

Electromagnetic Radiation Light

In the late 1800s light was considered to be only a wave traveling through an as yet undetected "ether". In 1881 and again in 1887 two American chemist set out to measure the "ether" and fail. Setting the stage for a whole sale revamping of physics and chemistry.

Modern Atomic Theory

The Rutherford model of the atom described the atom as a miniature solar system. The electrons in orbit around the nucleolus.

The planetary model was very popular, However there were some real problems . . .

By the early 1900s most believe that physics is a settled science. Most observable phenomena can be explained by current theories. There are just a few details left to wrap up.

The first result that begins to confront this comfortable world comes in 1900 when Max Planck while studding the light emitted by solid bodies heated to incandescence realizes that his results can not be explained by current theories. He postulates that energy can only be emitted in whole number ratios of the term $h\nu$. The constant h is called Planck's constant while ν is the frequency of light.

The work of Planck, and others stimulates Albert Einstein to propose that light can be described as a stream of particles called photons.

The energy of a photon is given by the equation: $E = h\nu$ $E = \frac{hc}{\lambda}$

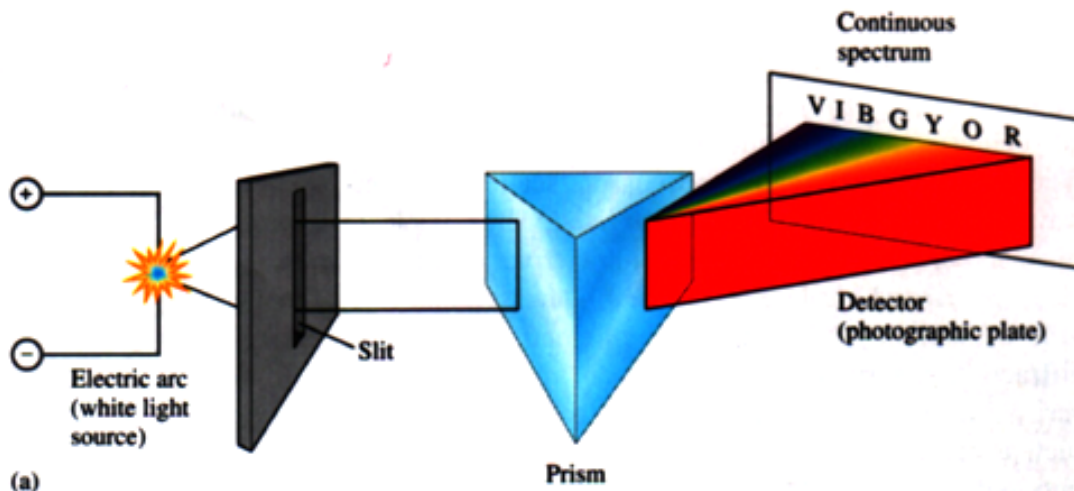
Stimulated by the work of Hendrick Lorentz, on the failure of the Michelson-Morley experiment, Einstein realizes that a natural extension of this is that matter and energy must be different manifestations of the same thing. Resulting in the famous equation: $E = mc^2$

The Bohr Model

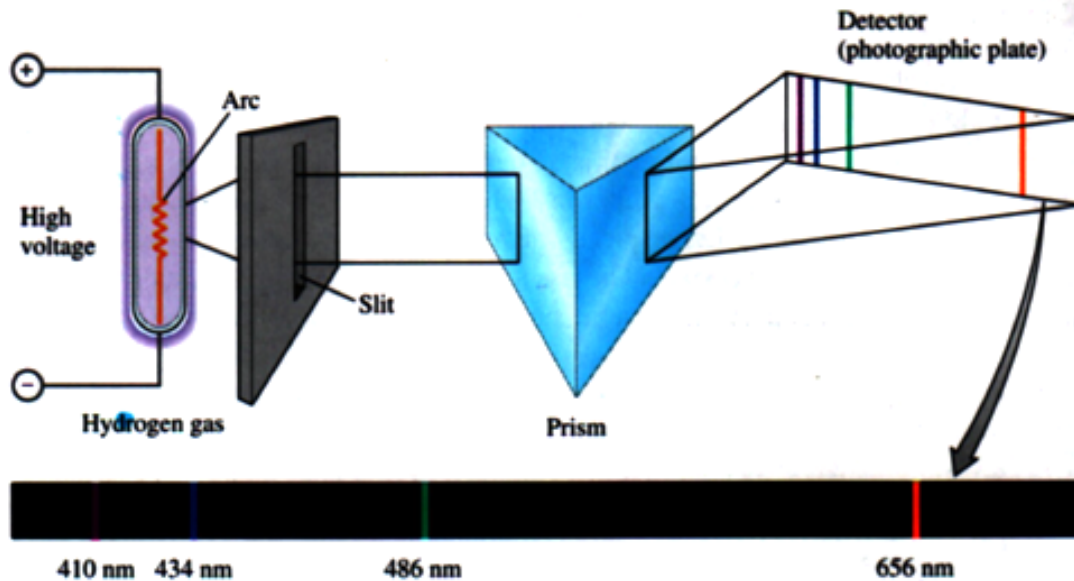
With these changes to the physics of light, energy and matter the stage is set for a major change in how the atom is perceived.

In 1913 Danish physicist Niels Bohr develops a new model for the atom that takes in to account many of the newest discoveries.

Bohr comes up with a model that quantizes the allowable energy levels of the electron in an atom. This work is a direct result of the line spectrum of hydrogen.



(a)

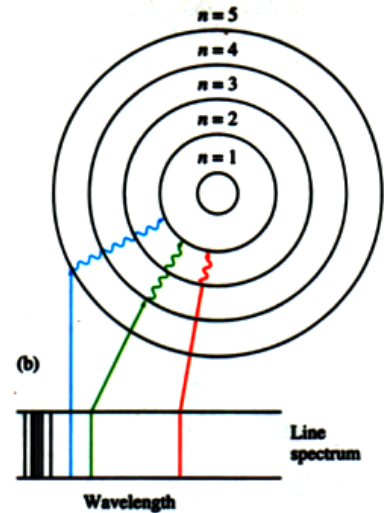


(b)

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Bohr interpreted the line spectrum of hydrogen to the possible energy levels that a hydrogen electron could have and he created an equation to predict those energy levels.

$$E = -2.178 \cdot 10^{-18} J \left(\frac{Z^2}{n^2} \right)$$



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