Diploma Programme
Programme du diplôme
Programa del Diploma

Astronomy
Standard level
Paper 1

Thursday 26 April 2018 (afternoon)

45 minutes

Candidate session number

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- A clean copy of the **astronomy data booklet** is required for this examination paper.
- The maximum mark for this examination paper is **[30 marks]**.

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Answer **all** questions. Answers must be written within the answer boxes provided.

The Stars

1.   The photograph shows part of the Sun, viewed in H−α light.

[https://solarscience.msfc.nasa.gov]
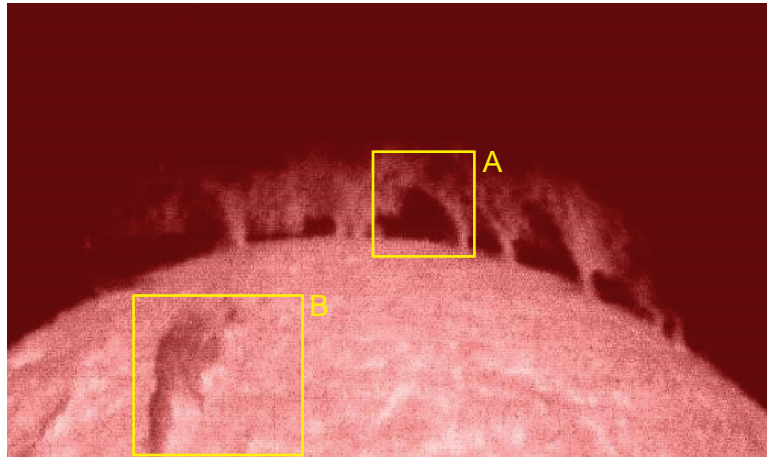
(a)   Identify the structures labelled A and B on the photograph.   [1]

A: . . . .

B: . . . .

(b)   Outline the relationship between structures A and B.   [1]

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(c)   Outline the advantage of viewing the Sun at specific wavelengths, such as H_α and Ca II.   [1]

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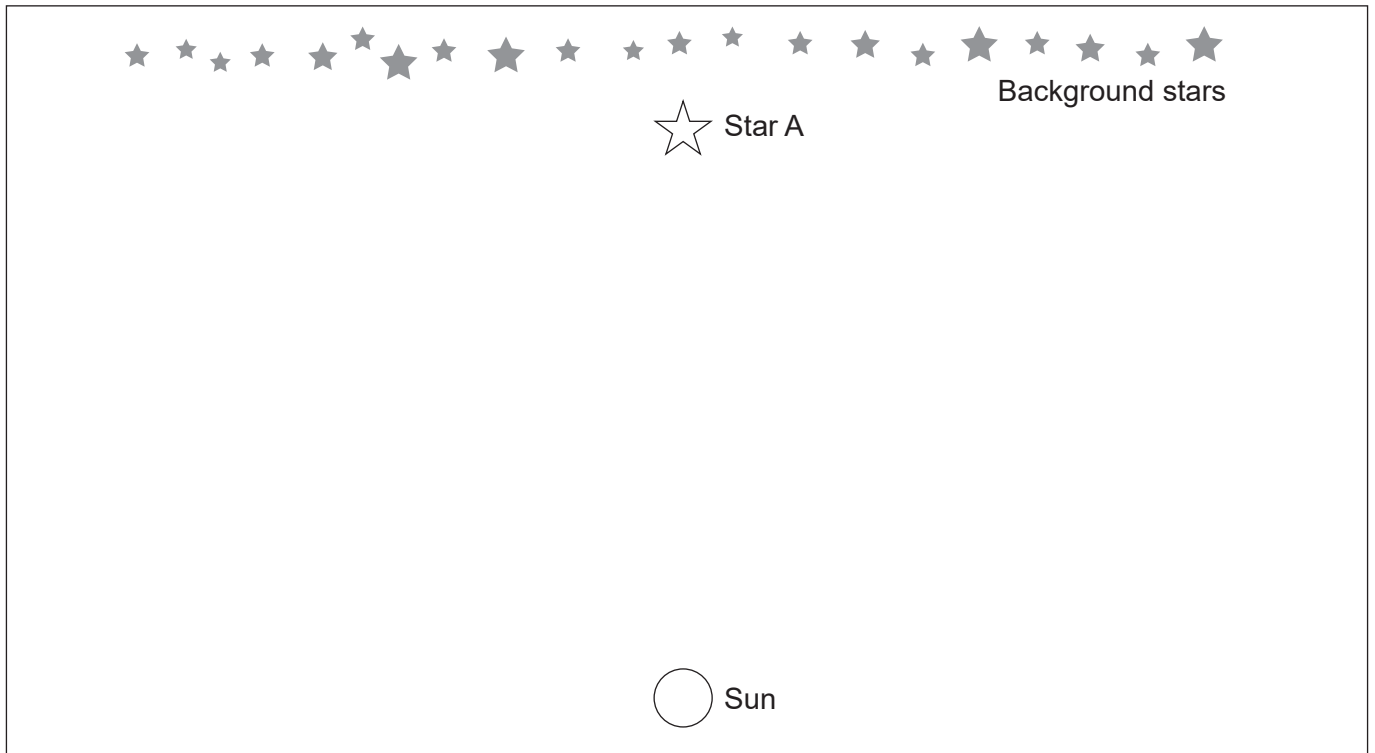
2. Explain, using the diagram, how the distance to star A can be calculated using stellar parallax. [3]

diagram not to scale

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3. Protostars are observed as luminous, red objects, even though they are not generating energy through nuclear fusion. Explain why protostars emit in visible wavelengths. [3]

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The Planets

4. Both electrical forces and gravitational forces are significant during the early formation
    of planets. Identify the role of each force in this process.   [2]

    Electrical: . . . .

                     . . . .

    Gravitational: . . . .

                     . . . .

5. Earth has a nitrogen–oxygen atmosphere, while Venus has a carbon dioxide–nitrogen
    atmosphere. However, both Venus and Earth are of similar size and had similar
    early atmospheres.

    (a) Explain the difference between the current carbon dioxide levels on Venus in
         comparison to those currently on the Earth.   [2]

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    (b) Venus has a much higher surface temperature than expected due to the higher levels
         of carbon dioxide in its atmosphere. Explain why.   [3]

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6. Ground-based telescopes frequently scan the wavelengths between 18 cm and 21 cm in the search for extra-terrestrial life. Identify **two** advantages of searching between these wavelengths. [2]

1: . . . .

. . . .

2: . . . .

. . . .

Galaxies

7.   (a)   Distinguish between the locations of Population I and Population II stars in the Milky Way.   [1]

Population I: . . . .

Population II: . . . .

(b)   Population I stars are younger than Population II stars. Explain how the composition of Population I stars supports this.   [3]

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8.   Type Ia supernovae can be used to measure the distance to distant galaxies.

(a)   Identify the characteristics of type Ia supernovae that make them useful for measuring distance.   [2]

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(b)   Identify **one** disadvantage of using type Ia supernovae for measuring distance.   [1]

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Cosmology

9. In the 1970s, a published estimate for the Hubble constant was about $55\,\text{kms}^{-1}\,\text{Mpc}^{-1}$.

    (a)   Based on this estimate, calculate the approximate age of the universe. [1]

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    (b)   Suggest the main assumption made when calculating your answer in part (a). [1]

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    ....

    (c)   In 2014, a scientific paper announced a refined Hubble constant of $69.6 \pm 0.7\,\text{kms}^{-1}\,\text{Mpc}^{-1}$. Explain why astrophysicists are continuing research to measure the Hubble constant. [1]

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10. Gravitation was first formally described by Newton, and later by Einstein. Distinguish between their views of gravity. [2]

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Please **do not** write on this page.

Answers written on this page
will not be marked.