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Atomic Structure

Ques which of the following Statement is correct

① K.E.1 > K.E.2 > K.E3

② P.E1 < P.E2 < P.E3

③ T.E.3 > T.E.2 > T.E.1

④ all

Ques $E_3(He^+)$ in Kcal/mol

$= -312 \times \frac{4}{9}$

$= -104 \times \frac{4}{3}$

$= -\frac{416}{3} = -137.$

② $E_2(Li^{2+})$ in KJ/mol $= -1312 \times \frac{3^2}{2^1}$ KJ/mol

③ $E_3(Be^{3+})$ in ev/atom $= -13.6 \times \frac{4^2}{3^2}$

④ $E_5(Ne^{9+})$ in J/atom $= -2.18 \times 10^{18} \times \frac{10^2}{5^2}$

$$\Delta E = E_{n_2} - E_{n_1} = -13.6 \times \frac{Z^2}{n_2^2} - \left(-13.6 \times \frac{Z^2}{n_1^2}\right)$$

$$\Delta E = -13.6\, Z^2 \left[\frac{1}{n_2^2} - \frac{1}{n_1^2}\right]$$

Ques $E_2 - E_1$ for He^+

$$E_2 - E_1 = -13.6 \times \frac{2^2}{2^2} - \left(-13.6 \times \frac{2^2}{1^2}\right)$$

$$= 13.6 + 13.6 \times 4$$

$$= 13.6 - 13.6(1-4) = -13.6 \times -3$$

$$= 40.8$$

Ques $\dfrac{E_3 - E_2\ (Li^{2+})}{E_4 - E_3\ (Li^{2+})} = \dfrac{-13.6 \times \frac{3^2}{3^2} - \left(-13.6 \times \frac{3^2}{3^2}\right)}{-13.6 \times \frac{3^2}{4^2} - \left(-13.6 \times \frac{3^2}{3^2}\right)}$

$$\frac{+13.6 \times 3^2\left(\frac{1}{3^2} - \frac{1}{2^2}\right)}{+13.6 \times 3^2\left(\frac{1}{4^2} - \frac{1}{3^2}\right)} = \frac{\frac{1}{9} - \frac{1}{4}}{\frac{1}{16} - \frac{1}{9}} = \frac{\frac{4-9}{36}}{\frac{9-16}{16\times 9}}$$

$$= \frac{\frac{-5}{36}}{\frac{-10}{16\times 9}} = \frac{+5 \times 16^4 \times 8}{+36 \times 10} = \frac{20}{10} = 2$$

Ques Calculate energy of 1st E.S. of Be^{3+}?

$$E = -2.18 \times 10^{-18} \times \frac{Z^2}{n^2}$$

$$= -2.18 \times 10^{-18} \times \frac{16}{4}\,4$$

$$= -8.72 \times 10^{-18}$$

Ques Calculate ratio of energy of 1st E.S. & 2nd E.S. of Li^{2+}?

$$\frac{E_2\ (Li^{2+})}{E_3} = \frac{3^2}{3^2} \times \frac{3^2}{2^2} = \frac{9}{4}$$

Ques If P.E. of H-atom is -6.8 eV then

① K.E. ② T.E. ③ n ④ r_n

① T.E. = -K.E. = 3.4eV

② T.E. = $\frac{P.E}{2}$ = $\frac{-6.8}{2}$ = -3.4eV

③ T.E. = -3.4 = $-13.6 \times \frac{1^2}{n^2}$

$n^2 = \frac{-13.6}{-3.4}$

$n = 2$

④ $r_n = 0.529 \times \frac{n^2}{Z}$

$= 0.529 \times \frac{2^2}{1} = 0.529 \times 4 = 2.116 Å$

Ques If energy of 2nd orbit of H is -322 KJ/mol then calculate energy of 4th orbit.

$E = -1312 \times \frac{Z^2}{n^2}$ KJ/mol

$\frac{E_2}{E_4} = \frac{-1312 \times 1^2/2^2}{-1312 \times 1^2/4^2}$

$\frac{-328}{E_4} = \frac{4^2}{2^2}$

Ques Energy of 1st $E_4 = -82$ KJ/mol E.S. of He^+ is x then find energy of 2nd E.S. of Li^{2+}?

① x ② x/2 ③ 4x ④ 3x

$\frac{E_2(He^+)}{E_3(Li^{2+})} = \frac{-136 \times 2^2/2^2}{-13.6 \times 3^2/3^2} = 1$

$E_3(Li^{2+}) = E_2(He^+) = x$