

- 7 (a) Explain how a line emission spectrum leads to an understanding of the existence of discrete electron energy levels in atoms.

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 ..... [3]

- (b) Some of the lines of the emission spectrum of atomic hydrogen are shown in Fig. 7.1.



**Fig. 7.1**

The photon energies associated with some of these lines are shown in Fig. 7.2.

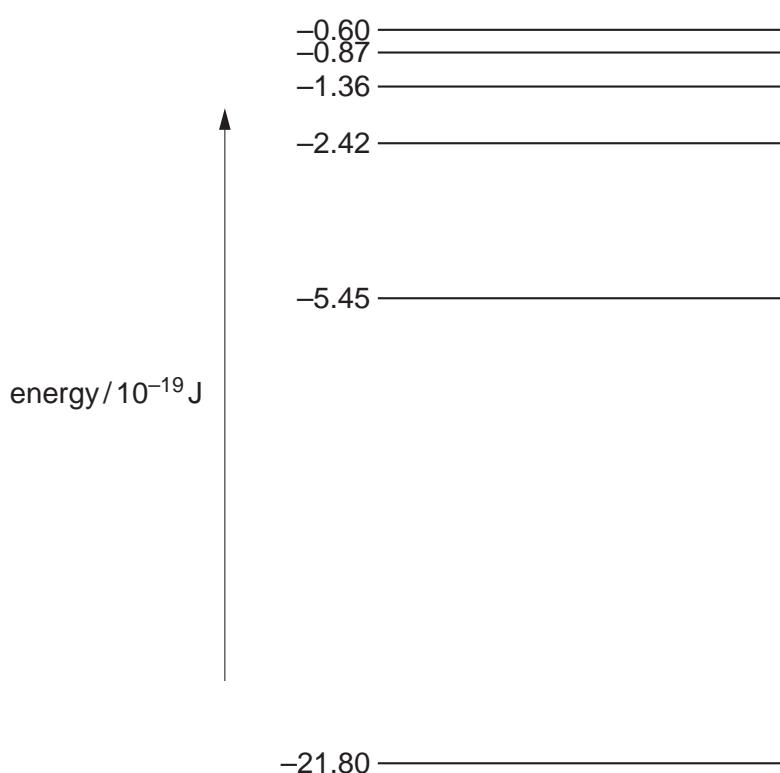
wavelength/nm	photon energy/ $10^{-19}\text{ J}$
410	4.85
434	4.58
486	.....
656	3.03

**Fig. 7.2**

- (i) Complete Fig. 7.2 by calculating the photon energy for a wavelength of 486 nm.

[2]

- (ii) Energy levels of a single electron in a hydrogen atom are shown in Fig. 7.3.



**Fig. 7.3** (not to scale)

Use data from (i) to show, on Fig. 7.3, the transitions associated with each of the four spectral lines shown in Fig. 7.1. Show each transition with an arrow. [2]