The total energy of an electron in a particular Orbit is calculated by adding its Potential energy & Kinetic energy

$E_{Total} = P.E. + K.E$

The Kinetic energy of the electron $= \frac{1}{2} mu^2$

Potential energy $= \frac{-kZe^2}{r}$

Hence Total Energy $= PE + K.E$

$$= \frac{-kZe^2}{r} + \frac{1}{2} mu^2 \quad \text{---} \quad (11)$$

We know that the Centrifugal force is equal to Coulombic attraction force

so,

$$\frac{mu^2}{r} = \frac{k.Ze^2}{r^2}$$

$$\text{or} \quad mu^2 = \frac{k.Ze^2}{r} \quad \text{---} \quad (12)$$

On substituting the value of $mu^2 = \frac{kZe^2}{r}$ in equation (11)

we have,

$$E_{Total} = -\frac{kZe^2}{r} + \frac{k.Ze^2}{2r}$$

$$\text{or} \quad E_{Total} = \frac{kZe^2}{2r} - \frac{kZe^2}{r} = \frac{k.Ze^2}{r}\left(\frac{1}{2} - 1\right)$$

$$= \frac{k.Ze^2}{r}\left(\frac{1-2}{2}\right)$$

$$= -\frac{k.Ze^2}{2r} \quad \text{---} \quad (13)$$

Again Substituting the value of

$$r = \frac{n^2h^2}{4\pi^2 m.Ze^2.k}$$ in equation (13)

$$E_{Total} = -\frac{k.Ze^2}{2} \times \frac{4\pi^2.mze^2.k}{n^2h^2}$$

$$= -\frac{2\pi^2 z^2 e^4.m.k^2}{n^2h^2} \quad \text{---} \quad (14)$$

Thus the total Energy of electron in an Orbit of hydrogen atom is given by

$$E_n = -\frac{2\pi^2 z^2 e^4 mk^2}{n^2h^2}$$

Where E_n is the total energy of electron moving ...

Calculation after ...