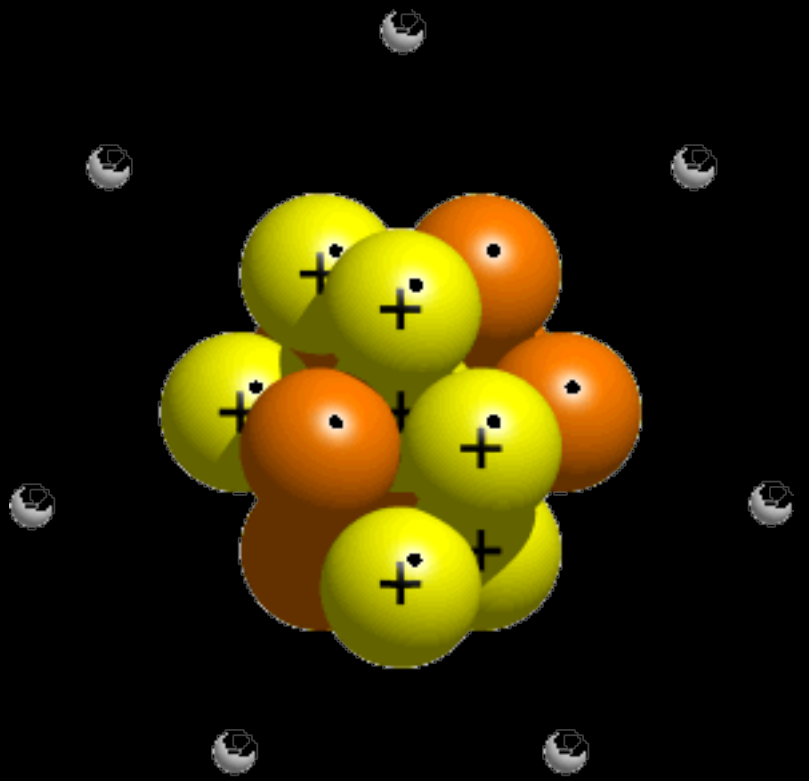
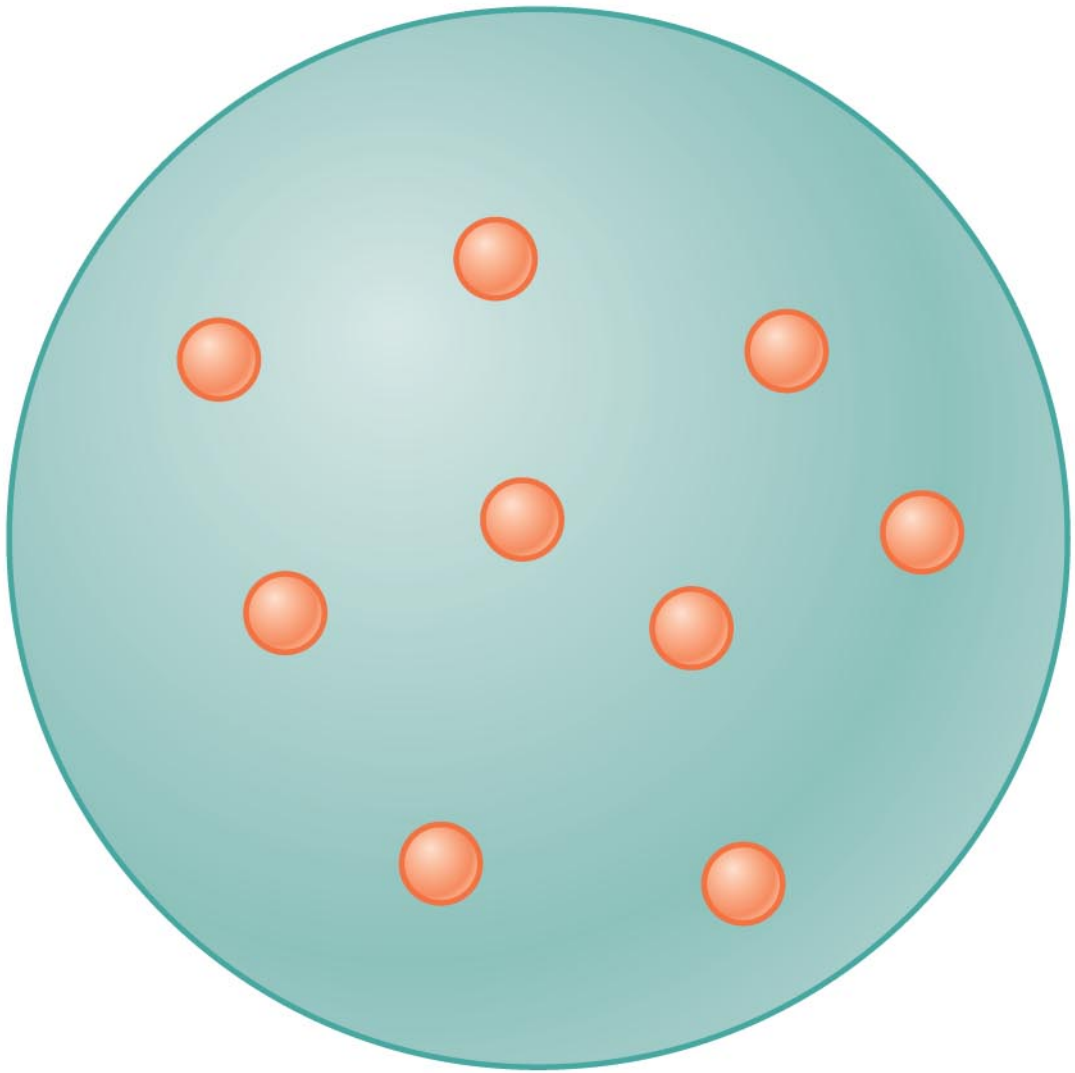
Chapter 25
The Atom



Revised 7.24.2020 Some diagrams from Pearson Physics by Walker. Used with permission

J.J. Thompson's Plum Pudding Model



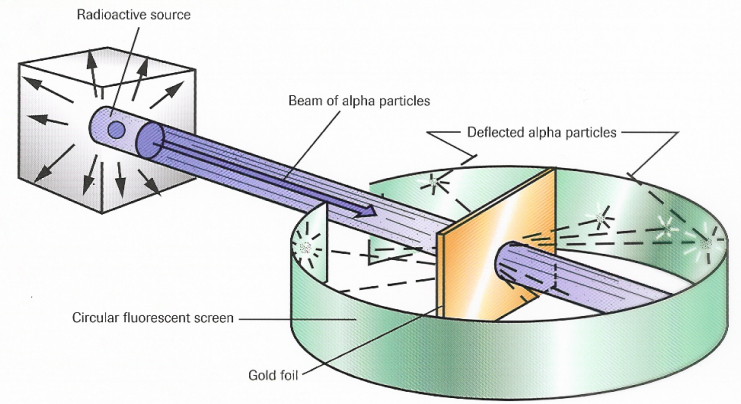
Positive charge

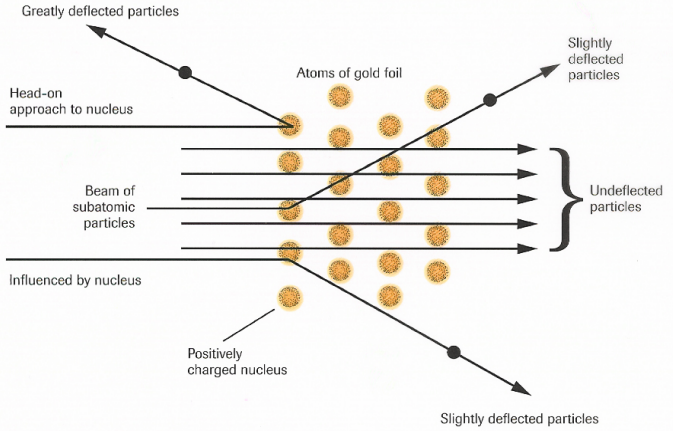
Negative charge

Rutherford's Experiment led to the "Planetary Model" where the negative electrons orbited the positively charged nucleus as planets orbit the sun.

51 Gold Foil Experiment

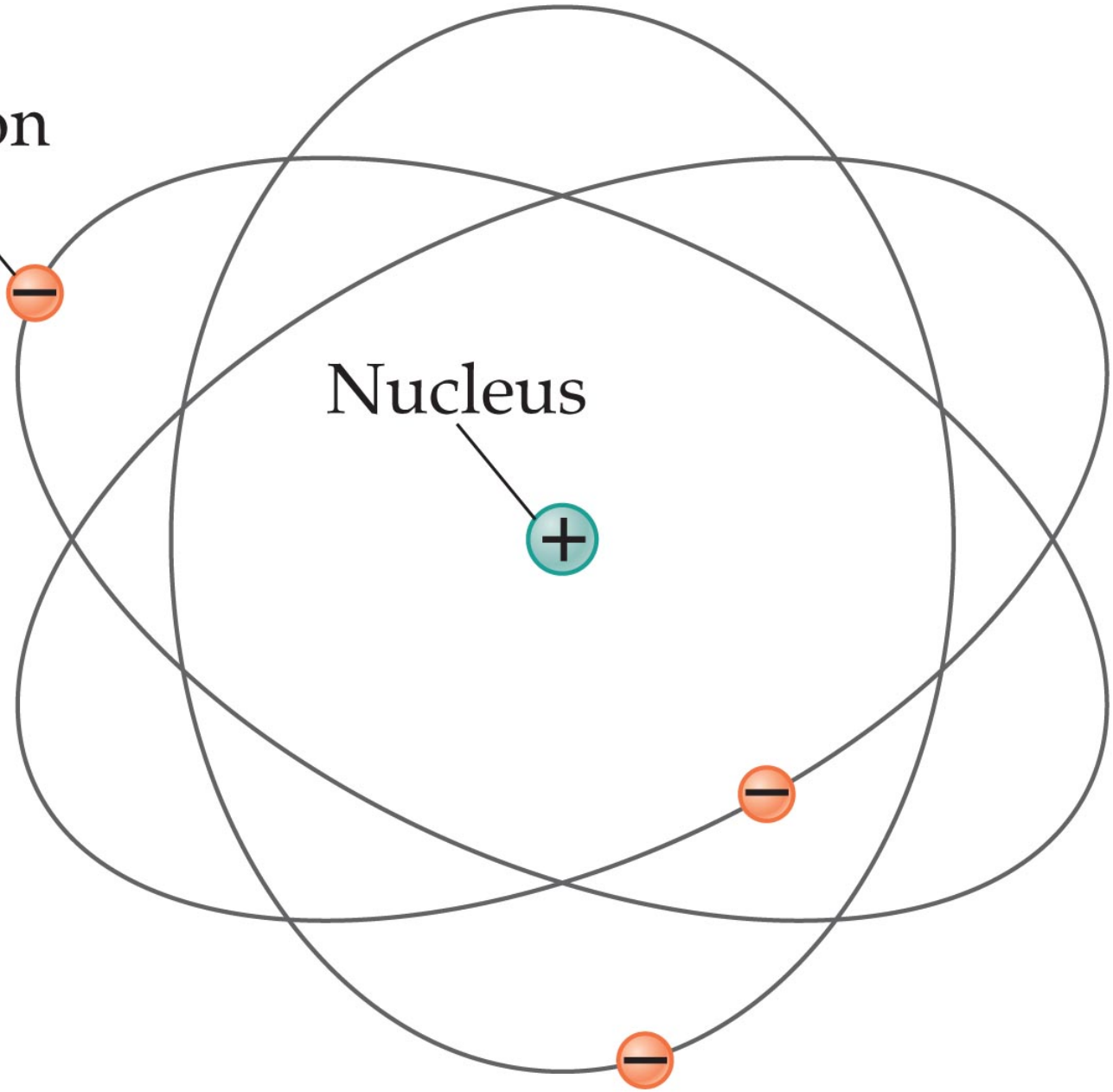
Use with Chapter 28.





Rutherford's Planetary Model

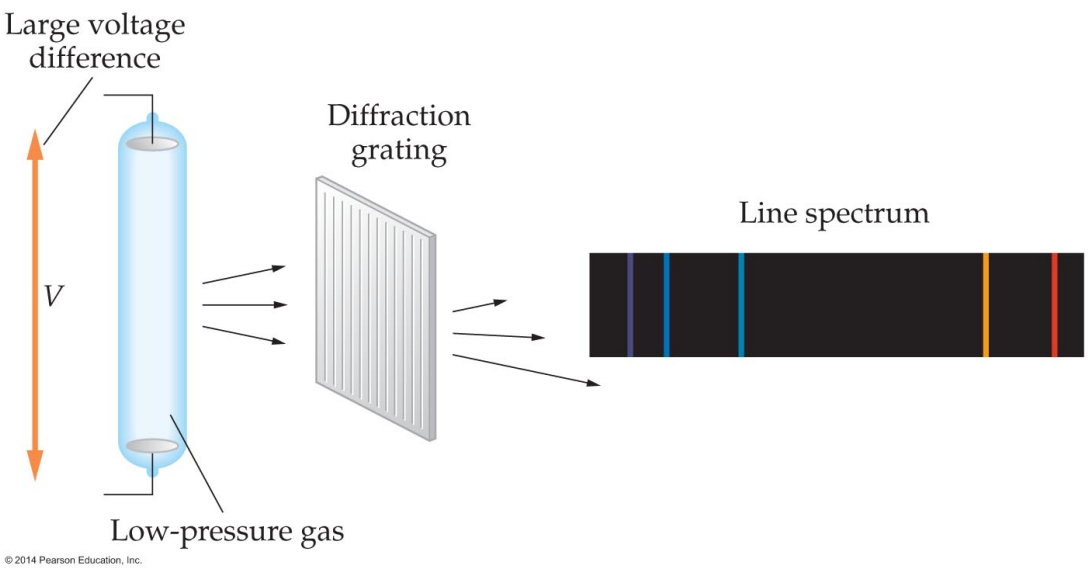
E Rutherford

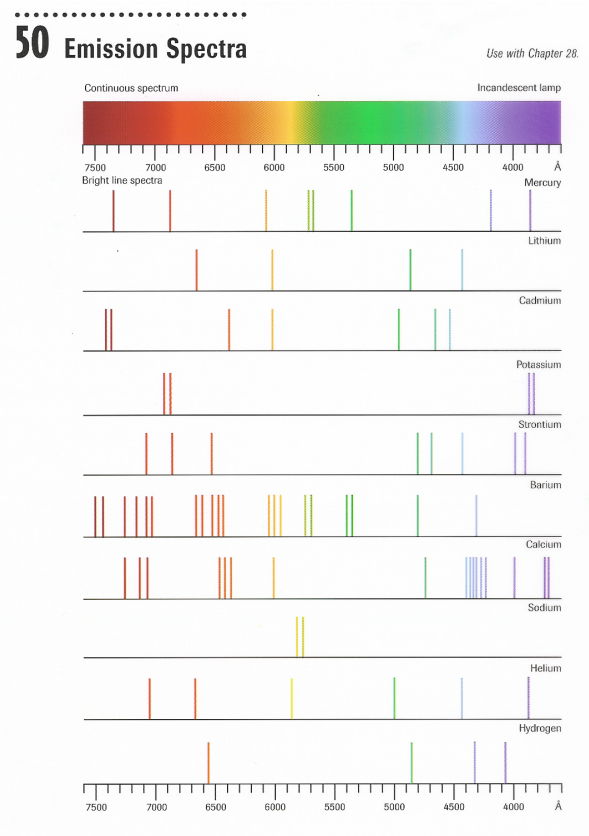


The planetary model had serious flaws.

1. The orbiting electron should give off energy by radiation and spiral inward. Atoms would not be stable.

2.The orbiting electrons should give off a continuous spectrum. They do not. They give off line spectra, as indicated at the right.

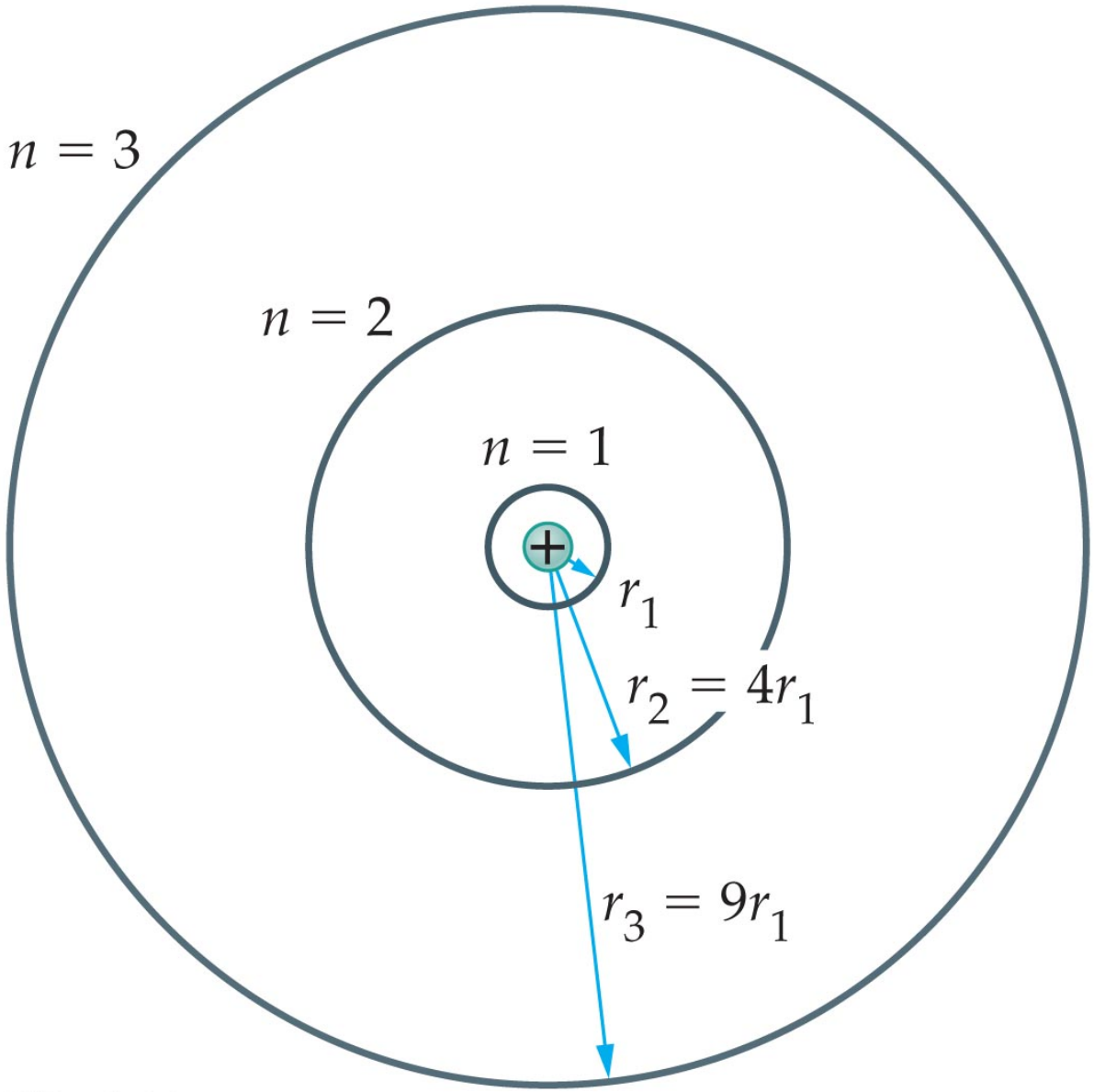




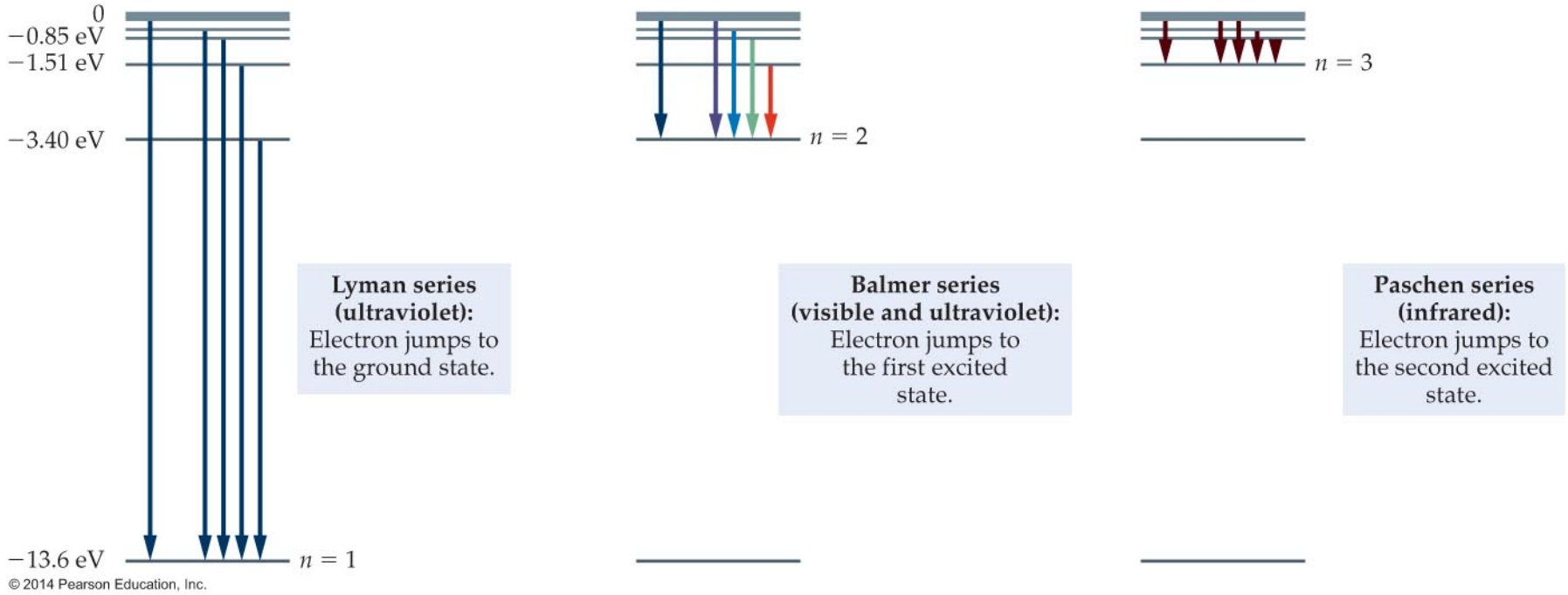
Bohr's model:

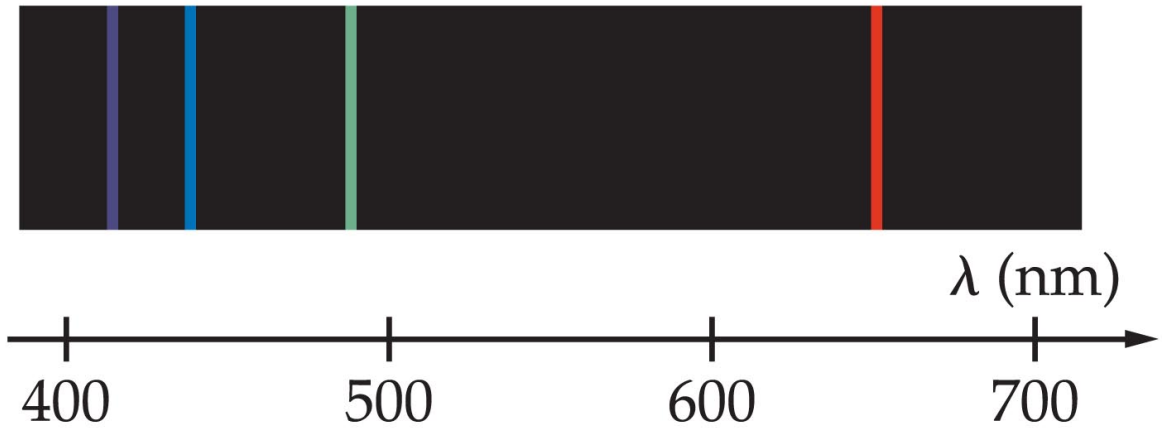
1. Only certain orbits are possible. Electrons in orbits are stable.
2. Electrons radiate only when they are changing orbit, in which case the energy is given off in quanta calculated by $E = hf$
3. Spectral lines represent energy differences between orbits.

Bohr's Model -- only certain orbitals are permitted.



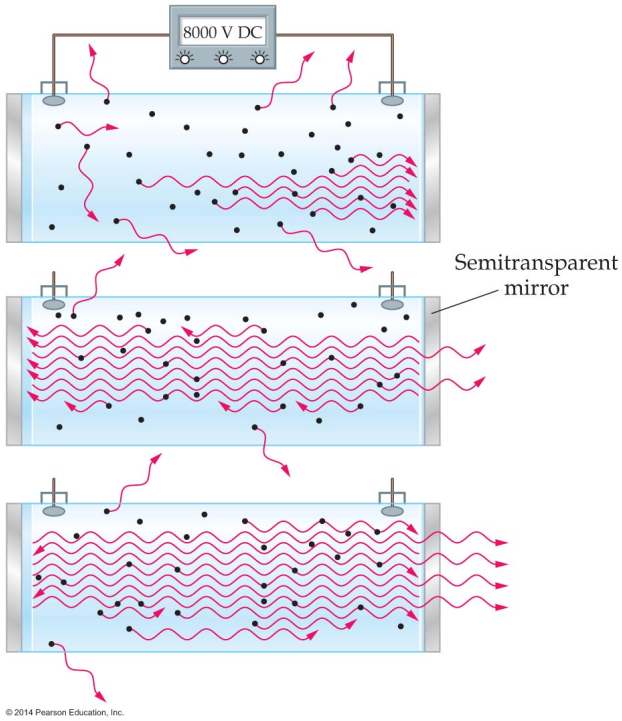
Neils Bohr

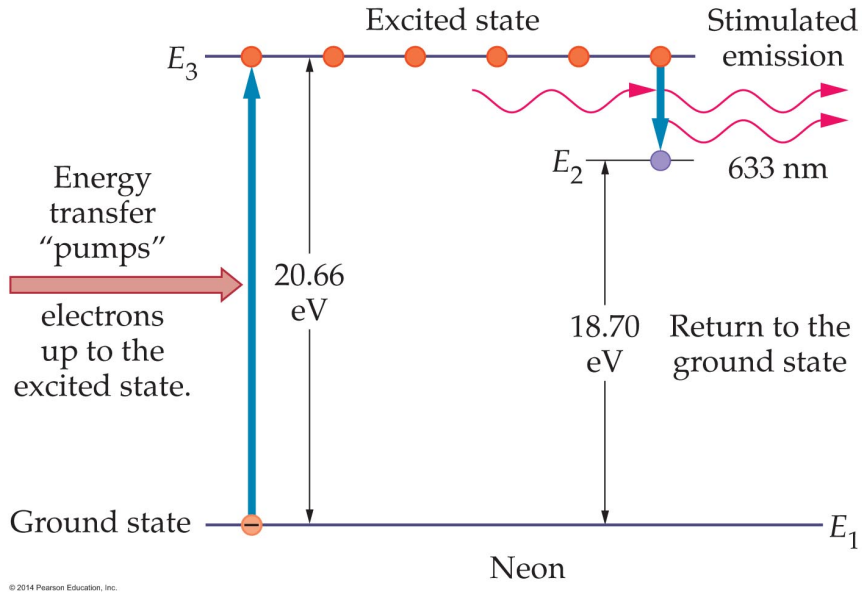




(a) Emission spectrum of hydrogen

Lasers:





Read pages 898 – 900 for the theory and some applications of lasers.