(d) *(4 marks)* The reactions of the CNO cycle are:

$$^{12}_{6}\mathrm{C} + {}^{1}_{1}\mathrm{H} \longrightarrow {}^{13}_{7}\mathrm{N} + \gamma$$

$$^{13}_{7}\mathrm{N} \longrightarrow {}^{13}_{6}\mathrm{C} + e^{+} + \nu$$

$$^{13}_{6}\mathrm{C} + {}^{1}_{1}\mathrm{H} \longrightarrow {}^{14}_{7}\mathrm{N} + \gamma$$

$$^{14}_{7}\mathrm{N} + {}^{1}_{1}\mathrm{H} \longrightarrow {}^{15}_{8}\mathrm{O} + \gamma$$

$$^{15}_{8}\mathrm{O} \longrightarrow {}^{15}_{7}\mathrm{N} + e^{+} + \nu$$

$$^{15}_{7}\mathrm{N} + {}^{1}_{1}\mathrm{H} \longrightarrow {}^{12}_{6}\mathrm{C} + {}^{4}_{2}\mathrm{He}$$

Show that the overall reaction is

$$4\,{}^{1}_{1}\mathrm{H} \longrightarrow {}^{4}_{2}\mathrm{He} + 2e^{+} + 3\gamma + 2\nu$$

and that $^{12}_{6}\mathrm{C}$ acts as a catalyst.

Question 4

This question relates to the whole of Block 1, in particular the skill of writing a non-technical account of a scientific topic. It carries 25% of the marks for this assignment.

The skill of writing a non-technical account of a scientific topic has broad applications. To make it more specific you have to imagine here that you are writing an article for your local newspaper – **please listen to audio band 1, *Writing a newspaper article*, for general advice before you tackle this exercise.** However, it is important for you to realize that the skills that this exercise will help you to develop are relevant to many other sorts of written communication of a scientific topic to a non-scientific audience.

For your article, marks are available as follows:

- *5 marks* for the evidence it contains showing that you understand the topic.
- *20 marks* for its effectiveness as a piece of written communication.

The article should address ONE of the following options. In either case, it *must be 300–500 words in length.*

Option 1

On 11 August 1999 a total solar eclipse will be visible from Cornwall, lasting a little over 2 minutes. Imagine that you are writing an article to tempt people to make the journey to see it. You will need to explain what causes such an eclipse, and explain what will be seen – notably solar prominences and the corona. You must warn people not to look at the Sun until the eclipse is total. Mention the British weather!

Option 2

Imagine that it has been discovered that the Sun is part of a binary system in which the companion is a brown dwarf in a highly elliptical orbit with an orbital period of about 10^6 years. It is getting closer and is just about visible in the night sky (without optical aid) roughly in the direction of Betelgeuse (in Orion)! In your article, explain

- what a brown dwarf is
- why it has been previously invisible in recorded history
- where to find the brown dwarf in the sky

Do reassure your readers that it will not collide with the Earth!

You are strongly advised to do Questions 1 and 2 of TMA02 (the next TMA) BEFORE you embark on your study of Block 2.