D. B. College (Jaynagar) Lect 1 – 2
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Atomic Structure

Energy

(1) $E = -2.18 \times 10^{-18} \frac{Z^2}{n^2}$ J/atom.

$E = -13.6 \times \frac{Z^2}{n^2}$ eV/atom

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

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

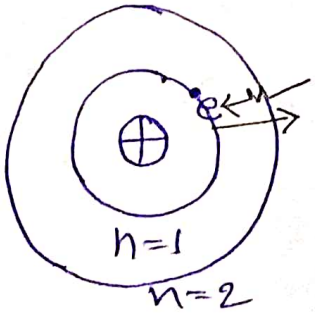
(2) $T.E. = \frac{P.E.}{2} = -K.E.$

Ionisation Energy :–
The amount of energy required to remove an e^- from ground state of an isolated atom.

$$Na(S) \longrightarrow \underset{\text{gaseous isolated atom}}{Na(g)} \longrightarrow Na^+(g) + e^{\ominus}$$

H-atom

$I.E. = E_\infty - E_1$
$= 0 - (-13.6)$.
$= 13.6$ eV



If 13.6 is given → $e^{\ominus}$ just comes out of atom

10 eV → $e^{\ominus}$ not comes out

15 eV → $e^{\ominus}$ comes out of atom with K.E. (15 − 13.6) = 1.4 eV

Ques Find I.E. for He^{+}.

$$I.E. = -E_1 = -\left(-13.6 \times \frac{2^2}{1^2}\right) = 54.4 \text{ eV}$$

Ques If 13.6 eV is needed to form $H^{\oplus}$ from H then find amount of energy required to form Li^{+} from Li?

$$I.E = -E_1$$

$$= -\left(-13.6 \times \frac{3^2}{1^2}\right)$$

$$= +13.6 \times 9 = 122.4$$

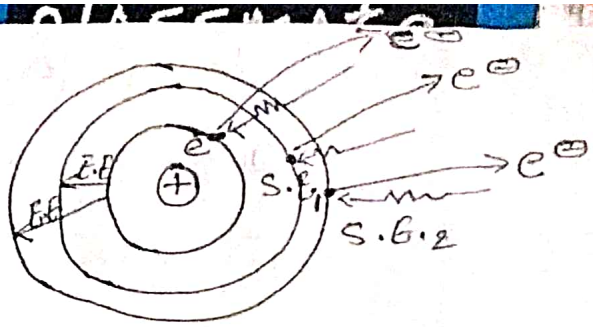
$$I.E._{Li} = 13.6 \times 9$$

$$\frac{13.6}{I.E._{Li}} = \frac{-E_1 H}{E_2 Li} = \frac{1}{9}$$

$$\boxed{I.E._{Li} = 13.6 \times 9}$$ Ans

Separation Energy :- (S.E.)

The amount of energy required to remove an e^{-} from its excited state.



H-atom

$S.E_1 = E_\infty - E_{1st\ E.S} = E_\infty - E_2 = 0 - (-3.4)$

$= 3.4\,eV$

$S.E_2 = E_\infty - E_{2nd\ E.S.} = E_\infty - E_3 = 0 - (-1.51)$

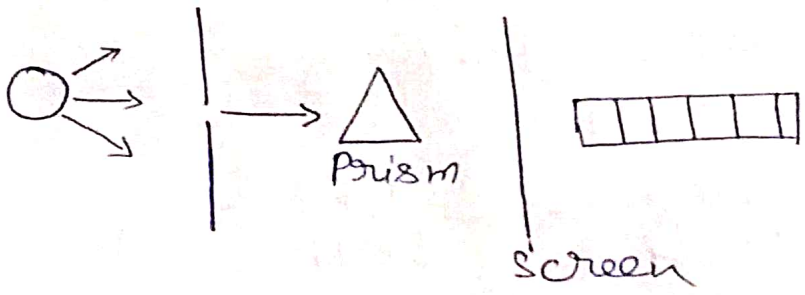
$= 1.51\,eV$

Excitation Energy :—

Amount of energy required to excite an $e^\ominus$ from ground S. to higher energy level.

E.M. Spectrum :—

Spectra — appearance



Monochromatic

mono → single

chromo → Colour

→ Single wavelength radiation