1. Estimation of closest distance of approach (derivation) of α-particle : $R = \frac{4KZe^2}{m_\alpha V_\alpha^2}$

2. The radius of a nucleus: $R = R_0(A)^{1/3}$ cm

3. Planck's Quantum Theory: Energy of one photon $= hv = \frac{hc}{\lambda}$

4. Photoelectric Effect: $\mathrm{hv} = hv_0 + \frac{1}{2}m_e v^2$

5. Bohr's Model for Hydrogen like atoms:

- $mvr = n\frac{h}{2\pi}$ (Quantization of angular momentum)
- $E_n = -\frac{E_1}{n^2}z^2 = 2.178 \times 10^{-18}\frac{z^2}{n^2}J/atom =$
- $r_n = \frac{n^2}{z} \times \frac{n^2}{4\pi^2 e^2 m} = \frac{0.529 \times n^2}{z}A$
- $v = \frac{2\pi z e^2}{nh} = \frac{2.18 \times 10^6 \times z}{n}m/s$

6. De-Broglie wavelength:

$\lambda = \frac{h}{mc} = \frac{h}{p}(\text{ for photon })$

7. Wavelength of emitted photon:

$\frac{1}{\lambda} = \bar{v} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

8. Number of photons emitted by a sample of H atom:

$\frac{\Delta n(\Delta n+1)}{2}$

9. Heisenberg's uncertainty principle: $\Delta x.\, \Delta p > \frac{h}{4\pi}$ or $m\Delta x \cdot \Delta v \geq \frac{h}{4\pi}$ or $\Delta x.\, \Delta v \geq \frac{h}{4\pi m}$

10. Quantum Numbers:

- Principal quantum number $(n) = 1, 2, 3, 4 \ldots\ldots$ to ∞.
- Orbital angular momentum of electron in any orbit $= \frac{nh}{2\pi}$
- Azimuthal quantum number $(\ell) = 0, 1, \ldots\ldots$ to $(n-1)$
- Number of orbitals in a subshell $= 2\ell + 1$
- Maximum number of electrons in particular subshell $= 2 \times (2\ell + 1)$
- Orbital angular momentum L = $\frac{h}{2\pi}\sqrt{\ell(\ell+1)} = \hbar\sqrt{\ell(\ell+1)}$ $\left[\hbar = \frac{h}{2\pi}\right]$