7 **(a)** Explain what is meant by a *photon*.

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..... [2]

(b) A beam of white light passes through a cloud of gas. The spectrum of the transmitted light contains a number of dark lines.

Explain why these dark lines occur.

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..... [4]

(c) Some electron energy levels in a hydrogen atom are illustrated in Fig. 7.1.

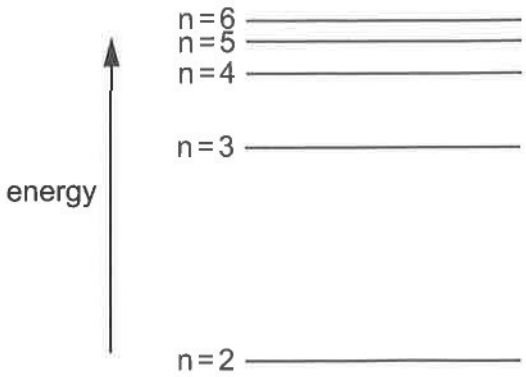

Fig. 7.1

The energy E in eV of each energy level may be determined using the expression

$$E = \frac{-13.6}{n^2}$$

where n is the energy level.

(i) Calculate the energy, in eV, of energy level $n = 2$.

energy = ... eV [1]

(ii) Determine the wavelength λ of light absorbed when an electron in energy level $n = 2$ is excited to energy level $n = 3$.

λ = ... m [3]

(iii) Explain why the energy of each energy level is negative.

.....

..... [1]

[Total: 11]