# Mark Scheme (Results)

# November 2020

Pearson Edexcel GCSE In Astronomy (1AS0)
Paper 1: Naked eye Astronomy

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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)(i)** | A NOT feature named<br>**B Copernicus**<br>C NOT feature named<br>D NOT feature named | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **1(a) (ii)** | A NOT feature named<br>B NOT feature named<br>C NOT feature named<br>**D the Sea of Crisis** | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **1(a)(iii)** | A NOT feature named<br>B NOT feature named<br>**C the Sea of Tranquility**<br>D NOT feature named | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **1(b)(i)** | **A Andromeda Galaxy**<br>B NOT feature named<br>C NOT feature named<br>D NOT feature named | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **1(b)(ii)** | A NOT feature named<br>**B Fomalhaut**<br>C NOT feature named<br>D NOT feature named | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **1(c)** | A can show stars that are above the horizon<br>B can show stars that are above the horizon<br>C can show stars that are above the horizon<br>**D does NOT show star above the observer's horizon** | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **2(a)** | A incorrect name<br>B incorrect name<br>C incorrect name<br>**D Zodiacal Band** | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **2(b)** | P marked on ecliptic and $0^0$ Dec<br> or<br>P marked at $0^0$ Dec and 12 h RA | **(1)** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(c)** | RA = 13:25 (range 13:20 to 13:27)<br>Dec = -11 (range -10.5 to -12) | Both values correct to gain mark | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **2(d)(i)** | A not autumn<br>**B spring**<br>C not summer<br>D not winter | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **2(d)(ii)** | Sun is in opposite part of the sky<br><br> or<br><br>Sun is located in Virgo in Autumn | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **2(e)** | Southern (hemisphere) (1)<br><br>Angles of declination are negative (1) | **(2)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(a)(i) | **A Equator**<br>B incorrect line<br>C incorrect line<br>D incorrect line | **(1)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(a)(ii) | A incorrect line<br>B incorrect line<br>C incorrect line<br>**D Tropic of Capricorn** | **(1)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(a)(iii) | A incorrect line<br>**B Prime Meridian**<br>C incorrect line<br>D incorrect line | **(1)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(b)(i) | A incorrect star<br>B incorrect star<br>C incorrect star<br>**D Star δ** | **(1)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(b)(ii) | A incorrect star<br>**B Star β**<br>C incorrect star<br>D incorrect star | **(1)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(b)(iii) | **A Star α**<br>B incorrect star<br>C incorrect star<br>D incorrect star | **(1)** |

| Question number | Answer | Mark |
| --- | --- | --- |
| 3(b)(iv) | A incorrect star<br>B incorrect star<br>D incorrect star<br>**D Star δ** | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 4(a)(i) | y-axis completed with false origin<br>The 7 large squares on the y-axis should have a range of no more than 12 cm (1)<br><br>All points plotted correctly (1)<br><br>Best-fit smooth **curve** drawn (1) | **(3)** |

| Question number | Answer | Mark |
|---|---|---|
| 4(a)(ii) | 12:02 (range 12:01 – 12:03) | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 4(a)(iii) | 0.5 degrees (range 0.25 – 0.75) (1)<br><br>West (minus) (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 4(b)(i) |     A incorrect method<br>**B The angular distance between the Moon and a certain bright star**<br>    C incorrect method<br>    D incorrect method | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 4(b)(ii) | Any 3 from:<br><br>• Record time of local noon / Sun culminates (1)<br><br>• Measure the difference between recorded time (local noon) and 12:00 (GMT) (1)<br><br>• A difference of 4 minutes corresponds to $1^o$ of longitude East or West (of the meridian)<br>or<br>A difference of 1 minute corresponds to $0.25^0$ of longitude East or West (of the meridian) (1)<br><br>• If clock is 'slow' then West of prime meridian (or vice versa) (1)<br><br>• Reference for the need to correct between Mean Solar Time (MST) and Apparent Solar Time (AST) using the | **(3)** |

| | Equation of Time (Equation does not need to be given) (1) | |
|---|---|---|
| | No mark awarded for reference to a sundial used on board a ship | |

| Question number | Answer | Mark |
|---|---|---|
| 5(a) | Can view more of the sky / larger field of view / telescope magnification is too large | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 5(b) | Due to perspective | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 5(c) | Name based on which constellation the radiant lies within / meteors radiate from | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 5(d) | | (6) |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable material. |
| Level 1 | 1-2 | Lacks clarity.<br>Basic plan attempted but with limited analysis of scientific ideas. Generalised comments made.<br>Plan is incomplete and contains basic information with some links to observing meteors and finding the radiant. |
| Level 2 | 3-4 | Some structure.<br>Plan is given with occasional evidence of analysis of scientific ideas and attempts to synthesise and integrate relevant knowledge.<br>Plan is adequate and shows most stages in linking observations of meteors with finding the location of the radiant. |
| Level 3 | 5-6 | Comprehensive and well structured.<br>Plan is given which is supported throughout by evidence from the analysis of the scientific ideas and demonstrates the skills of synthesising and integrating knowledge.<br>Plan is well-developed and shows a sustained line of scientific reasoning which could successfully find the position for the radiant of a meteor shower. |

Indicative content:

- Dark adapted eyes or other suitable observing techniques

- Observe meteor (brief streak of light)

- Plot meteor trail on a star chart

- Repeat observation to plot lots of trails

- Extrapolate meteor trails to a common origin

- Thus identify radiant and constellation in which it lies

| Question number | Answer | Mark |
|---|---|---|
| 6(a)(i) | Northern (hemisphere) (1) | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 6(a)(ii) | Any **one** from: (1)<br>• Correct reference to changing sunrise (rises earlier in summer, later in winter)<br>• Correct reference to changing sunset (sets earlier in winter, later in summer)<br>• Reference to changing length of day or night (longer days in summer, shorter days in winter) | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 6(a)(iii) | A incorrect answer<br>**B March and October**<br>C incorrect answer<br>D incorrect answer | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 6(a)(iv) | Sudden change (of 1 hour) in the time / graph is not a smooth curve | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 6(b)(i) | MST = 14:57 (3)<br><br>Breakdown:<br><br>Use of EOT = +4 (1)<br><br>Substitution and rearrangement of equation (1)<br>MST  = AST – EOT<br>     = 15:01 - 4<br><br>Answer of 14:57 (1)<br><br><br>If the EOT is incorrect, candidates can be awarded 1 mark if they have clearly shown the 15:01 – their EOT value. | (3) |

| Question number | Answer | Mark |
|---|---|---|
| 6(b)(ii) | EOT would **NOT** be +19 minutes (1)<br><br>Because it is not a linear function / does not change regularly with time / maximum value for EOT is less than +19 (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 6(c) | Any **two** from: (2)<br>• Gnomon / shadow caster must point north<br>• Gnomon / shadow caster must be set to the correct angle / latitude<br>• Gnomon / shadow caster must point to the pole star<br>• Sundial must be level<br><br>Gnomon / shadow caster must point to the north celestial pole is awarded BOTH marks | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 7(a) | Any **two** from:<br><br>• Aircraft flashes / satellites do not (usually) flash (1)<br>• Aircraft have coloured lights / satellites appear white (1)<br>• Aircraft can be seen from horizon to horizon / (some) satellites disappear when entering Earth's shadow (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 7(b) | Seeing is a measure of how still a star/object will appear (allow how much stars appear to twinkle/atmospheric stability) (1)<br><br>Weather affects the transparency of the sky (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 7(c)(i) | Wait a **sufficient amount of time** in **dark** conditions (1) | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 7(c)(ii) | Study an object while placing it at the **edge / periphery** of your vision / field of view | **(1)** |

| | Allow not looking directly at an object | |

| Question number | Answer | Mark |
|---|---|---|
| **7(d)** | | **(6)** |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable material. |
| Level 1 | 1-2 | Lacks clarity. Basic evaluation of method which is limited and narrow in scope. Appraisal of potential improvements is unsupported with limited attempt to give reasons. |
| Level 2 | 3-4 | Some structure. Evaluation of method shows some scientific reasoning. Appraisal of potential improvements is partially supported with clear scientific reasons. Attempts to integrate relevant knowledge. |
| Level 3 | 5-6 | Coherent and logically structured. Comprehensive evaluation with sustained scientific reasoning. Appraisal of potential improvements is supported throughout with clear, well-developed scientific reasons. |

Indicative content:

Reasons why proposed method is not suitable:

- Number of observable planets changes throughout the year (there may be no observable planets)

- Magnitude of planets changes throughout the year (and often too bright to find limiting magnitudes)

Alternative plan:
- Identify **reference (or known) stars**

- with a **range** of known magnitudes

- and **compare** which of these stars can / can't be observed

| Question number | Answer | Mark |
|---|---|---|
| 8(a) | A incorrect answer<br>B incorrect answer<br>C incorrect answer<br>**D the Moon's rotational period is equal to the Moon's orbital period** | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(b) | Can see more than 50% (half) of the lunar surface (1) | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(c)(i) | Label A at 3 o'clock or 9 o'clock w.r.t. Tycho<br>(within two crater diameters from Tycho) (1) | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(c)(ii) | Label B at 12 o'clock or 6 o'clock w.r.t. Tycho<br>(within two crater diameters from Tycho) (1) | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(d) | 11(.2)  (1)<br><br>Allow alternative ways of demonstrating this ratio. E.g.<br>11.2 : 1<br>1 : 0.0895<br>190:17<br>380 000:34 000 | **(1)** |

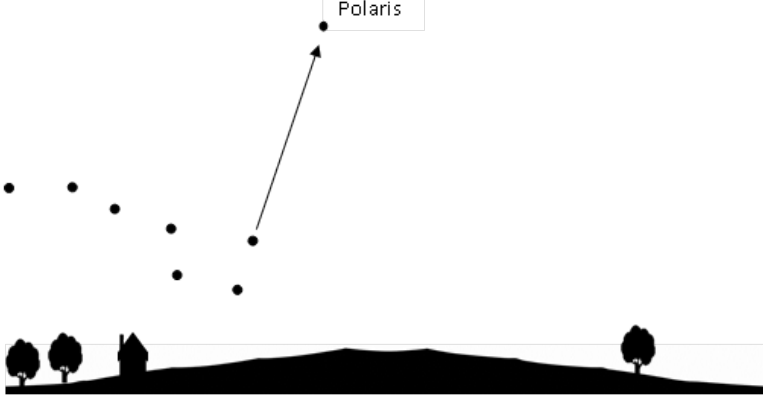| Question number | Answer | Mark |
|---|---|---|
| 8(e)(i) | Greater range between high and low tide (1)<br><br>because gravitational force of the moon is greater (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 8(e)(ii) | Shorter phase cycle (1)<br><br>because rotational period of the Moon around the Earth is shorter (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| **8(e)(iii)** | Eclipses last longer<br>or<br>Eclipses occur more frequently<br>or<br>Corona not visible (during totality) (1)<br><br>because Moon appears bigger in the sky (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| **9(a)(i)** | Either:<br>• Association with an event or significant time of the year e.g. harvest, flooding of the Nile etc.<br>    or<br>• Religious association with the bright star | **(1)** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **9(a)(ii)** | 24 800 (or 25 000) years (3)<br><br>Calculation:<br><br>Difference in angles = 29°<br>AND<br>Difference in dates = 2 000 years (1)<br><br>Ratio of 360° and difference angle (1)<br><br>$$\frac{360}{29}$$<br><br>Ratio multiplied by difference in dates to give the correct answer (1)<br><br>$$\frac{360}{29} \times 2\,000$$ | Correct answer gains all 3 marks | **(3)** |

| Question number | Answer | Mark |
|---|---|---|
| **9(b)** | Spring/Vernal Equinox (or 19/20/21 March) (1)<br><br>Autumn Equinox (or 21/22/23/24 September) (1) | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| 9(c)(i) | <br><br>7 stars in the shape of the Plough (1)<br><br>in the correct position such that "Pointers" align with Polaris (allow for seasonal variations in the position) (1)<br><br>Arrow does not need to be shown on diagram | (2) |

| Question number | Answer | Mark |
|---|---|---|
| 9(c)(ii) | Direction on the horizon (azimuth) gives North (1)<br><br>Altitude (above the horizon) (1)<br>gives latitude (1) | (3) |

| Question number | Answer | Mark |
|---|---|---|
| 9(c)(iii) | Polaris will appear to move further from the Celestial North Pole (1)<br><br>And will become an inaccurate measure for North /Latitude (1) | (2) |

| Question number | Answer | Mark |
|---|---|---|
| 10(a)(i) |  <br> T correctly shown (1) | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 10(a)(ii) |  <br> P correctly shown (1) <br> Allow either position for P | (1) |

| Question number | Answer | Mark |
|---|---|---|
| 10(b) | Any **two** from: <br> • Moon is orbiting around the Earth (producing a moving shadow) (1) <br> • Moon's projected shadow is small on Earth's surface (1) <br> • Earth is spinning on its axis (1) | (2) |

| Question number | Answer | Mark |
|---|---|---|
| 10(c) |     A incorrect answer <br> **B apogee** <br>     C incorrect answer <br>     D incorrect answer | (1) |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **10(d)** | Earth Sun distance = 154 million km (3 sig figs) (3)<br><br>Calculation:<br><br>Ratio of Sun's diameter to Moon's diameter<br><br>$\dfrac{1.39 \times 10^6}{3470}$ (= 401) (1)<br><br>equal to ratio of Sun's distance to Moon's distance<br><br>$\dfrac{Sun's\ Distance}{Moon's\ Distance} = \dfrac{1.39 \times 10^6}{3470}$ (= 401)<br><br>or<br><br>$Sun's\ distance = 401 \times Moon's distance$<br><br>or<br><br>$Sun's\ distance = 401 \times 384\,000$ (1)<br><br>Sun's distance = 154 million km (1) | Correct answer gains all 3 marks<br><br>Note: an answer of 150 million km or $1.5 \times 10^8$ km does **NOT** automatically gain the full three marks because this value is given on the Formulae and Data Sheet.<br><br>150 million km gains full marks provided there is evidence of working and rounding down to 2 sig fig. | **(3)** |

| Question number | Answer | Mark |
|---|---|---|
| **10(e)(i)** | A incorrect answer<br>**B 2**<br>C incorrect answer<br>D incorrect answer | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **10(e)(ii)** | A incorrect answer<br>B incorrect answer<br>C incorrect answer<br>**D 5** | **(1)** |

| Question number | Answer | Mark |
|---|---|---|
| **10(f)** | Measure the time it takes the Moon to travel from:<br>1st to 2nd umbral contact (position 2 to position 3)<br>    or<br>3rd to 4th umbral contact (position 5 to position 6)<br>                          (1)<br><br>Measure the time it takes the Moon to travel from:<br>1st to 3rd  umbral contact (position 2 to position 5)<br>    or<br>2nd to 4th umbral contact (position 3 to position 6)<br>                          (1)<br><br>Ratio of these times gives ratio of Earth-Moon diameter (1) | **(3)** |

| Question number | Answer | Mark |
|---|---|---|
| **10(g)** | Moon's orbit does not lie on the ecliptic<br>    or<br>They are not exactly in line<br>    or<br>They are not in perfect alignment<br>    or<br>Moon's orbit inclined | **(1)** |