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Class U.G semester 1st MJC (T)
1st

Session 2025 to 2028.

Sub: $\rightarrow$ Inorganic Chemistry.

Topic Name: — Atomic Structure.

Bohr's Theory, its limitations and atomic spectrum of hydrogen atom: $\rightarrow$ The Bohr's model successfully explained the atomic spectrum of hydrogen by proposing quantized energy levels and electron transitions but its limitation include an inability to explain multi-electron atoms, fine structure in spectral lines, and the relative intensities of lines, as it was a semi classical model that treated electrons as particles in fixed orbits. The hydrogen spectrum consists of discrete lines that correspond to specific energy differences between these quantized levels when an electron moves between them.

Bohr model and hydrogen atomic spectrum:

$\rightarrow$ Quantized energy levels:

Bohr model proposed that electrons orbit the nucleus in specific fixed orbits called energy levels or shells. Each orbit had a specific, quantized amount of energy.

Electron transitions: when an electron moves from a higher energy level to a lower one, it emits a photon of a

specific energy creating a line in the emission spectrum. The energy of this photon corresponds to the difference between the two energy levels.

Spectral lines: The hydrogen spectrum is a series of discrete lines in the ultraviolet, visible, and infrared regions, each corresponding to a specific electron transition.

Limitation of Bohr's theory:

Multi electron atoms: The model fails to explain the spectra of atoms with more than one electron, such as helium.

Fine structure: It could not explain the observation that spectral lines are actually composed of several closely spaced lines when viewed with a high resolution spectroscope.

Line intensities: Bohr's theory did not provide an explanation for why some spectral lines are brighter or more intense than others.

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Heisenberg uncertainty principle:

Bohr's model assumes electrons have well-defined fixed orbits, which violates the Heisenberg uncertainty principle that states you cannot know both the position and momentum of ~~an~~ an electron with perfect accuracy at the same time.
