4 = 6 marks

Question Number	Answer	Mark
5(a)	**C** 5800 K	**(1)**

Question Number	Answer	Mark
5(b)	**D** 35 days	**(1)**

Question Number	Answer	Mark
5(c)	**D** sunspots	**(1)**

Question Number	Answer	Mark
5(d)	**B** hydrogen	**(1)**

Question Number	Answer	Mark
5(e)	**A** Butterfly Diagram	**(1)**

Question Number	Answer	Mark
5(f)	**D** solar wind	**(1)**

Total for Question 5 = 6 marks

Question Number	Answer		Mark
6(a)	Any one of: No exploration of Southern Hemisphere by Greek or Egyptians constellations not visible from Greece/Egypt	Reject: different stars/constellations visible	**(1)**

Question Number	Answer	Mark
6(b)	different civilisations/cultures compiled different lists different language different mythical figures	**(1)**

Question Number	Answer		Mark
6(c)	Any 2 of: Asterism is a 'fun/popular' name for a pattern of stars Asterism is part of a constellation Constellation is (official) area of sky containing a pattern of stars	Insufficient: Asterism is smaller than a constellation.	**(2)**

Question Number	Answer	Reject	Mark
6(d)(i)	Any well-known asterism e.g. The Plough Saucepan Big Dipper W of Cassiopeia Summer Triangle Winter Triangle Winter Wreath Spring Triangle Winter Hexagon Orion's Belt Great Square of Pegasus Etc…	Great Bear Ursa Major Orion other 'popular names' that are really constellations	**(1)**

Question Number	Answer	Mark
6(d)(ii)	Any known constellation (accept English or Latin names).	**(1)**

Total for Question 6 = 6 marks

Question Number	Answer	Mark
7(a)	Sun, Moon and Earth is alignment (1) with Moon in middle (1) Ignore relative sizes or distances and any lines or rays included.	**(2)**

Question Number	Answer	Mark
7(b)	Moon's orbital plane and Earth's orbital plane do not coincide Moon's orbit inclined to ecliptic Some reference to planes (1) not coinciding (1)	**(2)**

Question Number	Answer	Mark
7(c) (i)	Gibbous (Waxing not required)	**(1)**

Question Number	Answer	Mark
7(c)(ii)	Crescent Moon (about 2 or 3 days old)	**(1)**

Total for Question 7 = 6 marks

Question Number	Answer		Mark
8(a)(i)	Any one of: street/motorway lights; sports stadiums the Moon aurorae	Reject: cities buildings Lamp posts	**(1)**

Question Number	Answer	Mark
8(a)(ii)	Milky Way (or its arms) is (mostly) a flat plane Insufficient: We are inside the Milky Way	**(1)**

Question Number	Answer		Mark
8(a)(iii)	Dust Allow: gas or molecular clouds	Reject Dark Matter / Energy	**(1)**

Question Number	Answer		Mark
8(b)	Any two of: more stars better/higher resolution higher contrast clearer brighter	Insufficient: better quality magnified bigger	**(2)**

Question Number	Answer	Mark
8(c)	Any one of: Small Magellanic Cloud Large Magellanic Cloud SMC LMC	**(1)**

Total for Question 8 = 6 marks

Question Number	Answer	Mark
9(a)(i)	Mercury and Venus (1) **both** required, either order	**(1)**

Question Number	Answer	Mark
9(a)(ii)	52 (km)	**(1)**

Question Number	Answer	Mark
9(a)(iii)	9.5 (AU)	**(1)**

Question Number	Answer	Mark
9(b)(i)	**B** 1.0 cm	**(1)**

Question Number	Answer	Mark
9(b)(ii)	150/30 (1) 5 (1) m (1) only awarded in conjunction with one of the above	**(3)**

Total for Question 9 = 7 marks

Question Number	Answer	Mark
10(a)(i)	90, +90, 90°, +90° = **2** 90 N or 90°N = **1** Any other numerical value = **0**	**(2)**

Question Number	Answer	Mark
10(a)(ii)	58 (°) Ignore unit.	**(1)**

Question Number	Answer	Mark
10(b)	Earth's rotation/revolution/spinning	**(1)**

Question Number	Answer	Mark
10(c)	circumpolar	**(1)**

Question Number	Answer	Mark
10(d)	No, it would not set (since the star is circumpolar from this latitude)	**(1)**

Total for Question 10 = 6 marks

Question Number	Answer	Mark
11(a)(i)	Any one of: drier air less atmosphere less absorbing air steadier air less water vapour lower background/ambient temperature (accept: cooler) less thermal/background noise	**(1)**

Question Number	Answer	Mark
11(a)(ii)	Any two of: carbon dioxide methane water (vapour) nitrous oxide	**(2)**

Question Number	Answer	Mark
11(b)(i)	Any two of: allows us to breathe regulates temperature allows liquid water protection from UV/X-rays/solar radiation (NOT: solar wind) protection from meteoroids etc	**(2)**

Question Number	Answer	Mark
11(b)(ii)	Any one of: only transmits small part of EMS absorbs light so less bright only observe stars at night/non-24h observations reduces seeing conditions refraction atmospheric scintillation weather and clouds scatters light	**(1)**

Total for Question 11 = 6 marks

Question Number	Answer		Mark
12(a)(i)	7 days (with correct number)	(allow 6 – 8) **Reject:** Any number outside this range, e.g. '9 days' = 0	**(1)**

Question Number	Answer	Mark
12(a)(ii)	determine time period (1) use period-luminosity equation to obtain M (1) Use m and M in formula to calculate d (1)	**(3)**

Question Number	Answer	Mark
12(b)(i)	correct scale: 0, 10, 20, 30, 40	**(1)**

Question Number	Answer	Mark
12(b)(ii)	S shown on dashed orbit at: 9 o'clock (1) either 12 o'clock or 6 o'clock (1)	**(2)**

Total for Question 12 = 7 marks

Question Number	Answer	Mark
13(a)(i)	**P** marked at 3 o'clock	**(1)**

Question Number	Answer		Mark
13(a)(ii)	ellipse or elliptical	**Reject:** oval or ecliptic	**(1)**

Question Number	Answer	Mark
13(b)	look at the Sun (1) describing a safe method (1)	**(2)**

Question Number	Answer	Mark
13(c)	**C** shown on Mars' orbit at 9 o'clock	**(1)**

Question Number	Answer	Mark
13(d)(i)	2.5 (AU)	**(1)**

Question Number	Answer	Mark
13(d)(ii)	1.5^3 or 1.837 (1) 1.8 (2) (ignore units)	**(2)**

Total for Question 13 = 8 marks

Question Number	Answer	Mark
14	vertical axis labelled luminosity or M (1) horizontal axis laballed spectral type/class or temperature (1) main sequence shown as band from top left to bottom right (1) White dwarfs labelled bottom left (1) Red giants labelled top right (1)	**(5)**

Total for Question 14 = 5 marks

Question Number	Answer	Mark
15(a)	**D** water	**(1)**

Question Number	Answer	Mark
15(b)	Any named method e.g. astrometry, transit method, radial velocity method (1) description of method: one relevant point (1) two relevant points (2) QWC mark Capital letters and full stops (1) ALL MARKS INDEPENDENT	**(4)**

Total for Question 15 = 5 marks

Question Number	Answer	Mark
16(a)	change in wavelength / spectral lines (1) increase / longer in wavelength OR frequency getting lower (1)	**(2)**

Question Number	Answer	Mark
16(b)	Any 3 of: strong radio sources (1) matched with faint star like object (1) revealing unusual / highly redshift spectrum (1) precise radio position (of 3C273) determined during lunar occultation (1) QWC mark: correct use of technical/astronomical term**s** (1)	**(4)**

Total for Question 16 = 6 marks

Question Number	Answer	Mark
17(a)	6.25 or 2.5 x 2.5	**(1)**

Question Number	Answer	Mark
17(b)	δ (Delta)	**(1)**

Question Number	Answer	Mark
17(c)(i)	δ (Delta)	**(1)**

Question Number	Answer	Mark
17(c)(ii)	ε (Epsilon)	**(1)**

Question Number	Answer	Mark
17(c)(iii)	α (alpha)	**(1)**

Total for Question 17 = 5 marks

Question Number	Answer		Mark
18	**Ceres** Giuseppe Piazzi (1) Any one of: position predicted in sky (Bode's Law) found after search of zodiac with large/reflecting telescope **Pluto** Clyde Tombaugh (1) Any one of: predicted from irregularities in Neptune's orbit using repeated photographs blink comparator QWC mark: flowing use of English (1)	Insufficient: with a telescope	**(5)**

Total for Question 18 = 5 marks

Question Number	Answer	Mark
19(a)(i)	α (alpha)	**(1)**

Question Number	Answer	Mark
19(a)(ii)	α (alpha)	**(1)**

Question Number	Answer	Mark
19(b)(i)	Any one of: highest in sky; crosses observer's meridian; due south	**(1)**

Question Number	Answer	Mark
19(b)(ii)	00:15	**(1)**

Question Number	Answer	Mark
19(b)(iii)	22:52 (2) allow 1 mark for 23:08	**(2)**

Total for Question 19 = 6 marks

Question Number	Answer	Mark
20 (a)	(1) correct substitution or correct calculation of shift = 40 (2) correct unrounded answer, e.g. 31 579 etc (3) 32 000 Ignore units	**(3)**

Question Number	Answer	Mark
20 (b)	(1)correct substitution or correct unrounded answer, e.g. 1558 etc (2)1600 + 1 **independent** mark for unit (Mpc)	**(3)**

Total for Question 20 = 6 marks

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