

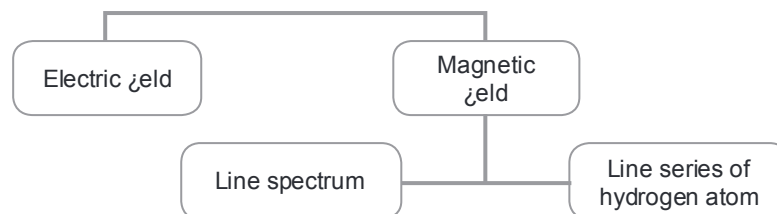
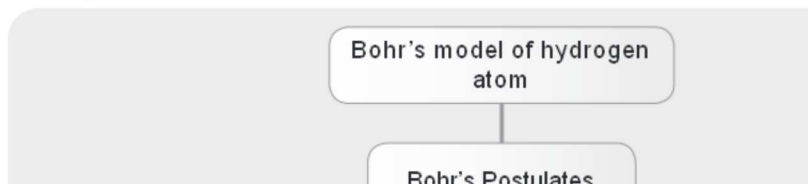
Bohr's Model of Hydrogen Atom

27



Neils Bohr suggested several important postulates in order to describe the behavior of electron in hydrogen atom. Bohr formulated an equation to estimate the minimum radius of a hydrogen atom can have and the energy level of electron based on their orbit.

When a low pressure gas (hydrogen, neon etc.) in sealed tube is subjected to an electric discharge using electrodes placed at both end of the tube, it will emit electromagnetic waves. The individual wavelengths emitted by the gas can be separated (using grating spectroscope) and identified as a series of bright fringes (line spectrum). Each line represents the information of the electron transition.





27.1 Bohr's Atomic Model

LEARNING OUTCOME

You should be able to:

- Explain Bohr's postulates of the hydrogen atom

Bohr's postulates of the hydrogen atom

Postulate 1:

- Electron in the hydrogen atom orbits around the nucleus in a circular path.
- While moving in its orbit, the electron does not emit any radiation and does not lose any energy.

Postulate 2:

- The angular momentum of electron is quantized.
- The angular momentum is an integral multiple of $\frac{h}{2\pi}$.
- The allowed orbits must satisfy

$$L = m_e v_n r_n = \frac{nh}{2\pi}$$

where $n = 1, 2, 3, \dots$

- v_n and r_n are respectively the velocity and radius of the n^{th} orbit.

Postulate 3:

- The electron can make a transition from one orbit to another orbit.
- When making a transition from the outer orbit to an inner orbit, radiation is emitted.
- Electron can also make a transition from the inner orbit to the outer orbit by absorbing radiation.