



**Pearson
Edexcel**

Mark Scheme (Results)

Summer 2018

Pearson Edexcel GCSE

In Astronomy (5AS01)

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	Notes	Marks
1 (a)	B The Plough		(1)

Question number	Answer	Notes	Marks
1 (b)	D Ursa Major		(1)

Question number	Answer	Notes	Marks
1 (c)	C Polaris		(1)

Question number	Answer	Notes	Marks
2 (a)	B meteor		(1)

Question number	Answer	Notes	Marks
2 (b)	A lunar eclipse		(1)

Question number	Answer	Notes	Marks
2 (c)	A aurora		(1)

Question number	Answer	Notes	Marks
2 (d)	C double star		(1)

Question number	Answer	Notes	Marks
2 (e)	C satellite		(1)

Question number	Answer	Notes	Marks
3 (a)	B Mercury		(1)

Question number	Answer	Notes	Marks
3 (b)	A Jupiter		(1)

Question number	Answer	Notes	Marks
3 (c)	B Mercury		(1)

Question number	Answer	Notes	Marks
3 (d)	D Venus		(1)

Question number	Answer	Notes	Marks
4 (a)	M between S and E		(1)

Question number	Answer	Notes	Marks
4 (b)	M exactly in line with S and E and to the right of E	(Same as Figure 2)	(1)

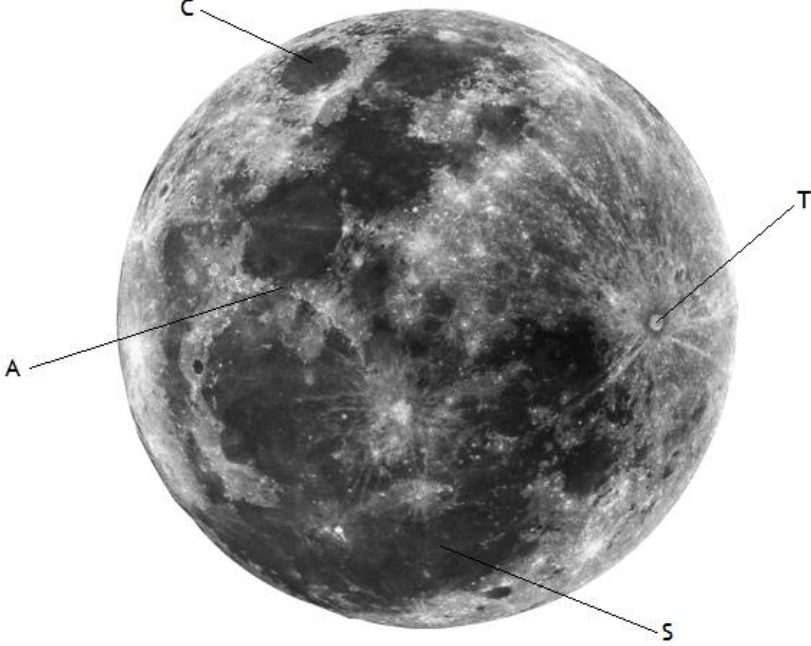
Question number	Answer	Notes	Marks
4 (c)	M directly above or directly below E (or 12 or 6 o'clock positions around E)		(1)

Question number	Answer	Notes	Marks
4 (d)	M between 7 and 11 o'clock positions around E and not at 9 o'clock.	<i>Reject:</i> M in line with S and E.	(1)

Question number	Answer	Notes	Marks
5 (a)	D Photosphere		(1)

Question number	Answer	Notes	Marks
5 (b)	D Umbra		(1)

Question number	Answer	Notes	Marks
5 (c)	C Penumbra		(1)

Question number	Answer & Notes	Marks
6 (a) (i-iv)		(4)

Question number	Answer	Notes	Marks
6 (b) (i)	A Crater		(1)

Question number	Answer	Notes	Marks
6 (b) (ii)	C Rille		(1)

Question number	Answer	Notes	Marks
6 (b) (iii)	D Terra		(1)

Question number	Answer	Notes	Marks
7 (a) (i)	C planetary nebula (1)		(1)

Question number	Answer	Notes	Marks
7 (a) (ii)	A emission nebula (1)		(1)

Question number	Answer	Notes	Marks
7 (a) (iii)	A emission nebula (1)		(1)

Question number	Answer	Notes	Marks
7 (b) (i)	C neutron star (1)		(1)

Question number	Answer	Notes	Marks
7 (b) (ii)	D red giant star (1)		(1)

Question number	Answer	Notes	Marks
7 (b) (iii)	C neutron star (1)		(1)

Question number	Answer & Notes	Marks
8 (a)	<p> 3 All 4 correct 2 2 or 3 correct 1 1 correct 0 0 correct </p> <p>Name labels not required.</p>	(3)

Question number	Answer	Notes	Marks
8 (b)	Ecliptic runs through/near the constellation. (1) Correct reference to RA and Dec data from table/graph (1) hello	Insufficient: Reference to zodiac(-al band)	(2)

Question number	Answer	Notes	Marks
8 (c) (i)	May, June or July (1)		(1)

Question number	Answer	Notes	Marks
8 (c) (ii)	Sagittarius is close to (position of Sun on) northern winter solstice (1) Near summer solstice/six months later/earlier Sagittarius will be opposite Sun in sky / at opposition. (1)	'highest point in sky/culminates' = 1	(2)

Question number	Answer	Notes	Marks
9 (a)	24.2 hours (3) Incorrect answers may score any two from: <ul style="list-style-type: none"> • Averaging star trail angles (24.8°) (1) • Dividing into/by 360° (14.5 or 0.069) (1) • Multiplying by 1h 40min (x 1.666h) (1) 	Accept 24h 12mins	(3)

Question number	Answer	Notes	Marks
9 (b)	Any two from the following actions... ...and their accompanying reasons: <ul style="list-style-type: none"> • Better choice of star trails / some long and clear ones not used (2) • Longer exposure time / longer trails can be measure more accurately (2) • Take photograph away from buildings / reduce light pollution in photo (2) • Measure exposure time more accurately / improve calculation. (2) • Averaging results / improves reliability or helps detect anomalous results (1) 		(2) (2)

Question number	Answer	Notes	Marks
9 (c)	<ul style="list-style-type: none"> • Pole Star has (appeared to) move around NCP during exposure (1) • Pole Star not exactly at North Celestial Pole (1) 		(2)

Question number	Answer	Notes	Marks
10 (a)	Brightest star in the constellation (Leo). (1)	<i>Insufficient:</i> Bright star	(1)

Question number	Answer	Marks
10 (b)	Combined brightness of the two objects (1) <i>Any one from:</i> <ul style="list-style-type: none"> • Jupiter is one of the brightest planets (1) • Regulus is a bright star (1) 	(2)

Question number	Answer	Notes	Marks
10 (c)	<ul style="list-style-type: none"> • Jupiter would (appear to) stop/move backwards (1) • Spending longer than usual close to Regulus (1) 		(2)

Question number	Answer Notes	Marks								
11	<p>This question has a level-based tiered mark scheme, based on the clarity with which the candidates' answer conveys its meaning:</p> <table border="1" data-bbox="424 353 1125 880"> <thead> <tr> <th data-bbox="424 353 611 387">Level:</th> <th data-bbox="611 353 1125 387">Difficulties</th> </tr> </thead> <tbody> <tr> <td data-bbox="424 387 611 517">1: Unclear (1/2 marks)</td> <td data-bbox="611 387 1125 517">Exact meaning is unclear and text is hard to follow due to spelling, punctuation or grammatical issues.</td> </tr> <tr> <td data-bbox="424 517 611 683">2: Clear (3/4 marks)</td> <td data-bbox="611 517 1125 683">Exact meaning is clear and text can be read through at first attempt. Language used is 'everyday' with few if any scientific terms.</td> </tr> <tr> <td data-bbox="424 683 611 880">3: Clear and scientific (5/6 marks)</td> <td data-bbox="611 683 1125 880">Exact meaning is clear and text can be read through at first attempt. Language used is 'scientific' with scientific terms used correctly throughout.</td> </tr> </tbody> </table> <p>If two or more correct scientific points related to the search for extra-terrestrial life and the Drake Equation are established, then the answer scores the higher of the two marks in each level. Otherwise, the lower mark is awarded.</p>	Level:	Difficulties	1: Unclear (1/2 marks)	Exact meaning is unclear and text is hard to follow due to spelling, punctuation or grammatical issues.	2: Clear (3/4 marks)	Exact meaning is clear and text can be read through at first attempt. Language used is 'everyday' with few if any scientific terms.	3: Clear and scientific (5/6 marks)	Exact meaning is clear and text can be read through at first attempt. Language used is 'scientific' with scientific terms used correctly throughout.	(6)
Level:	Difficulties									
1: Unclear (1/2 marks)	Exact meaning is unclear and text is hard to follow due to spelling, punctuation or grammatical issues.									
2: Clear (3/4 marks)	Exact meaning is clear and text can be read through at first attempt. Language used is 'everyday' with few if any scientific terms.									
3: Clear and scientific (5/6 marks)	Exact meaning is clear and text can be read through at first attempt. Language used is 'scientific' with scientific terms used correctly throughout.									

Question number	Answer	Notes	Marks
12 (a)	A Circumpolar (1)		(1)

Question number	Answer	Notes	Marks
12 (b)	D Rises and sets, without passing through his zenith. (1)		(1)

Question number	Answer	Notes	Marks
12 (c)	A Circumpolar (1)		(1)

Question number	Answer	Notes	Marks
12 (d)	D Rises and sets, without passing through his zenith. (1)		(1)

Question number	Answer	Notes	Marks
12 (e)	B Never above the horizon (1)		(1)

Question number	Answer	Notes	Marks
13 (a)	Some objects (planets) orbited the Sun (1) <i>or:</i> Not all objects orbited the Earth (1)		(1)

Question number	Answer	Notes	Marks
13 (b) (i)	Sun moves relative to stars (1)	Accept any motion different to the 24h east to west motion described in question. E.g. 'west to east' or 'east to west once a year'.	(1)

Question number	Answer	Notes	Marks
13 (b) (ii)	Moon moves relative to stars (1)	Accept any motion different to the 24h east to west motion described in question. E.g. 'west to east' or 'east to west once a month'.	(1)

Question number	Answer	Notes	Marks
13 (b) (iii)	Mars moves forwards and backward relative to the stars (1)	Accept loops or epicycles or retrograde	(1)

Question number	Answer	Notes	Marks
13 (c)	Any one from: <ul style="list-style-type: none"> • Planets orbiting Sun • Moon orbiting Earth • Sphere of stars 		(1)

Question number	Answer	Marks
13 (d)	(Uranus and Neptune) had not been discovered. (1)	(1)

Question number	Answer	Marks
14 (a)	90 (years)(2) Evidence of correctly calculating intervals between years given in the question, e.g. 2010 - 1830 = 180 or 1830 - 1560 = 270 (1)	(2)

Question number	Answer	Marks
14 (b)	Highly elliptical orbit (1) Sun at centre/one focus (1) Aphelion between Uranus and Neptune (1)	(3)

Question number	Answer	Notes	Marks
14 (c) (i)	Any two from: <ul style="list-style-type: none"> • Largest (apparent/angular) 'size' (1) • Brightest (1) • Tail prominent (1) 	<i>Insufficient:</i> Closest to Earth best for observation	(2)

Question number	Answer	Notes	Marks
14 (c) (ii)	Each correctly drawn and labelled feature (1) to a maximum of 2.	Ignore incorrect features.	(2)

Question number	Answer	Notes	Marks
15 (a)	<ul style="list-style-type: none"> Sun is only overhead on one day each year (1) Syene is on/close to Tropic (of Cancer) (1) 	<i>Insufficient: rarely overhead</i>	(2)

Question number	Answer	Marks
15 (b) *	<p>Measure shadow length and calculate / use a clinometer (1)</p> <p>Never look directly at Sun (1)</p> <p>+ QWC: Answer can be clearly understood without re-reading. No major spelling, punctuation or grammatical errors. All astronomical terms spelt correctly. (1)</p>	(3)

Question number	Answer	Marks
15 (c)	<p>40 800 (km) (3)</p> <p>Incorrect answers may score up to two from the following:</p> <ul style="list-style-type: none"> Calculating difference in angles (6°) (1) Dividing into 360° (60) (1) Multiplying by 680km (1) 	(3)

Question number	Answer	Notes	Marks
16 (a)	<p>Any two from:</p> <ul style="list-style-type: none"> • Difference between Solar and (local) Mean time / Equation of Time (1) • Daylight Saving adjustments, e.g. BST. (1) • Differing longitude from Greenwich (1). 	<p>Reject:</p> <ul style="list-style-type: none"> • Any reference to Time Zones • Sidereal time 	(2)

Question number	Answer	Marks
16 (b) *	<p>Explanation establishes any three of the following:</p> <ul style="list-style-type: none"> • Sidereal day is time for Earth to complete one rotation (360°) (1) • Solar Day is time for Sun to return to same place in the sky / successive sunrises or sunsets (1) • Earth moves along its orbit around the Sun during the day (1) • Earth needs to turn more than 360° to complete a Solar Day. (1) <p>+ QWC: Points presented clearly and in a logical order. (1)</p>	(4)

Question number	Answer	Marks
17 (a)	C Star C (1)	(1)

Question number	Answer	Marks
17 (b)	B Star B (1)	(1)

Question number	Answer	Marks
17 (c)	A Star A (1)	(1)

Question number	Answer	Marks
17 (d)	D Star D (1)	(1)

Question number	Answer	Marks
17 (e)	D Star D (1)	(1)

Question number	Answer	Notes	Marks
18 (a)	<ul style="list-style-type: none"> Andromeda is part of Local Group (1) Pulled towards Milky Way by gravity (1) 	Reject blue shifted	(2)

Question number	Answer	Notes	Marks
18 (b)	Universe is expanding (1) Any one from: <ul style="list-style-type: none"> Space/distance between us is getting larger (1) Too far apart for gravity (1) Is not in the Local Group (1) 	Reject red shifted	(2)

Question number	Answer	Marks
18 (c)	Obtain spectrum/spectral lines from galaxy (1) Any two from: <ul style="list-style-type: none"> Compare lines with those from stationary/nearby/reference sources (1) Determine 'red shift' (1) Use amount of shift to calculate (radial) velocity of galaxy. (1) Correct use of red shift formula (1) 	(3)

Question number	Answer	Marks
19 (a)	-3.84 (3) Or: Correct substitution (1) Log d = 2 (1)	(3)

Question number	Answer	Marks
19 (b)	-2.0 (3) Or: <ul style="list-style-type: none"> • Star A must be 16x (4^2) times fainter than Star B (1) • 16x is equivalent to 3 magnitudes 	(3)

Question number	Answer	Marks
20 (a)	<p>Cosmic Microwave Background radiation (1) 'Left over' radiation from Big Bang (1)</p> <p>Discovery of QSOs/Quasars/Quasi-stellar Objects (1) Only found at great distances hence only present in early universe. (1)</p> <p>Hubble deep field image(1) shows the universe has changed (1)</p>	(4)

Question number	Answer	Marks
20 (b) *	<ul style="list-style-type: none"> • Universe may expand/contract/stay at stable size (1) • Depends on relative size of Expansion and gravitational forces (1) • Dark Matter and Dark Energy may also affect balances of forces (1) <p>+QWC: Correct usage of any two of the following astronomical terms:</p> <ul style="list-style-type: none"> • Expansion (1) • Gravity / gravitational (1) • Dark Matter / Dark Energy (1) • Equilibrium (1) • Matter (1) • Big Rip or Big Crunch (1) 	(4)

