

Question 30 — Astrophysics (25 marks)

- (a) (i) The star Algol is an eclipsing binary as viewed from Earth. 2

Describe the observations made by astronomers to identify a star as an eclipsing binary.

- (ii) Binary stars are important in determining stellar masses. 4

Explain how the total mass of a binary star system can be calculated.

- (b) The table gives information about various nearby stars.

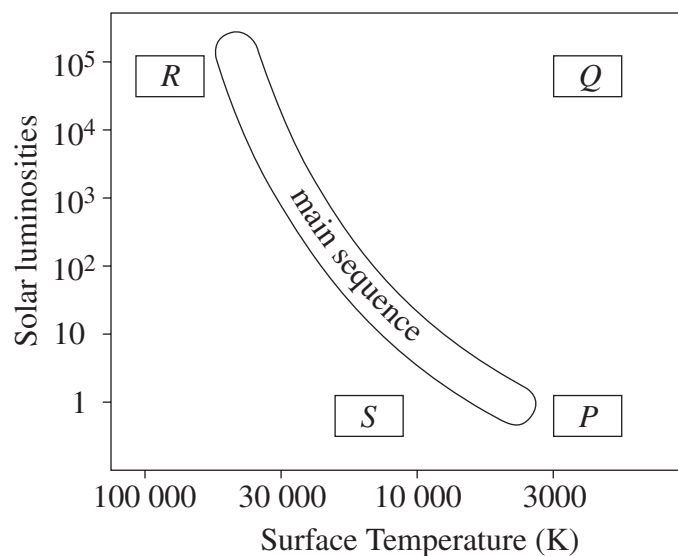
<i>Star</i>	<i>Distance (parsecs)</i>	<i>Apparent visual magnitude</i>	<i>Colour Index</i>
Proxima Centauri	1.29	11.01	1.90
Barnard's Star	1.82	9.54	1.74
Lalande 21185	2.55	7.49	1.51
Ross 154	2.97	10.37	1.75

- (i) Which star from the table is the most blue in colour? 1
- (ii) Calculate how much brighter Ross 154 is than Proxima Centauri when viewed from Earth. 2
- (iii) Sketch a labelled diagram indicating the information required to use the trigonometric parallax method to determine the distance to Barnard's Star. 3

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Question 30 (continued)

(c) An H-R diagram can be used to show the evolutionary track of stars.



- (i) Select the position *P*, *Q*, *R* or *S* on the H-R diagram in which white dwarfs would be found. Justify your choice. 2
- (ii) A white dwarf is considered to be in a stable condition. Explain why a white dwarf does not continue to shrink in size. 2
- (iii) Describe ONE nuclear reaction taking place in a star located on the main sequence. 2
- (d) Discuss how the development of adaptive optics and at least one other development have improved resolution and sensitivity of ground based astronomy. 7

End of Question 30