

CBE 310
Molecular Concepts and Applications

Hydrogen Atom

09 22 2014

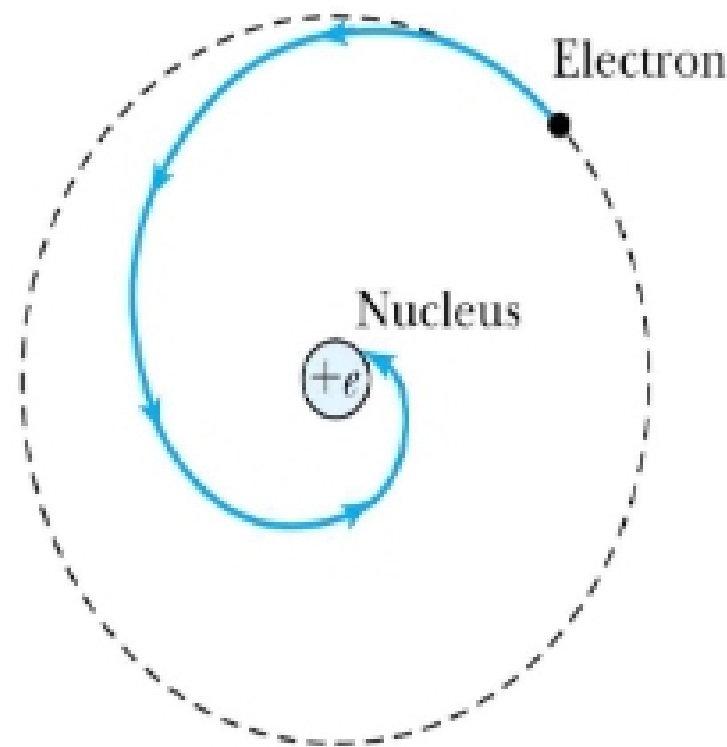
ANNOUNCEMENTS:

HW #4 out WEDNESDAY DUE 9/30

Bohr Model of Hydrogen

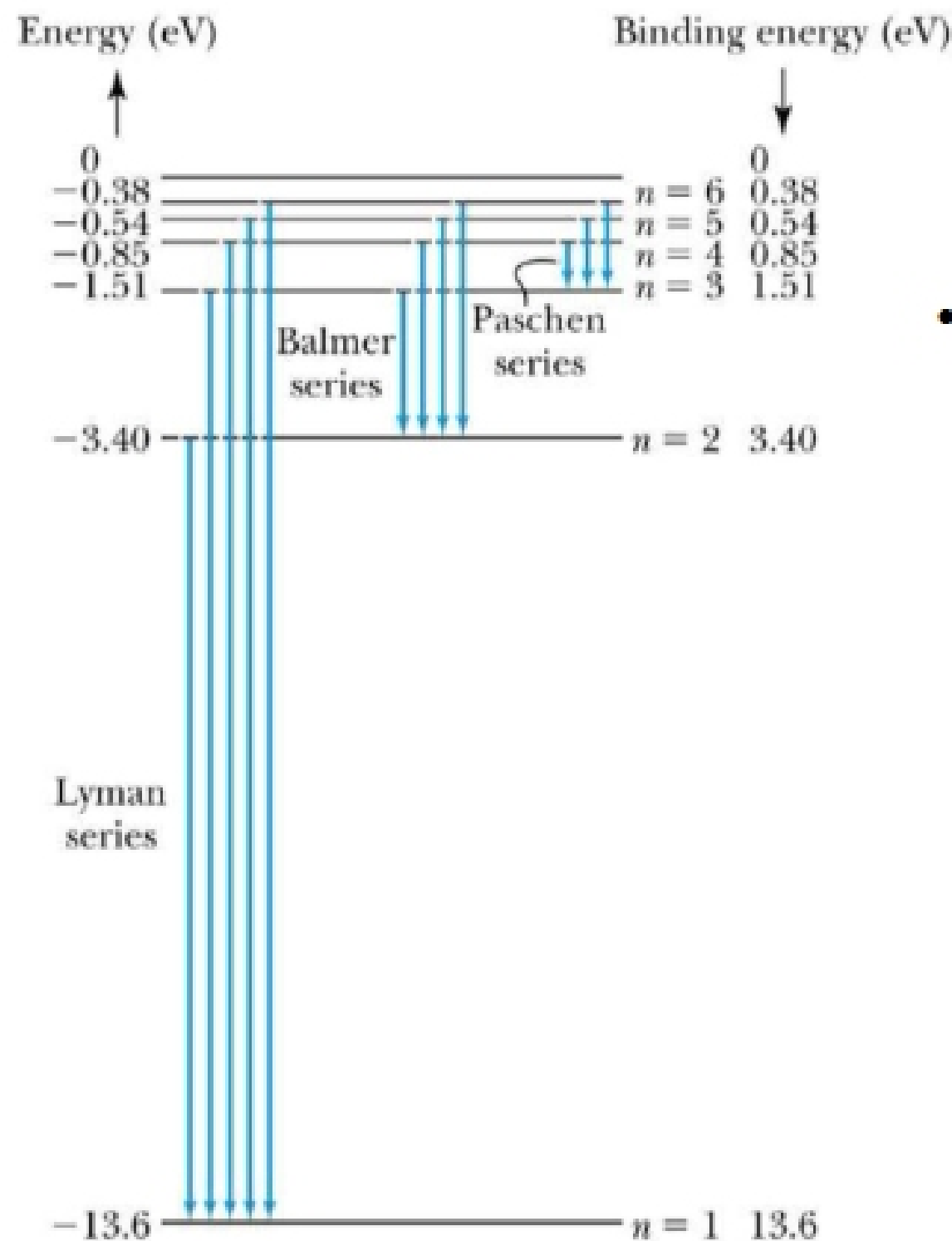
$$\vec{F}_e = \frac{-1}{4\pi\epsilon_0} \frac{e^2}{r^2} \hat{e}_r = \frac{mv^2}{r}$$

The Classical description fails because it predicts that the electron should fall into the nucleus



- Niels Bohr used the emission spectrum of hydrogen to develop a quantum model for hydrogen and related systems containing two particles.

Bohr was really the first to apply quantum mechanics to atoms, he had the idea that the electron circles the “nucleus” in only certain allowed circular orbits, with quantized angular momentum



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Quantum Mechanics and the Atomic Spectra

- Joseph Balmer (1885) was the first to noticed that the frequency of visible lines in the H atom spectrum could be reproduced by:

$$\nu \propto \frac{1}{2^2} - \frac{1}{n^2} \quad n = 3, 4, 5, \dots$$

$$\nu = R_h \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

$$R_h = 109677 \text{ cm}^{-1}$$

