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Atomic Structure

Size of nucleus is very small

radius of atom $(r_A) = 10^{-10}$ m

radius of nucleus $(r_N) = 10^{-15}$ m

$$\frac{r_A}{r_N} = \frac{10^{-10}}{10^{-15}} = 10^5$$

$$\boxed{r_A = 10^5 \times r_N}$$

$$\frac{\text{Vol. of atom}}{\text{Vol. of nucleus}} = \frac{\frac{4}{3}\pi r_A^3}{\frac{4}{3}\pi r_N^3} = \frac{(10^{-10})^3}{(10^{-15})^3} = 10^{15}$$

$$\boxed{\text{Vol. of atom} \simeq 10^{15} \times \text{Vol. of nucleus}}$$

Radius of Nucleus :—

$$\boxed{R = R_0 (A)^{1/3}}$$

A ⇒ Mass no.

R_0 = b/w 1.11×10^{-15} m to 1.44×10^{-15} m

generally $= 1.2 \times 10^{-15}$ m

Calculate radius of Al (A = 27)

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

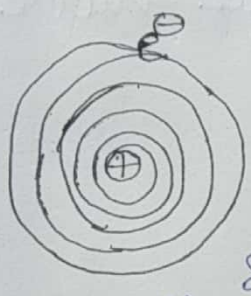
$= 1.2 \times 10^{-15} (27)^{1/3}$

$= 3.6 \times 10^{-15}$ m

Drawback :—

- He could not explain stability of atom.

Maxwell Electromagnetic Theory :—



Acc^{n} to Maxwell, a moving charged Particle lose its energy.

So a $e^{\ominus}$ moving in circular orbit will lose energy & its orbit become smaller & smaller and finally $e^{\ominus}$ falls in nucleus.

- He could not explain H– spectrum

Atomic Number (Z) :— It is no. which represent no. of protons in an atom.

For neutral atom

Z = no. of proton = no. of $e^{\ominus}$

For changed atom

Z = no. of proton

= no. of $e^{\ominus}$ in charged atom + charge on atom

$Na^{\oplus} \rightarrow$ 11 = no. of proton = Z

no. of $e^{\ominus}$ = 10

Z = 10 + 1 = 11

$F^{\ominus}$ no. of proton = 9 = Z

no. of $e^{\ominus}$ = 10

$Z = 10 + (-1) = 9$

Mass Number : (A)

- no. of proton and neutron is called mass no.
- It is also k/n as no. of nucleons (n+p)

$$\boxed{A = n + p}$$

$$A = n + Z$$

$$\boxed{n = A - Z}$$

Representation of an element :—

$$^{A}_{Z}X$$

Ques Find no. of e, P & n

$^{12}_{6}C$ $^{19}_{9}F$ $^{23}_{11}Na^{+}$ $^{27}_{13}Al^{3+}$ $^{16}_{8}O^{-2}$ H_2O CO_2 CO_3^{2-} N^{3-}

e	6	9	10	10	10	10	22	32	10
P	6	9	11	13	8	10	22	30	7
n	6	10	12	14	8	8	22	30	7

40 = 16 + 24

	SO_2	SO_3	H_2SO_4	SO_4^{2-}	S^{-2}	48 / 32 / 80
			2+32+64 = 98	32+64 = 96		
e	32	40	49	50	18	
P	32	40	49	48	16	
n	32	40	47	46	16	