

SET 3

EXERCISE 1

- 1/ Calculate the radius of the first and second energy levels of the He^+ ion.
- 2/ Find the energies for the ground state and for $n = 2$ and $n = 3$, as well as the $n \rightarrow \infty$ limit. Draw the energy level diagram.
- 3/ Determine the change in energy for the electron in its transitions from the ground state to the first and second excited states,
- 4/ Determine the ionization energy of hydrogen atom and of the He^+ ion.

EXERCISE 2

- 1/ The light radiation with a wavelength $\lambda = 28,08\text{nm}$ causes the ionization of an unknown hydrogen-like atom X.
 - 1.a/ Calculate the ionization energy of the ion.
 - 1.b/ Deduce its atomic number Z and specify the ion's charge.
- 2/ For the hydrogen like ion C^{5+} in its second excited state, determine the orbital period of the electron.

EXERCISE 3

- 1/ How much energy must a hydrogen atom absorb for its electron to move from the ground state to the third excited state?
- 2/ How many spectral lines are emitted by a hydrogen atom when it is raised to the third excited state? Classify them by series. Which transition corresponds to the longest wavelength (without calculation)?

EXERCISE 4

- 1/ In the hydrogen atom's emission spectrum, a line corresponds to an energy transition of 2.85 eV. Assign this line to a spectral series and identify the corresponding electronic transition.
- 2/ You are given the wavelengths of the three emission lines of He^+ .

$$\lambda_1 = 468.9 \text{ nm} ; \lambda_2 = 320.5 \text{ nm} ; \lambda_3 = 273.5 \text{ nm}$$

Assign each line to its electronic transition and indicate the spectral domain it falls into.