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Faculty of Mathematics & Matter Sciences
Department of Chemistry



Year: 2023\2024 **Course:** Chemistry 1 **Level:** First year

TD N4: Electronic structure of atom

Exercise 01 :

We apply Bohr's theory to the electron of the hydrogen atom, which is characterized by $n=2$.

1) Calculate without demonstration

a- The radius of this orbit in Å .

b- The energy of the electron in eV.

2) find the speed of the electron in the hydrogen atom in the fundamental state, then in the excited state for $n = 3$.

Exercise 02 :

The binding energy of the electron to the nucleus of the hydrogen atom can be put in the form: $E_n = -13.6/n^2$ where n is an integer and E_n is expressed in electronvolts (eV).

1- Write this expression for the total energy by expressing E_n in the SI system.

2- Calculate the energies which correspond to the first three levels and give the level diagram energy levels.

Exercise 3 :

1) Establish the electronic configuration of the following elements: ${}_{28}\text{Ni}$, ${}_{18}\text{Ar}$, ${}_{14}\text{Si}$, ${}_{16}\text{S}$, ${}_{46}\text{Pb}$

2) Calculate the Z effectiveness of each element.

3) Calculate for each element the orbit radius of the electron located on the last layer

4) Calculate in (eV) then in joules, for each element the energy of the electron located on the last layer.

Exercise 4:

- 1) Are the following series of values for the quantum numbers characterizing an electron possible or not? Justify your answer.

a- $n = 2, l = 0, m = 0$

b- $n = 2, l = 1, m = -1$

c- $n = 2, l = 2, m = 0$

d- $n = 4, l = 1, m = -2$

2) Here are electronic structures written using quantum boxes. Correct those that are not correct



3) We give the electronic structures of the last layer of two elements X and Y. Which ones do not respect Klechkowski's rules.

Explain.

a) X : $n s^2 (n-1) d^2$

b) Y : $n s^2 (n-1) d^9$