

Bohr's Hydrogen Atom

PHYS section 11

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January 26, 2016

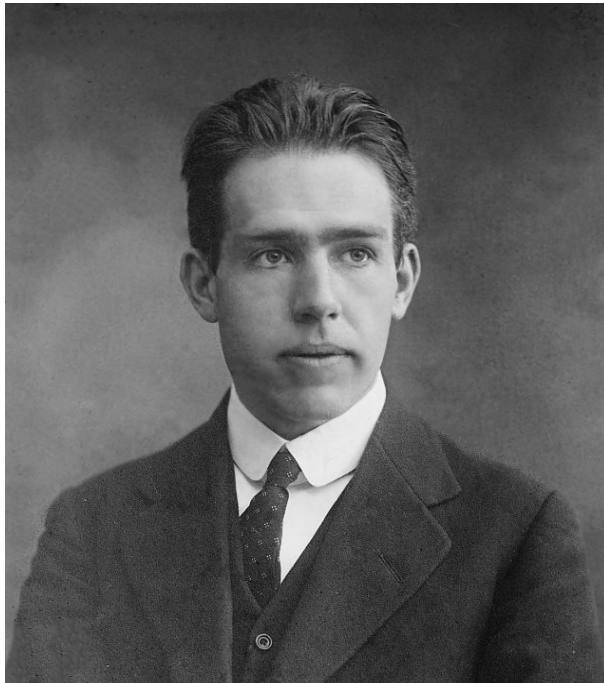


Figure 1: Bohr's picture

1 Bohr's background description

Niels Bohrs is a danish physicists in late 1800s and early 1900s, born in 1885 and pass away at 1962. In 1913, he

is the one who manage to explain the spectrum of atomic hydrogen.

2 Atom

In the hydrogen atom, the nucleus in the center is a very small section of the atom, but it is the majority of the mass because it made up from protons and neutrons. The electron occupies a lot of space in the atom but the effect of the total mass doesnt significantly change. Rutherford is a person who created the model of the structure inside of an atom, where Niels Bohrs put further investigation into the electrons.

3 Explanation

Niels Bohr knew that any changed particles that are moving is been giving off Electromagnetic radiation, as in process, it is loosing energy in the electrons and it will decrease in similar to spiral until it reaches the center of the atom. As it gives off radiation, the wavelength of the radiations varies, because it is different it gives out a spectrum of electromagnetic radiation. The light spectrum is not as smooth as people think it is, it have gaps in between, where the Bohrs theory of the hydrogen atom helps to explain the reason. Apart from electron can explain and view the properties of certain atom, now the Bohr models helps us to explain what is the electron doing and how they are moving. They are moving in discrete energy states.

The electrons moves in a circle that spinning around the center of the atom - nucleus, however, they have different level of shells. The shell of electrons that circle closer to the center of the atom has the lowest energy, as it is, the shell that is far away from the center of the atoms contain the most energy. The shell of electrons count from the center toward the outside. The orbits of the electron are quantized, that there are nothing in between the electrons shell, it is the difference in energy level.

As i mentioned above, the electron is moving like a spiral and each shell has its own energy state, therefore, the electron can be losing energy and gaining energy. Electrons can release energy and fall down to the closest shell to the nucleus. On the other hand, an electron can absorb energy and move to an orbit far away from the nucleus.

If an electron is dropping from shell 6 to shell 1, it release the amount of energy and it gives off those light. because it contain the same wavelength of the drop of energy. The change in the energy fit perfectly the numbers of the light spectrum.

4 Formulae and table data

$$\Delta E = E(\textit{final}) - E(\textit{initial})$$

$$E = hv = \frac{hc}{\lambda}$$

Relaxation	$\Delta E \times 10^{-18}$	λ
E2-E1	1.63	122nm
E3-E1	1.929	103nm
E4-E1	2.034	98nm
E5-E1	2.0832	96nm
E6-E1	2.1097	94nm
$E_{\infty} - E1$	2.17	92nm
E3-E2	0.299	665nm
E4-E2	0.404	492nm
E5-E2	0.453	439nm
E6-E2	0.48	414nm
$E_{\infty} - E2$	0.54	368nm
E4-E3	0.105	1895nm
E5-E3	0.1542	1290nm
E6-E3	0.1807	1101nm
$E_{\infty} - E3$	0.241	825nm
E5-E4	0.0492	4044nm
E6-E4	0.0757	2628nm
$E_{\infty} - E4$	0.136	2292nm
E6-E5	0.0265	7506nm
$E_{\infty} - E5$	0.0868	2292nm
$E_{\infty} - E6$	0.0603	3300nm