

D. B. College (Jaynagar) Lect - 23

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Part - I

Atomic Structure

Ques  $r_n$  of 2nd E.S of  $Be^{3+}$

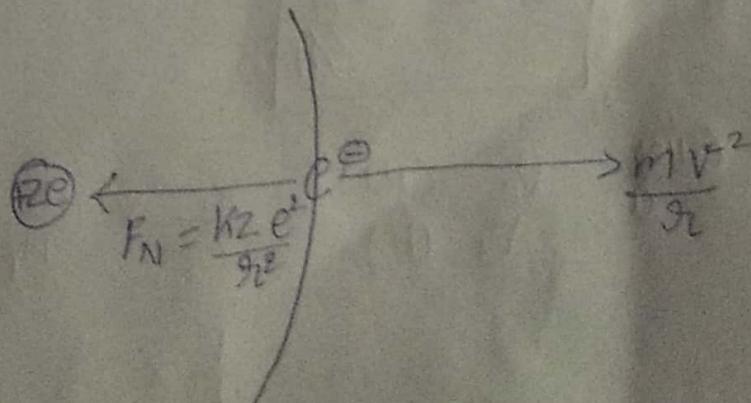
$$r_n = 0.529 \times \frac{n^2}{Z}$$

$$= \frac{4 \cdot 761}{4} = 1.19 \text{ \AA}$$

Ques  $\frac{r_1 \text{ 2nd E.S. of } Li^{2+}}{r_1 \text{ 3rd E.S. of } Be^{3+}} =$

$$\frac{r_1}{r_2} = \frac{83}{164} \times \frac{4}{3} = \frac{3}{4}$$

2. Calculation of velocity :-



$$\frac{kze^2}{r^2} = \frac{mv^2}{r}$$

$$\frac{kze^2}{r} = mv^2$$

$$\frac{kze^2}{r} = (mv)v$$

$$mv^2 r = \frac{nh}{2\pi}$$

$$mv^2 = \frac{nh}{2\pi r}$$

$$\frac{kze^2}{r} = \frac{nh}{2\pi r} \times v$$

$$v = \frac{2\pi kze^2}{nh}$$

$$v = 2.18 \times 10^6 \times \frac{z}{n} \text{ m/s}$$

$$v \propto \frac{z}{n}$$

Time Period

$$T = \frac{2\pi r}{v}$$

$$T \propto \frac{n^2/z}{z/n}$$

Frequency ( $\nu$ )

$$\nu = \frac{1}{T}$$

$$\nu \propto \frac{z^2}{n^3}$$

Ques  
①

$$\frac{\nu_2}{\nu_3} \text{ (H)} = \frac{z_1}{z_2} \times \frac{n_2}{n_1}$$

$$= \frac{1}{1} \times \frac{3}{2} = \frac{3}{2}$$

$$(2) \frac{V_1(H)}{V_1(Li^+)} = \frac{1}{3} \times 1 = \frac{1}{3}$$

$$(3) \frac{V_3(He^+)}{V_2(Be^{3+})} = \frac{2}{4} \times \frac{2}{3} = \frac{4}{12} = \frac{1}{3}$$

$$(4) \frac{T_1(He^+)}{T_3(He^+)} = \frac{1}{27} \times \frac{4}{4} = \frac{4}{108} = \frac{1}{27}$$

$$(5) \frac{T_2(Li^{2+})}{T_3(Be^{3+})} = \frac{8}{27} \times \frac{16}{9} = \frac{27}{35}$$

$$(6) \frac{V_2(H)}{V_2(Be^{3+})} = \frac{Z_1^2}{Z_2^2} \times \frac{n_2^3}{n_1^3}$$

$$= \frac{1}{16} \times \frac{8}{8} = \frac{1}{16}$$

$$(7) \frac{V_3(He^+)}{V_2(Li^{2+})} = \frac{2^2/3^3}{3^2/2^5}$$

Radius

$$(1) r = 0.529 \times 10^{-10} \times \frac{n^2}{Z} \text{ m}$$

$$r = 0.529 \times \frac{n^2}{Z} \text{ \AA}$$

$$r = \frac{n^2}{Z}$$