

HONORS CHEM – CHPT 4

Starfish and Coffee <https://www.youtube.com/watch?v=cQ08PlzgaNQ>

What is light? <https://www.youtube.com/watch?v=luv6hY6zsd0>

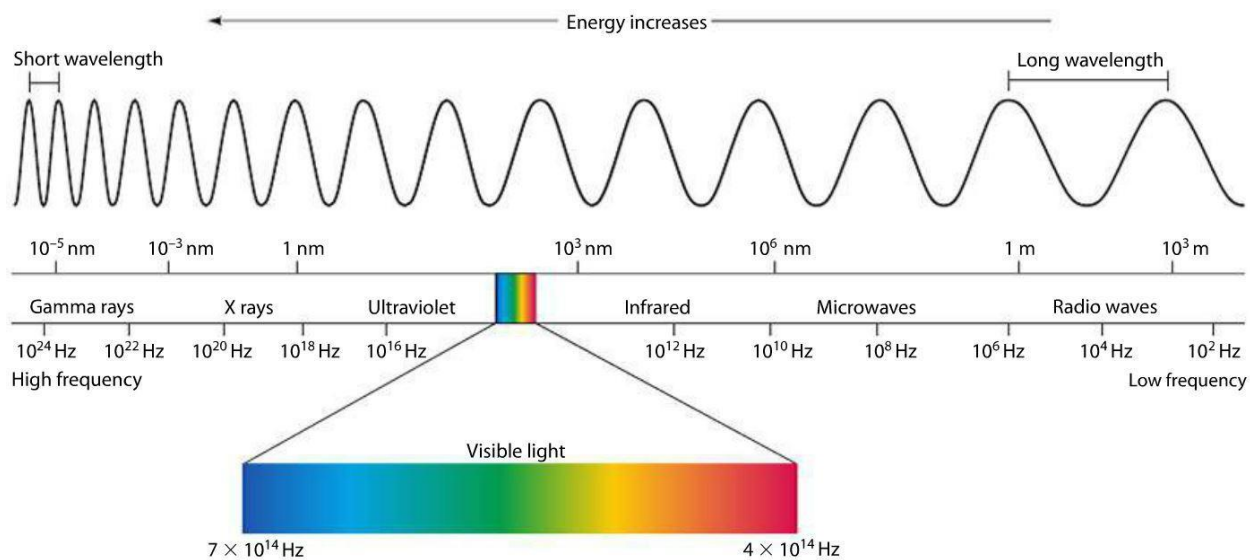
*Beginning until 1:30 (double slit)

Good to show wavelength, types of EMR:

http://www.bbc.co.uk/schools/gcsebitesize/science/21c_pre_2011/radiation/electromagneticradiation.act.shtml

Electromag Rad: Review (2.13) - <https://www.youtube.com/watch?v=m4t7gTmBK3g>

Review – Good, but longer (3.22): https://www.youtube.com/watch?v=Uz11z0u_700



DUAL NATURE OF LIGHT



Historical view:

Everything in our world can be divided into two categories – matter or energy.

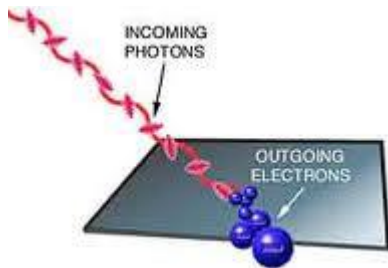
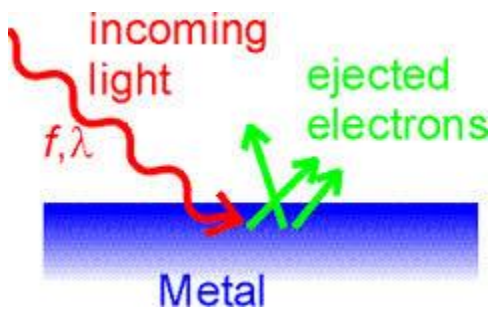
<i>Property</i>	MATTER	ENERGY
Mass	Has mass	No mass
Volume	Has Volume	No volume
Position	Has position – you can hold a pencil, you can identify where a baseball is	No position – you can't "hold" light

-----1920s-----



1) Max Plank:

Photoelectric Effect



<https://www.youtube.com/watch?v=YQL2Q5ZArjs> **Great animation (shows photons)

Showed that light had MATTER (particle) properties

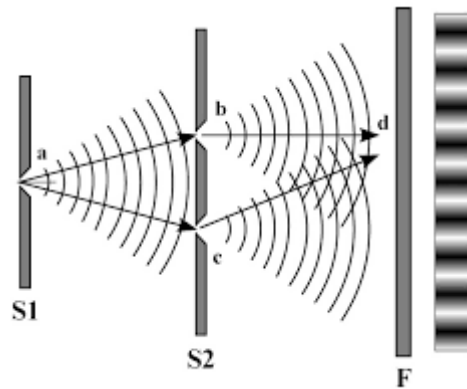
Einstein and Plank reasoned that light was made of PHOTONS ("particles") traveling in waves.

2) THOMAS YOUNG

DOUBLE SLIT EXPERIMENT



Wave Interference <http://zonalandeducation.com/mstm/physics/waves/interference/intrfrnc.html>



What particles vs. waves do when encounter slits: https://www.youtube.com/watch?v=Xmq_FJd1oUQ

What is light Video: <https://www.youtube.com/watch?v=luv6hY6zsd0> **BEGIN AT 2:00 min. – 5:50

Showed that light was a WAVE

Only waves show constructive and destructive interference,
so light must be waves (energy)

3) Einstien

$$E = mc^2$$

Why can't light be BOTH a wave (energy) and a particle (matter)?

These experiments and theoretical findings caused us to look at light "differently" (as possessing matter properties (as well as wave/energy)).

NEILS BOHR

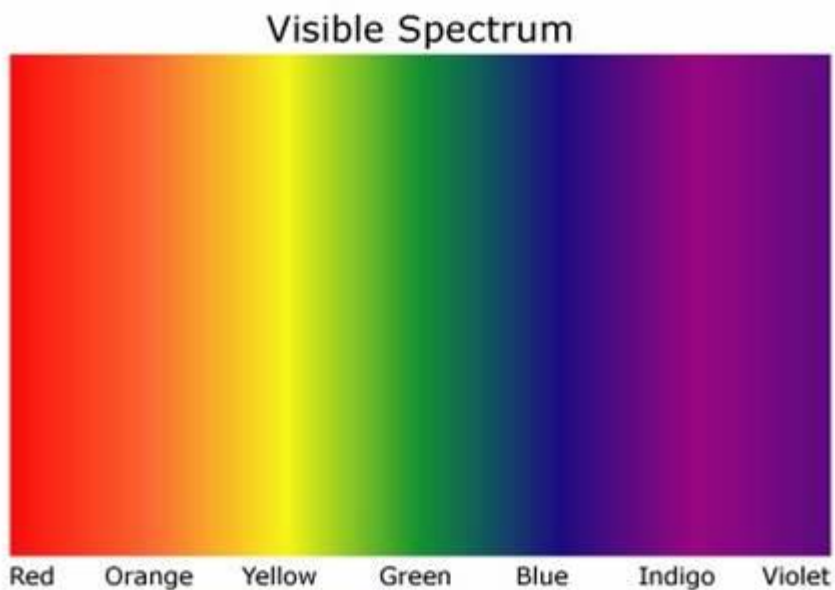


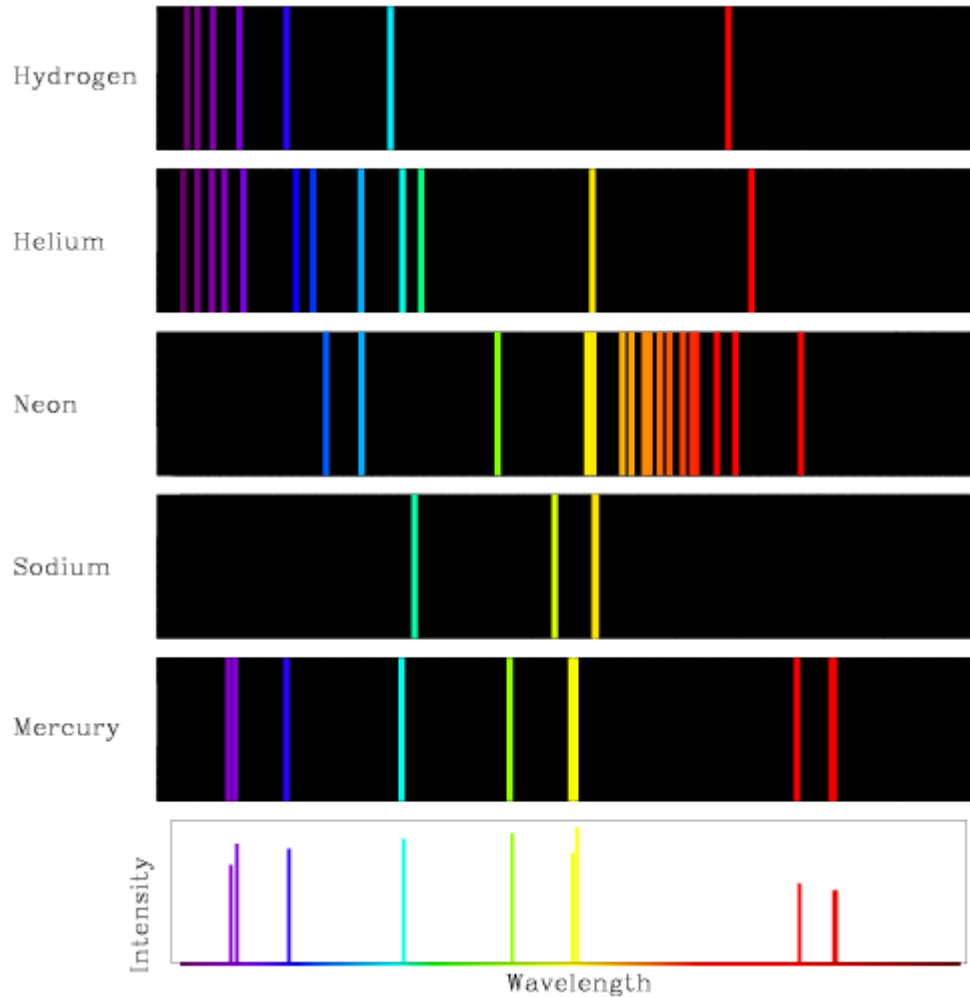
Applied idea of photons to explain why atoms release light when energized (like in fireworks).

<https://www.youtube.com/watch?v=GhAn8xZQ-d8>

Bohr Model of the Atom:

https://en.wikipedia.org/wiki/Bohr_model





**electron has distinct distance from the nucleus (orbit) and moved around the nucleus in this circular path – its' position and energy is quantized (set) – there are not electrons found in-between the orbits, only on the orbits.

Called “planetary model”

Only “explained” Hydrogen

Bohr used line spectral data to conclude upon his model:

<http://www.avogadro.co.uk/light/bohr/spectra.htm> (don't worry about “Balmer Series”)

Shows animation of exciting e- and relaxing: <https://www.youtube.com/watch?v=1uPyq63aRvg>

The next logical step was to ask if matter had wave-like properties . . .

De Broglie Equation:

$$\lambda = \frac{h}{mv}$$

Mathematically shows that “anything that has mass and is moving travels in waves”

Applied to an electron (“just right mass” to yield 50% character of wave and 50% character of particle). . .

→ QUANTUM MODEL OF THE ATOM (Modern Model)

**Views electron as moving in waves (not just as a particle traveling in circular paths)
(actually as a standing wave – electron exists in many area at once)

**Due to the Heisenburg Uncertainty Principal, we cannot know exactly where an electron is within an atom.

Heisenburg Uncertainty Principal:

- **the uncertainty principle states that the position and velocity cannot both be measured, exactly, at the same time (actually pairs of position, energy and time)**
- **uncertainty principle derives from the measurement problem, the intimate connection between the wave and particle nature of quantum objects**
- **the change in a velocity of a particle becomes more ill-defined as the wave function is confined to a smaller region**

We can only predict where an electron will be . . .

ORBITAL – a probable location of an electron (no orbits!!, no definite locations!!)

https://en.wikipedia.org/wiki/Atomic_orbital

<http://www.chemguide.co.uk/atoms/properties/atomorbs.html> how get shapes – probability

s, p, d, f <http://www.chemtube3d.com/orbitals-s.htm>

<http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch6/quantum.html>

layer 1s, 2s, 3s

<http://www.chemtube3d.com/A%20Level%20orbitals-all.htm>

<https://www.youtube.com/watch?v=sMt5Dcex0kg&feature=youtu.be>