2012 APR 13

(66, Ch 27, P16)

$E = hf$ ENERGY OF ONE PHOTON

$$E = hf = \frac{hc}{\lambda} = \frac{(6.63 \times 10^{-34}\ J \cdot s)(3 \times 10^{8}\ m/s)}{550 \times 10^{-9}\ m}$$

$$= 3.61 \times 10^{-19}\ J$$

$$\text{NUMBER OF PHOTONS} = \frac{10^{-18}\ J}{3.61 \times 10^{-19}\ J} = 2.77$$

NEED 3 PHOTONS

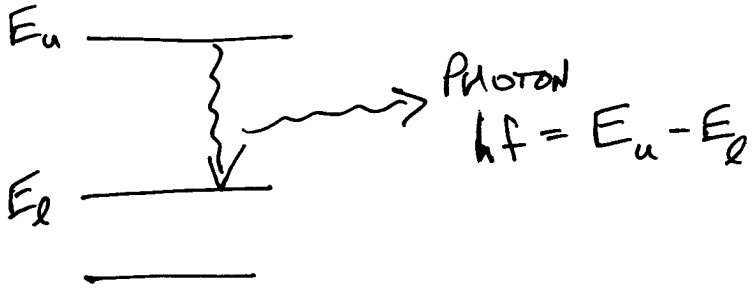
BOHR MODEL OF AN ATOM

NEILS BOHR, 1912

- SOLAR SYSTEM MODEL OF ATOM HAS A THEORETICAL PROBLEM (AN ACCELERATING CHARGED PARTICLE RADIATES.)

- ATOMS, WHEN HEATED OR EXCITED, EMIT LIGHT AT SPECIFIC FREQUENCIES (NOT A BROAD SPECTRUM).

BOHR: WHAT IF ATOMS COULD ONLY EXIST IN CERTAIN PARTICULAR ENERGIES (ENERGY LEVELS)?



BOHR CONTINUES

WHAT IF AN ELECTRON ORBITING A NUCLEUS CAN ONLY HAVE AN ANGULAR MOMENTUM OF 0, 1, 2, 3, ... TIMES SOME FUNDAMENTAL QUANTUM OF ANGULAR MOMENTUM?

$$L = n\hbar \qquad \hbar = \frac{h}{2\pi}$$

THIS LEADS TO DISCRETE ENERGIES:

$$E_n = (-13.6\,eV)\frac{Z^2}{n^2}$$

FOR A ONE-ELECTON ATOM

$n = 1, 2, 3, \ldots$

$Z =$ # OF PROTONS IN NUCLEUS

WE CAN USE THIS EQUATION FOR

- HYDROGEN
- SINGLY-IONIZED HELIUM (He^+)
- DOUBLY-IONIZED LITHIUM (Li^{2+})