8 The spectrum of sunlight has dark lines. These dark lines are due to the absorption of photons of certain wavelengths by the cooler gases in the atmosphere of the Sun.

Fig. 8.1 shows some of the energy levels of an isolated atom of helium.

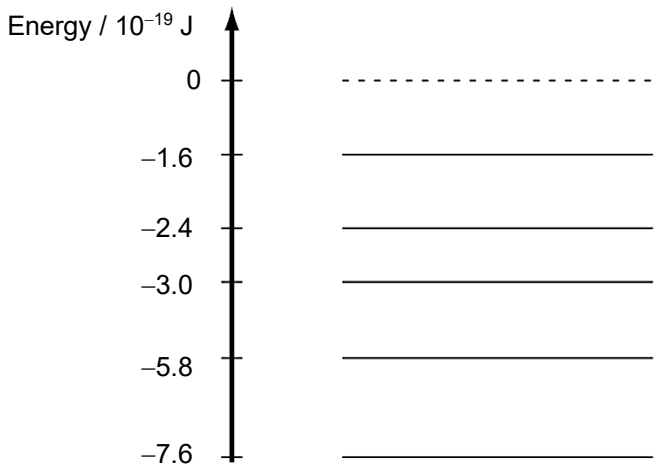

Fig. 8.1

(a) Explain the significance of the energy levels having negative values.

.....

.....

..... [1]

(b) **(i)** One particular dark spectral line has a wavelength of 590 nm.

Calculate the energy of a photon with this wavelength.

energy = ... J [2]

(ii) Hence, with reference to a possible transition in Fig. 8.1, explain how there could be presence of helium in the atmosphere of the Sun.

.....

.....

..... [2]

(c) All the light absorbed by the atoms in the Sun's atmosphere is re-emitted.

Suggest why a dark spectral line of wavelength of 590 nm is still observed from the Earth.

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..... [1]