

A Level Physics A
H556/01 Modelling physics

Question Set 9

1 (a)

Fig. 21.1 shows some of the energy levels of electrons in hydrogen gas atoms. The energy levels are labelled **A**, **B**, **C** and **D**.

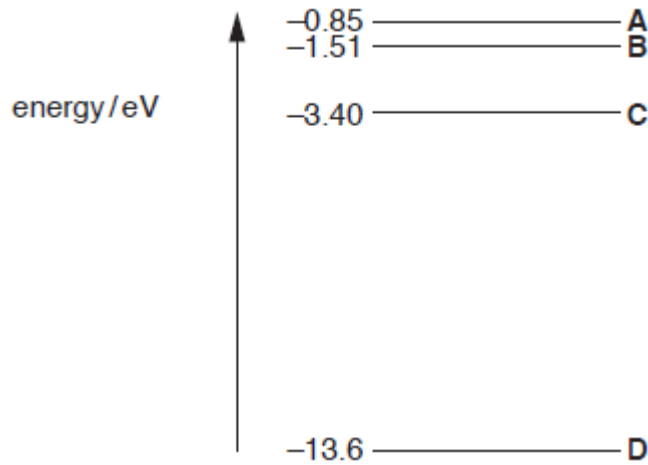


Fig. 21.1 (not to scale)

(i) Explain why the energy levels are negative. [1]

(ii) An electron makes a transition (jump) from level **C** to level **A**.

1 Calculate the energy gained by this electron.

energy = eV [1]

2 Calculate the wavelength in nm of the photon absorbed by this electron.

wavelength = nm [3]

- (b) Light from a distant galaxy is passed through a diffraction grating. Fig. 21.2 shows the part of the spectrum of light that shows a strong hydrogen-alpha emission line.

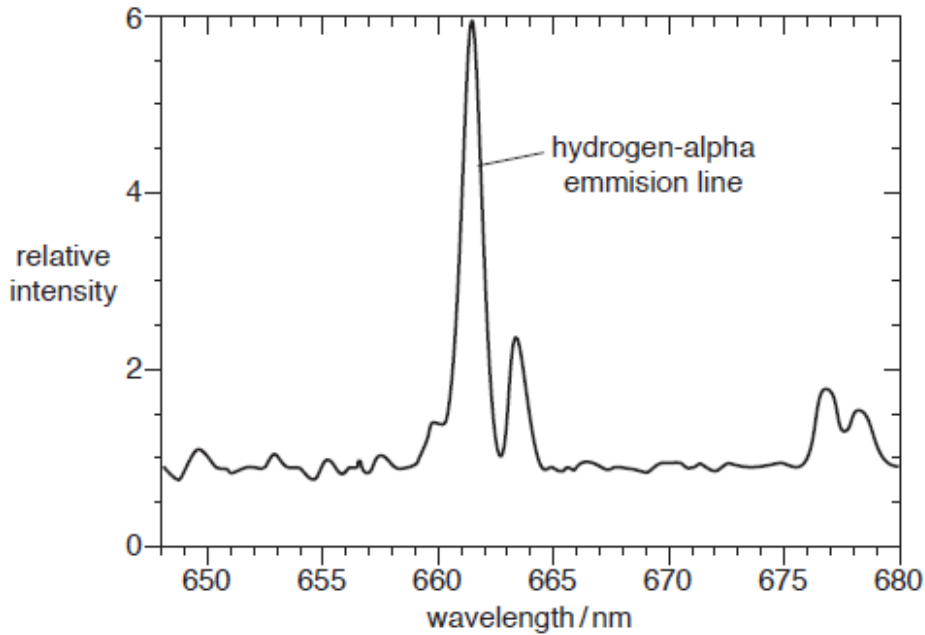


Fig. 21.2

- (i) State how an emission line is produced. [1]
- (ii) State an adjustment that could be made to the experimental arrangement that would space the emission lines more widely. [1]
- (iii) In the laboratory, the wavelength of the hydrogen-alpha emission line is 656.3 nm. Use Fig. 21.2 to determine the recession velocity of the galaxy.
- recession velocity = ms^{-1} [3]
- (iv) Suggest why hydrogen spectral lines play an important role in determining red shift of galaxies. [1]
- (c) Light from a similar star is viewed in a galaxy **further** away. The star is part of a pair of stars which orbit a common centre of mass. Describe and explain how the equivalent spectrum might appear. [3]

Total Marks for Question Set 9: 14

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