Exercise 5.13

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note: $n=1$ is the ground state

a) The energy of each electron is $E = \frac{Z^2}{n^2} E_1 = \frac{2^2}{2^2} \cdot -13.6 = -13.6\,eV$

Now, we have 2 electrons; so, their total energy is $2 \cdot -13.6\,eV = -27,2\,eV = 2E_1$

We put one electron back in the ground state, which means it will now have energy $E = \frac{Z^2}{n^2} E_1 = \frac{4}{1} E_1 = 4E_1$

Then, the other emitted electron must obtain 'the difference of the energies; that is, it will have energy $2E_1 - 4E_1 = -2E_1 = +27,2\,eV$

b) your answers as appropriate multiples of the hydrogen values.) Where in the electromagnetic spectrum would the Lyman series fall, for $Z = 2$ and $Z = 3$? *Hint:* There's nothing much to *calculate* here—in the potential (Equation 4.52) $e^2 \rightarrow Ze^2$, so all you have to do is make the same substitution in all the final results.

(exercise 4.19)

In essence, all that needs to be done is replace e^2 by Ze^2; as R is proportional to $(e^2)^2$, this means we need to ~~replace~~ multiply equation 4.93 by Z^2, and we're done:

$$\frac{1}{\lambda} = Z^2 R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$