

Fig. 7.1 (drawn to scale)

Fig. 7.2 shows the lines in the emission spectrum of the atom that correspond to the transitions of the electron from $n = 3$ to $n = 1$ and from $n = 4$ to $n = 1$.

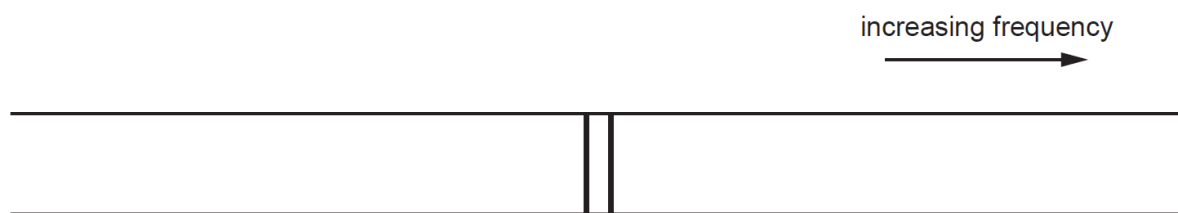


Fig. 7.2

- (a) Explain, with reference to photons, why there is a single frequency of electromagnetic radiation that corresponds to each of these transitions.

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 [2]

- (b) (i) On Fig. 7.2, draw a line that corresponds to the transition of the electron from $n = 2$ to $n = 1$.

Label this line A.

[1]

- (ii) On Fig. 7.2, draw a line that corresponds to the transition of the electron from $n = 3$ to $n = 2$.

Label this line B.

[1]

- (c) The frequency of radiation represented by line A is f_A .
The frequency of radiation represented by line B is f_B .
The energy of the ground state ($n = 1$) is E_1 .

Determine an expression, in terms of f_A , f_B , E_1 and the Planck constant h , for the energy E_3 of the energy level $n = 3$.

$$E_3 = \dots\dots\dots [2]$$