

ATOMS, NUCLEI

- atom size $\rightarrow 10^{-10} \text{ m}$
- Nucleus size $\rightarrow 10^{-15} \text{ m}$

* Total energy :-

$$K.E + P.E$$

$$T.E = -\frac{KZe^2}{2a}$$

* Mass defect :-

$$M_{\text{nucleus}} < M_p + M_n$$

$$\Delta M = Zm + (A-Z)m - M_n$$

* energy :-

$$E = E_0 \frac{Z^2}{n^2}$$

$$E_0 = -13.6 \text{ eV}$$

$$E = -13.6 \frac{Z^2}{n^2} \text{ eV}$$

* Binding energy :-

$$B.E = E_b = \Delta mc^2$$

* BE per nucleon :-

$$E_b = \frac{\Delta E_b}{A} \quad B.E \propto \text{Stability per nucleon}$$

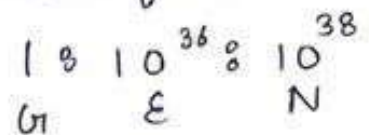
$$* Fe^{56} = 8.76 \text{ MeV/nucleon}$$

* Rydberg's Formula :-

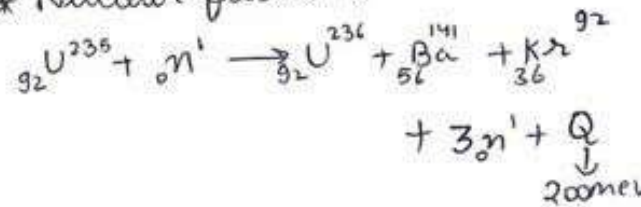
$$\frac{1}{\lambda} = \frac{1}{R} \left[\frac{1}{n_f^2} - \frac{1}{n_i^2} \right]$$

$$R = 1.09 \times 10^7$$

* Nuclear force :-



* Nuclear fusion :-



* Nucleus

$$m_p = 1.66 \times 10^{-27} \text{ kg}$$

$$m_p = 1.0073 \text{ u}$$

$$m_n = 1.67 \times 10^{-27} \text{ kg}$$

$$m_n = 1.0086 \text{ u}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$m_e = 0.00055 \text{ u}$$

$$M_{\text{H atom}} = m_p + m_n$$

$$M_{\text{H}} = 1.0078 \text{ u}$$

* Radius of nucleus :-

$$R = R_0 A^{1/3}$$

$$R_0 = 1.2 \times 10^{-15}$$

* Nuclear density :-

$$\rho = \frac{3m}{4\pi R_0^3} = 2.29 \times 10^{17} \text{ same for all.}$$

* Distance of closest approach :-

$$M = \frac{2KZe^2}{E_k}$$

$$M = \frac{4KZe^2}{mv^2}$$

* Impact parameter :-

$$b = \frac{KZe^2 \cot\left(\frac{\theta}{2}\right)}{E_k}$$

* Bohr's Radius :-

$$M = \frac{H_0 n^2}{Z}$$

$$H_0 = 0.531 \text{ \AA}$$

$$M = 0.53 \frac{n^2}{Z}$$

* Velocity :-

$$V = V_0 \frac{Z}{n}$$

$$1^{\text{st}} \text{ orbit} = V_0 = \frac{c}{137}$$

$$2^{\text{nd}} \text{ orbit}, V_0 = \frac{c}{274}$$

* Time period :-

$$T = \frac{T_0 n^3}{Z^2}$$

* Energy :-

1) Potential energy :-

$$U = -\frac{KZe^2}{a}$$

2) Kinetic energy :-

$$K.E = \frac{KZe^2}{2a}$$