

Answer on Question #76516, Chemistry / Inorganic Chemistry

Calculate the ionization energy of hydrogen atom using Bohr's theory.

Solution

To answer this question we should use the equation:

$$E = hv = \frac{hc}{\lambda}$$

To find $\frac{1}{\lambda}$ we should use the Rydberg equation:

$$\frac{1}{\lambda} = R_{\infty} \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

Where $R_{\infty} = 1.09737316 \times 10^7 \text{ m}^{-1}$,

for hydrogen atom $n_f = 1, n_i = \infty$, then

$$\frac{1}{\lambda} = R_{\infty}$$

and

$$E = hv = \frac{hc}{\lambda} = hvR_{\infty}$$

$$E_i = 6.626 \times 10^{-34} \times 2.997 \times 10^8 \times 1.09737316 \times 10^7 = 2.179 \times 10^{-18} \text{ (J)}$$

Answer: $2.179 \times 10^{-18} \text{ (J)}$