

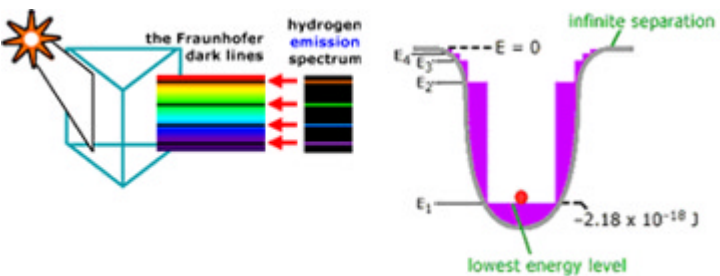
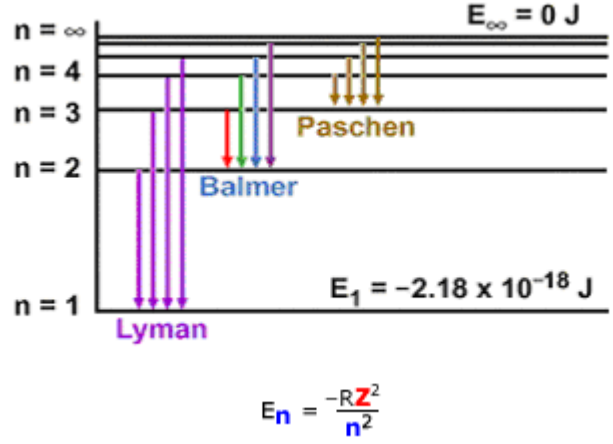
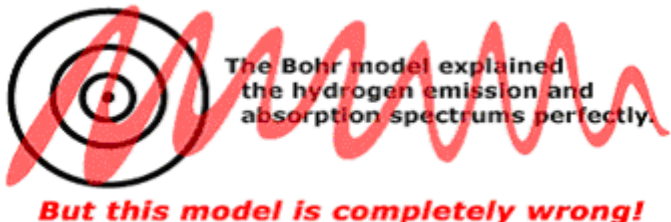
Unit: Modern Atomic Theory

Module: Electromagnetic Radiation and the Idea of Quantum [page 1 of 1]

## The Bohr Model

### key concepts:

- The **Bohr model** provided the conceptual bridge from classical theoretical physics to **quantum mechanics**. It is important because it introduced the idea of quantized energy states for **electrons** in **atoms**.
- Bohr's model worked very well for explaining atoms and **ions** having a single electron, such as H, He<sup>+</sup>, Li<sup>2+</sup>, and Be<sup>3+</sup>.
- Bohr's model was inadequate for explaining **atomic spectra** of other atoms or ions.

	<p>Neils Bohr explained the observation that the missing <b>spectral frequencies</b> of sunlight are exactly the same <b>frequencies</b> as those <b>emitted</b> by the hydrogen atom.</p> <p>The Bohr model provided the conceptual bridge from classical theoretical physics to quantum mechanics. It is important because it introduced the idea of quantized energy states for <b>electrons</b> in atoms.</p>
 $E_n = \frac{-RZ^2}{n^2}$	<p>Bohr's postulated that the <b>angular momentum</b> of electrons is quantized, so the distance of electrons from the nucleus is quantized, and the energy of electrons is quantized.</p> <p>The Bohr model asserted that only certain <b>orbits</b> were allowed. It accounted for <b>potential energy</b>, <b>kinetic energy</b>, and the fact that only specific energy levels were observed. It also stated that energy was directly proportional to the square of the <b>nuclear</b> charge divided by the square of the principal <b>quantum number</b>, which must be a positive <b>integer</b>.</p> <p>The Bohr model explained all lines in both the visible and the non-visible spectra of hydrogen (the Balmer series, the Lyman series, and the Paschen series).</p>
 <p><b>But this model is completely wrong!</b></p>	<p>While the Bohr model works well for predicting properties of hydrogen, it does not work for elements with more than one electron.</p> <p>The Bohr model assumed that the electron was a particle with a fixed distance from the nucleus.</p> <p>However, just like light, electrons have both particle properties and wave properties.</p>