

Tutor Marked Assignment

S281 02

Make sure you know how to complete and send in your TMA and PT3 form: detailed instructions are given in your student handbook (or supplement).

Covering: **Project work, Block 1, Chapters 3 and 4, and Block 2, Chapters 1–3**

Cut-off date:

Friday 26 May 1995

This assignment consists of four questions.

You are strongly advised to do Questions 1 and 2 before you embark on your study of Block 2.

Question 1

This question relates to the project work, and carries 50% of the marks for this assignment.

This question is centred on project write-up. IT IS MOST IMPORTANT that you follow the advice given in Section 2.5 of the *Project file*, including the organization of a write-up into sections, and the suggested lengths of each section. *The total length of your write-up should not exceed about 1200 words, plus sketches and graphs.*

There are two options – **CHOOSE ONLY ONE OF THEM.**

Option 1

Present your write-up of the project *The difference in length between the sidereal day and the mean solar day.*

Option 2

Present your write-up of the project *The luminosity of the Sun.*

*For Option 1 only, you can use back-up data that we supply on your request (see the *Project file* for details). If you choose Option 1, and your write-up is based on the back-up data, then all marks are still available to you provided that (under observational/measurement procedure)*

- you include a description of any observational efforts of your own, and/or your reasons for resorting to our data, and
- you describe our data, and how you used them.

If you did not obtain our data, yet have insufficient data of your own for a full write-up, then proceed as far as you can.

Question 2

This question relates to Book 1, Chapters 3 and 4, and carries 20% of the marks for this assignment.

In 200 to 300 words overall, outline the various ways in which the later stages of the evolution of stars can lead to very compact objects, namely (i) white dwarfs, (ii) neutron stars and (iii) black holes.

In your answer

- consider each of the cases (i)–(iii) in turn
- concentrate on stars that evolve on their own, but briefly consider the possible consequences when a star is influenced by a close companion
- include a brief statement of the force that prevents a white dwarf from contracting further, and of the force that prevents neutron star contraction.

Question 3

This question relates to Book 2, Chapters 1 and 2, and carries 18% of the marks for this assignment.

The asteroid catalogued as 1993 KA₂ is thought to be only about 6 m across, and is one of the smallest to have had its orbit determined. It was discovered in May 1993 as it passed within a few hundred thousand miles of the Earth. The semi-major axis of its orbit is 2.227 AU. Its closest approach to the Sun (perihelion) is about 0.50 AU and its furthest point (aphelion) is about 3.95 AU.

(a) (4 marks) Calculate the period of 1993 KA₂'s orbit around the Sun, expressing your answer in years. *Show your working.*

(b) (2 marks) (i) Bearing in mind 1993 KA₂'s nearest and furthest points from the Sun, suggest an appropriate term from Book 2 to describe it. *(a few words)*

(ii) 1993 KA₂ is too faint for its brightness at different wavelengths to have been determined. Bearing in mind that the semi-major axis of 1993 KA₂'s orbit is an expression of its average distance from the Sun, suggest to which colour type it is most likely to belong.

(a few words)

(c) (12 marks) (i) Recount, in your own words, theories for the origin of the asteroids in general (i.e. not specifically those similar to 1993 KA₂), making it clear