$n_I = 1$, $n_{II} = 2, 3, 4 \ldots$ Lyman Series

$n_I = 2$, $n_{II} = 3, 4, 5 \ldots$ Balmer Series Visible

$n_I = 3$, $n_{II} = 4, 5, 6 \ldots$ Paschen Series Near IR

$n_I = 4$, $n_{II} = 5, 6, 7 \ldots$ Brackett Series Far IR

$n_I = 5$, $n_{II} = 6, 7, 8 \ldots$ Pfund Far IR

Reduced Mass: $\mu = \frac{mM}{m+M}$.

Limitations of Bohr's Model: ① Uni electron system/multi-electron system

② Hyperfine splitting

③ Contrary to Heisenberg's Uncertainity principle.

④ Zeeman effect or Stark effect.

Sommerfeld's relativistic atomic model

① The path of an electron around the nucleus, in general, is an ellipse. Circle is the one special case of ellipse.

② The velocity of the electron moving in an elliptical orbit varies considerably at different part of the orbit.

$$E_n = -\frac{2\pi^2 me^4}{(n_\phi + n_r)^2 h^2}$$

Concept of azimuthal qu. no.

$$\int p_\phi \, d\phi = n_\phi h$$

$$\int p_r \, dr = n_r h$$

$$k = (n-1)$$

$$m_{ell} = \sqrt{k(k+1)}\, h/2\pi$$

$$b/a = k/n$$

$n = k + n_r$

$k = n$, when the orbit is circular