Atomic spectrum - Hydrogen spectrum.

Atomic spectrum

(1) Spectrum is the impression produced on a photographic film when the radiation (s) of particular wavelength (s) is (are) analyzed through a prism or diffraction grating. It is of two types, emission and absorption.

(2) Emission spectrum: A substance gets excited on heating at a very high temperature or by giving energy and radiations are emitted. These radiations when analyzed with the help of spectroscope, spectral lines are obtained. A substance may be excited, by heating at a higher temperature, by passing electric current at a very low pressure in a discharge tube filled with gas and passing electric current into metallic filament. Emission spectra is of two types,

(I) Continuous spectrum: When sunlight is passed through a prism, it gets dispersed into continuous bands of different colors. If the light of an incandescent object resolved through prism or spectroscope, it also gives continuous spectrum of colors.

(ii) Line spectrum: If the radiations obtained by the excitation of a substance are analyzed with help of a spectroscope a series of thin bright lines of specific colors are obtained. There is dark space in between two consecutive lines. This type of spectrum is called line spectrum or atomic spectrum.

(3) Absorption spectrum: When the white light of an incandescent substance is passed through any substance, this substance absorbs the radiations of certain wavelength from the white light. On analyzing the transmitted light we obtain a spectrum in which dark lines of specific wavelengths are observed. These lines constitute the absorption spectrum. The wavelength of the dark lines correspond to the wavelength of light absorbed.

Hydrogen spectrum

(1) Hydrogen spectrum is an example of line emission spectrum or atomic emission spectrum.

(2) When an electric discharge is passed through hydrogen gas at low pressure, a bluish light is emitted.

(3) This light shows discontinuous line spectrum of several isolated sharp lines through prism.

(4) All these lines of H-spectrum have Lyman, Balmer, Paschen, Barckett, Pfund and Humphrey series. These spectral series were named by the name of scientist discovered them.

(5) To evaluate wavelength of various H-lines Ritz introduced the following expression,

$$\bar{\nu} = \frac{1}{\lambda} = \frac{\nu}{c} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

Where R is universal constant known as Rydberg's constant its value is 109, 678 cm^{-1} .