

- 6** A beam of light consists of a continuous range of wavelengths from 420 nm to 740 nm. The light passes through a cloud of cool gas, as shown in Fig. 6.1.

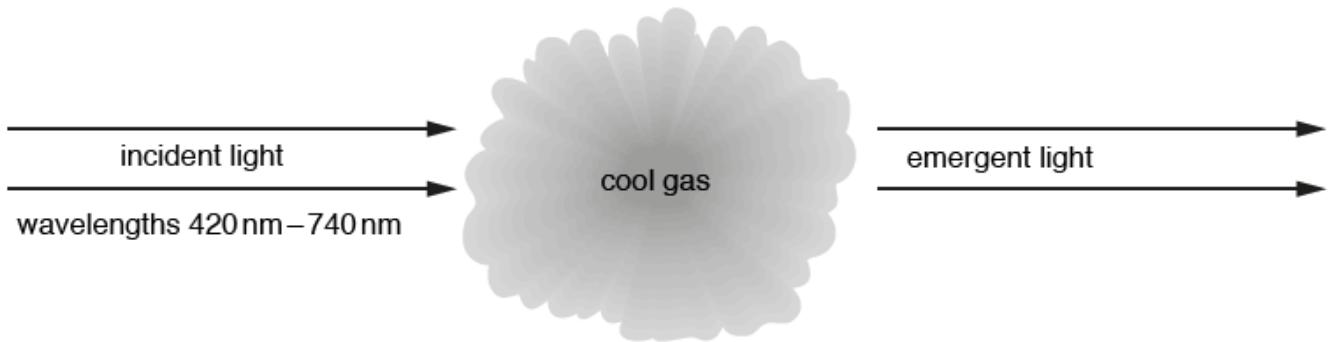


Fig. 6.1

- (a) State what is meant by a *photon*.

..... [1]

- (b) The spectrum of the light emerging from the cloud of cool gas is viewed using a diffraction grating.

Explain why this spectrum contains several dark lines.

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[4]

- (c) Some of the electron energy levels of the atoms in the cloud of gas are represented in Fig. 6.2.

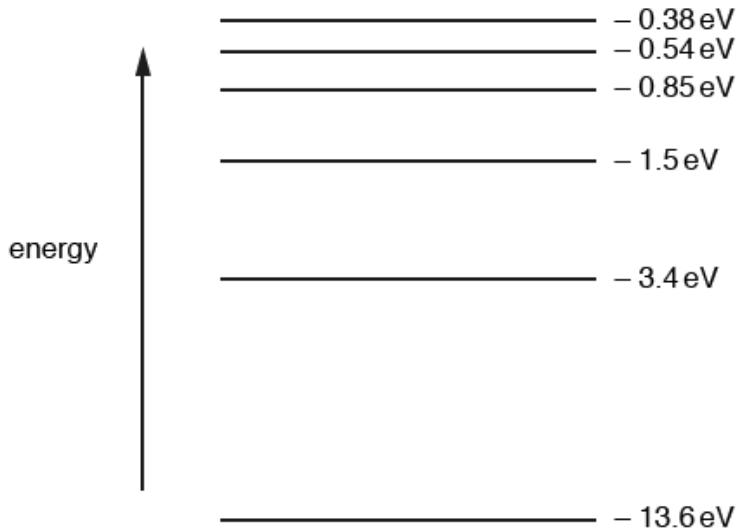


Fig. 6.2 (not to scale)

- (i) Show that the photon energy, in eV, of light of wavelength 420 nm and 740 nm are 2.96 eV and 1.68 eV respectively.

[2]

- (ii) Use data from (c)(i) to show, on Fig. 6.2, the changes in energy levels, giving rise to the dark lines in (b).

[2]

- (d) Calculate the speed of an electron having a de Broglie wavelength equal to the shortest wavelength of the beam of light.

speed = m s^{-1} [2]

[Total: 11]

