Series N° 3 Bohr's Atom

Exercice 1 :

1. According to Bohr's model, what is the expression for radius, velocity and total energy of an electron in n^{th} orbit).

2. A photon is emitted as an atom makes a transition from n = 4 to n = 2 level.

- What is the frequency, wavelength and energy of the emitted photon?

3. For the Balmer series, what is the longest and shortest wavelength possible? Is any of the frequency of Lyman series, which corresponds to transitions where electron ends up in n = 1 level, in the visible region? (Frequency range of visible light is from 4×10^{14} to 8×10^{14})

4. A Hydrogen atom initially in its ground state, absorbs a photon and ends up in n = 4 level.

- What must have been the frequency of the photon? Now the electron makes spontaneous emission and comes back to the ground state.

- What are the possible frequencies of the photons emitted during this process.

5. If the electron in a hydrogen atom were in the energy level with n=3.

- How much energy in joule would be required to ionize the atom?

6. If an electron in a hydrogen atom has an energy of -6.06×10^{-20} J.

- Which Bohr orbit is it in?

7. An electron in a hydrogen atom in its ground state absorbs energy equal to the ionization energy of Li^{+2}.

- Calculate the wavelength of the emitted electron.

8. What is the wavelength (in Å) and frequency (in Hz) of a photon emitted when an electron undergoes a change of energy of -8.69×10^{-17} J as an atom relaxes from a high energy state to a lower energy state?

9. A photon of 9560 Å is emitted from a hydrogen atom as an electron relaxes from a high energy level (ni) to the n = 3 level.

- Determine the value of ni of the electron.

Data : h = $6{,}62.10^{-34}$ J.s ; c = 3.10^{8} m/s, R_H=$1{,}097.10^{7}m^{-1}$; 1 eV = $1{,}6.10^{-19}$ J ; E_H = -13,6 eV

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