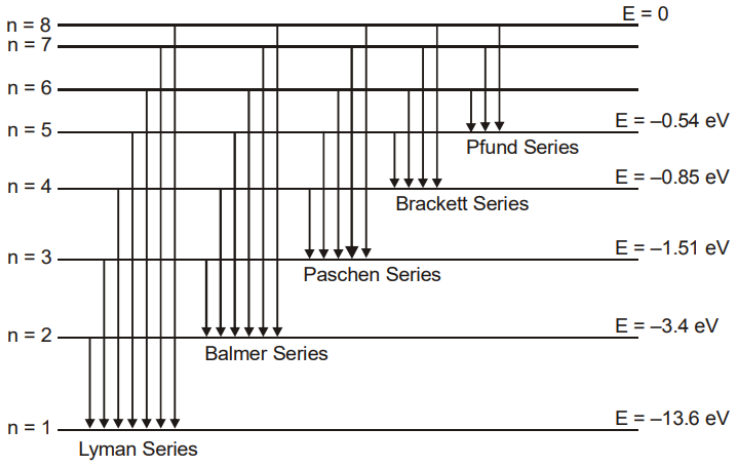
ATOMS

THE LINE SPECTRA OF THE HYDROGEN ATOM

SPECTRAL SERIES OF HYDROGEN ATOM:

The determination of the wavelength for the lines in each spectral series within the Hydrogen Spectrum can be accomplished through the utilization of the formula provided in equation (a). The Hydrogen Spectrum manifests five distinctive series, each aligning with one of the five energy levels of the Hydrogen atom. These series are denoted by the names of their respective discoverers, and they are:

- Lyman Series
- Balmer Series
- Panchen Series
- Brackett Series
- Pfund Series



1. Lyman Series:

The Lyman Series encompasses wavelengths of radiations emitted when an electron transitions from a higher energy level to the $n = 1$ orbit. The wavelengths within this series are situated in the Ultra Violet region of the electromagnetic spectrum. Specifically, for the Lyman Series, the quantum numbers are designated as follows: $n_1 = 1$ and $n_2 = 2, 3, 4$ ….

The initial line within the Lyman series corresponds to the transition from $n_2 = 2$ to $n_1 = 1$, and similarly, the second line in the Lyman series corresponds to the transition from $n_2 = 3$ to $n_1 = 1$

2. Balmer Series:

The Balmer series comprises wavelengths of radiations emitted when an electron transitions from a higher energy level to the $n = 2$ orbit. These wavelengths are located in the visible region of the electromagnetic spectrum.

3. Panchen Series:

The Panchen series encompasses wavelengths of radiations emitted during the electron's transition from a higher energy level to the $n = 3$ orbit. These wavelengths are situated in the Near Infra-Red region of the electromagnetic spectrum.

4. Brackett Series:

The series consists of wavelengths of the radiations which are emitted when electron jumps from a higher energy level to $n = 4$ orbit. The wavelengths constituting this series lie in the Infra-Red region of the electromagnetic spectrum.

5. Pfund Series:

The series consists of wavelengths of the radiations which are emitted when electron jumps from a higher energy level to $n = 5$ orbit. The wavelengths constituting this series lie in the Deep Infra-Red region of the electromagnetic spectrum. We can find out the wavelengths corresponding to the first line and the last line for remaining four spectral series as mentioned in the case of Lyman Series.