Bohr radius

- The Bohr radius is the radius of the first orbit in the Bohr model. We give it the symbol a_0:

$$a_0 = \frac{4\pi\varepsilon_0\hbar^2}{me^2}$$

- The Bohr radius is a fundamental unit of distance. It is also called the atomic unit of distance. It is equal to 0.52977 Å.

The Quantized Energy Levels

- The energy levels calculated using the Schrödinger equation are given by

$$E_n = -\frac{me^4}{8\varepsilon_0{}^2h^2}\frac{1}{n^2} = -\frac{R}{n^2}$$

- In units of Bohrs the Rydberg constant is

$$\mathrm{R} = \frac{me^4}{8\varepsilon_0{}^2h^2} = \frac{e^2}{(4\pi\varepsilon_0)2a_0}$$

The Rydberg Constant

- The energy levels calculated using the Schrödinger equation permit calculation of the Rydberg constant.
- One major issue is units. Spectroscopists often use units of wavenumber or cm^{-1}. At first this seems odd, but $h\nu = hc/\lambda = hc\tilde{\nu}$ where $\tilde{\nu}$ is the value of the transition in wavenumbers.

$$\tilde{R} = \frac{1}{hc}\frac{me^4}{8\varepsilon_0{}^2 h^2}$$ in cm^{-1}

The simple form for H energy levels

Using the Rydberg constant the energy of the hydrogen atom can be written as:

$$E_n = -\frac{\tilde{R}}{n^2}$$

where $\tilde{R}$ = 109,690 cm^{-1}.

In units of eV R = 13.6 eV.