Course and assignment number:
S281 41

Computer Marked Assignment

Make sure you know how to use the CMA form: detailed instructions are given in your student handbook (or supplement).
You are strongly advised to attempt every question in this assignment.
If you do not wish to answer a question, pencil across the 'don't know' cell ('?').
If you think that a question is unsound in any way, pencil across the 'unsound' cell ('U') *in addition to* pencilling across either an answer cell or the 'don't know' cell.
Note For each question, you **must** *pencil across* **either** *the required number of answer cells* **or** *the 'don't know' cell.*

Covering: **Block 1**

Cut-off date:
Friday 29 April 1994

PART A

This part relates to Block 1, Chapters 1–4, and carries 60% of the marks for this assignment.

Q1 Under normal conditions, we cannot see the solar corona. The reason is partly that the corona *scatters* only a small fraction of the light emitted by the photosphere, and partly that coronal *emission* is weak. Why is coronal emission weak? Select *one* reason from the key, and pencil across *one* cell in row 1.

KEY for Q1

A The corona is far hotter than the photosphere.

B The radial thickness of the corona is far greater than that of the photosphere.

C The corona has holes.

D The corona has a very low density.

E The corona is not appreciably heated by radiation from the photosphere.

Q2 Images of the solar corona are readily obtained at 530.3 nm, a line emitted by Fe^{13+}. Why is this emission line so prominent in the corona? Select *one* reason from the key, and pencil across *one* cell in row 2.

KEY for Q2

A The photosphere does not emit at this wavelength.

B The chromosphere completely absorbs this wavelength.

C The abundance of Fe^{13+} is particularly high in the corona.

D The corona consists largely of heavy elements.

E The photons are all emitted in our direction.

Limited Marketing

Q3 Consider the following features of the Sun:

(i) The geometrical form of the corona

(ii) The fraction of the photosphere covered by sunspots

(iii) The fraction of the photosphere covered by plages

(iv) Solar flares

(v) Solar prominences

Which of these features are correlated with the Sun's activity cycle? Select *one* set of features from the key, and pencil across *one* cell in row 3.

KEY for Q3

A All of (i)–(v)
B All except (iii)
C All except (iv)
D All except (v)
E Only (i)–(iii)
F Only (i) and (ii)
G Only (ii) and (iv)
H Only (ii)

Q4 Observations of a binary star have provided the following data:

- the orbital period is 23.5 years,
- the semimajor axis of the orbit of one star with respect to the other is 14 AU,
- the more massive star lies very close to the centre of mass of the binary.

Calculate the mass of the more massive star. Select from the key the value closest to yours, and pencil across *one* cell in row 4.

KEY for Q4

A $1\,M_\odot$
B $3\,M_\odot$
C $5\,M_\odot$
D $7\,M_\odot$
E $9\,M_\odot$
F $11\,M_\odot$