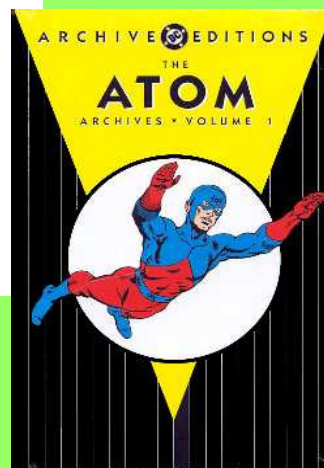
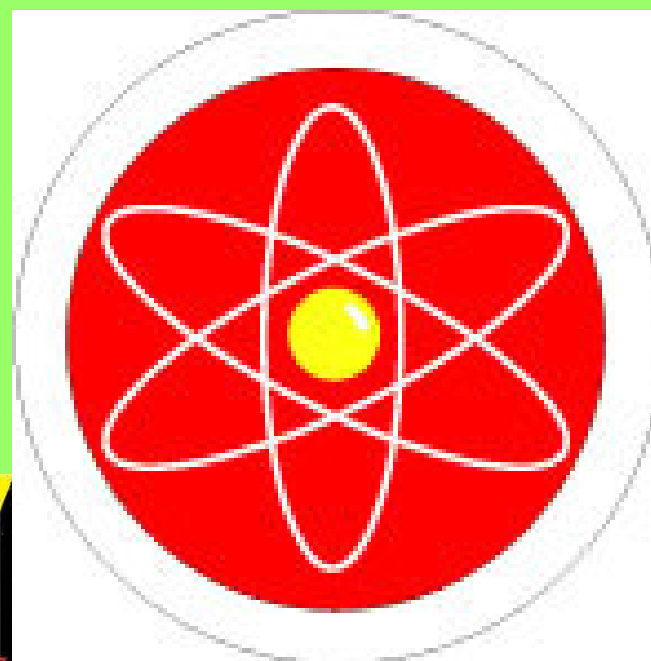
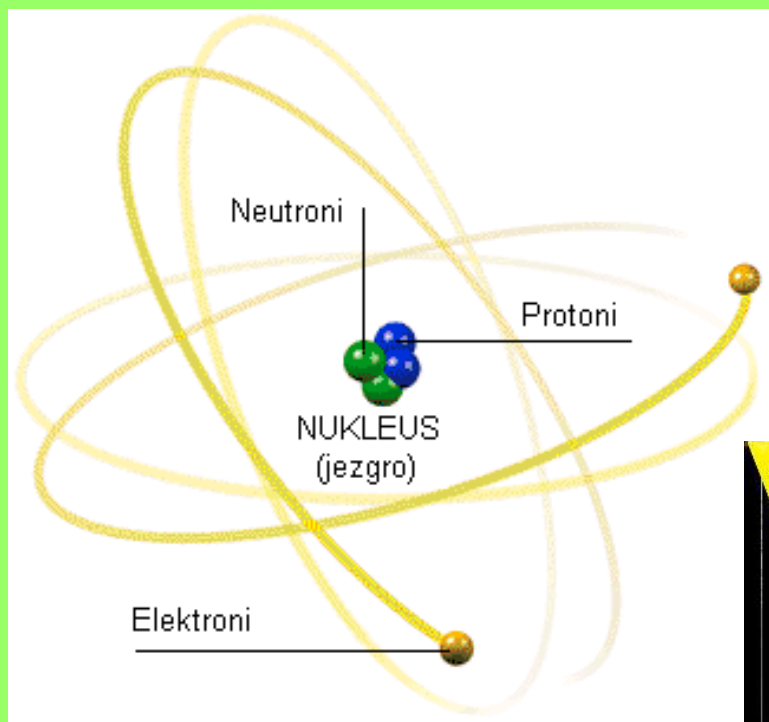


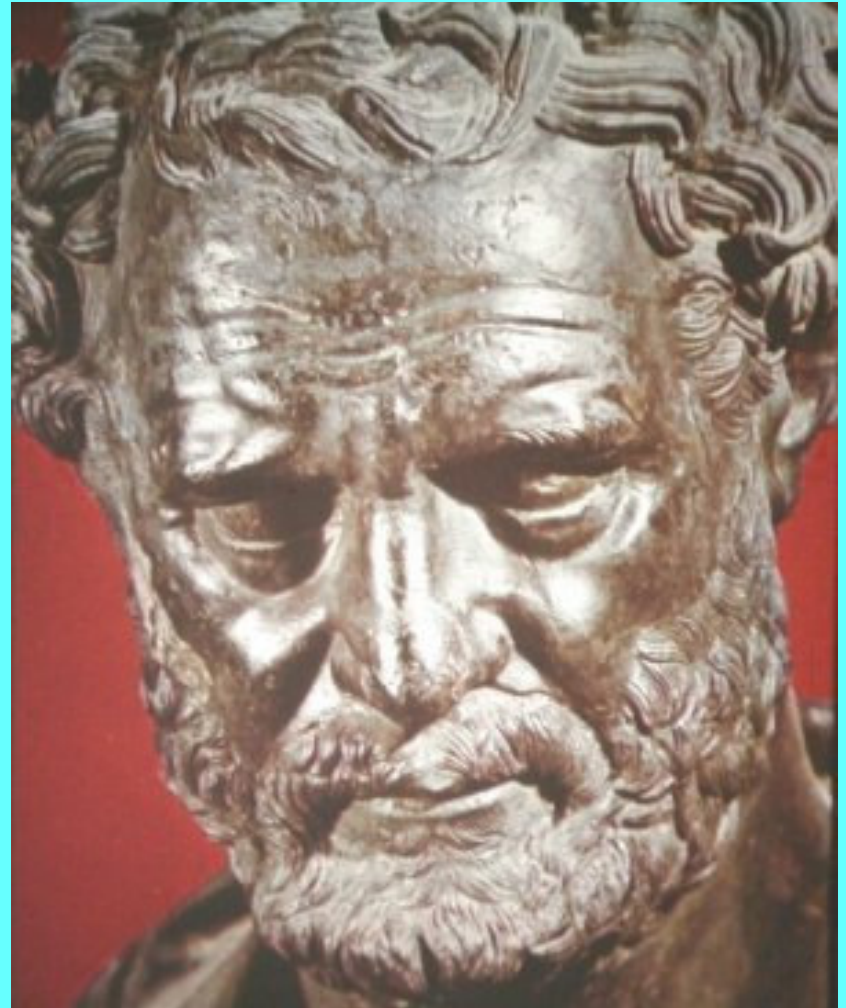
Chemistry 11

Early Models of the Atom




Ancient Greeks were the first to come up with the idea of atoms.

Democritus suggested that all matter was made of tiny indivisible particles called atoms. (Greek “atoma”)



Democritus



In the dark ages, the idea of atoms was frowned upon. Not much progress was made.

ATOMS?
What's that?
**OFF with your
HEAD!**

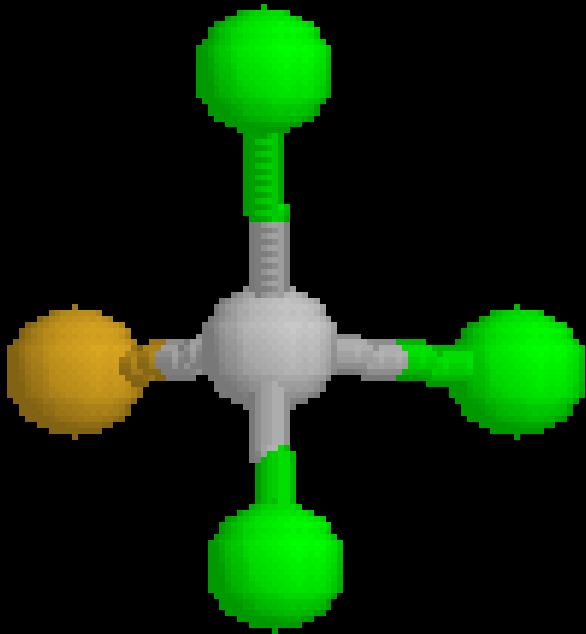


**In the early 1800's,
John Dalton came
up with the **ATOMIC
THEORY.****

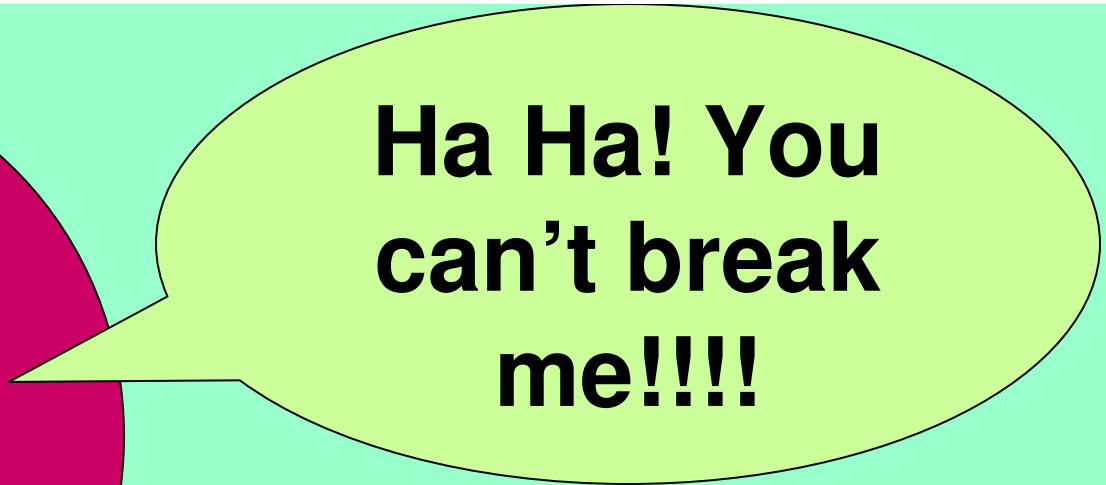
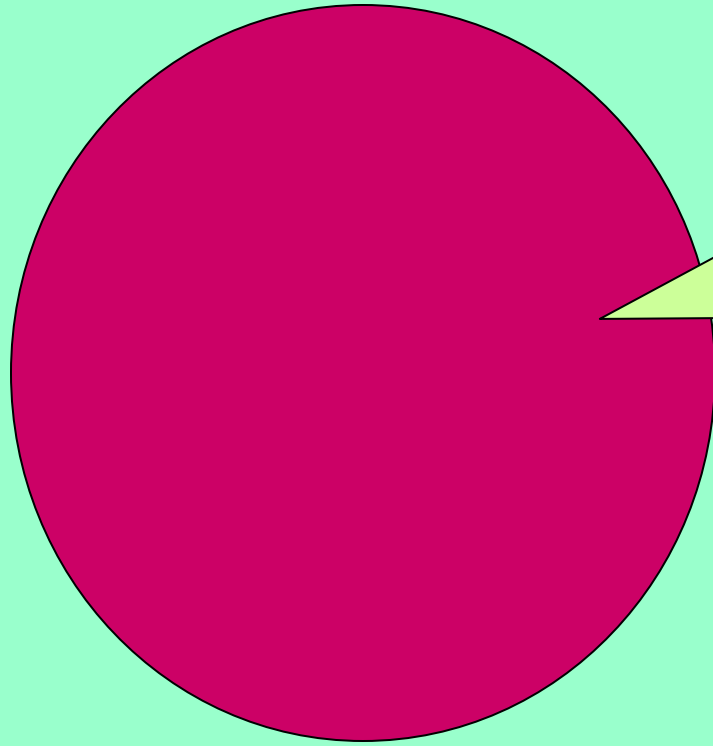
His main points were:

Dalton's Atomic Theory

- 1) All matter is made of atoms. Atoms are indivisible and indestructible.**
- 2) All atoms of a given element are identical in mass and properties**
- 3) Compounds are formed by a combination of two or more different kinds of atoms.**
- 4) A chemical reaction is a *rearrangement* of atoms.**



Compounds are composed of little “balls” called **atoms**, joined together by “bonds” to form **molecules**.



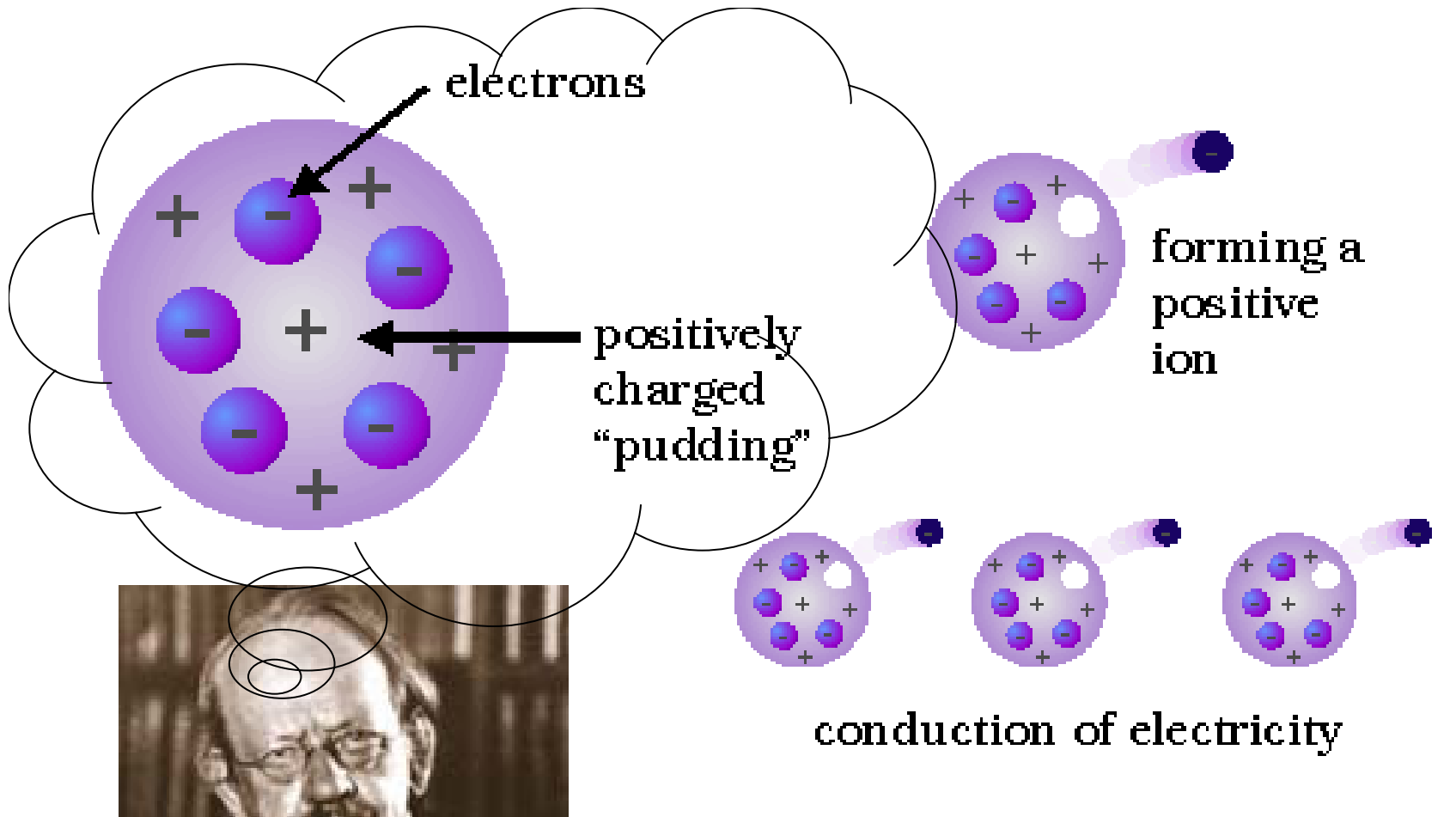
**An indestructible
“Dalton” atom**

crookes tube

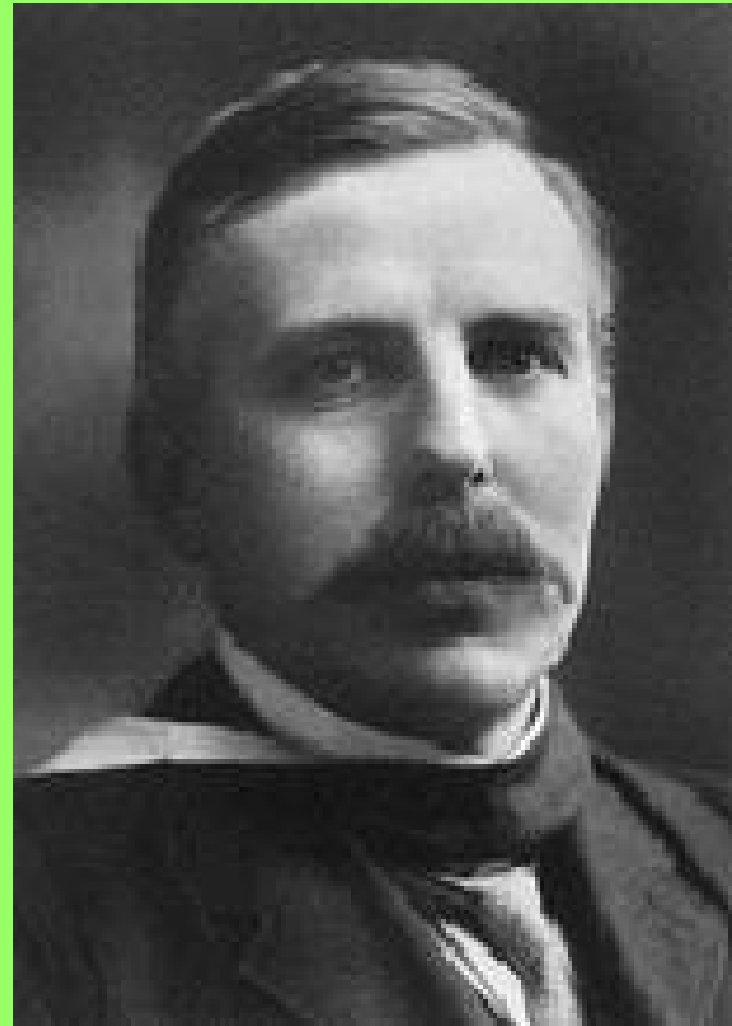
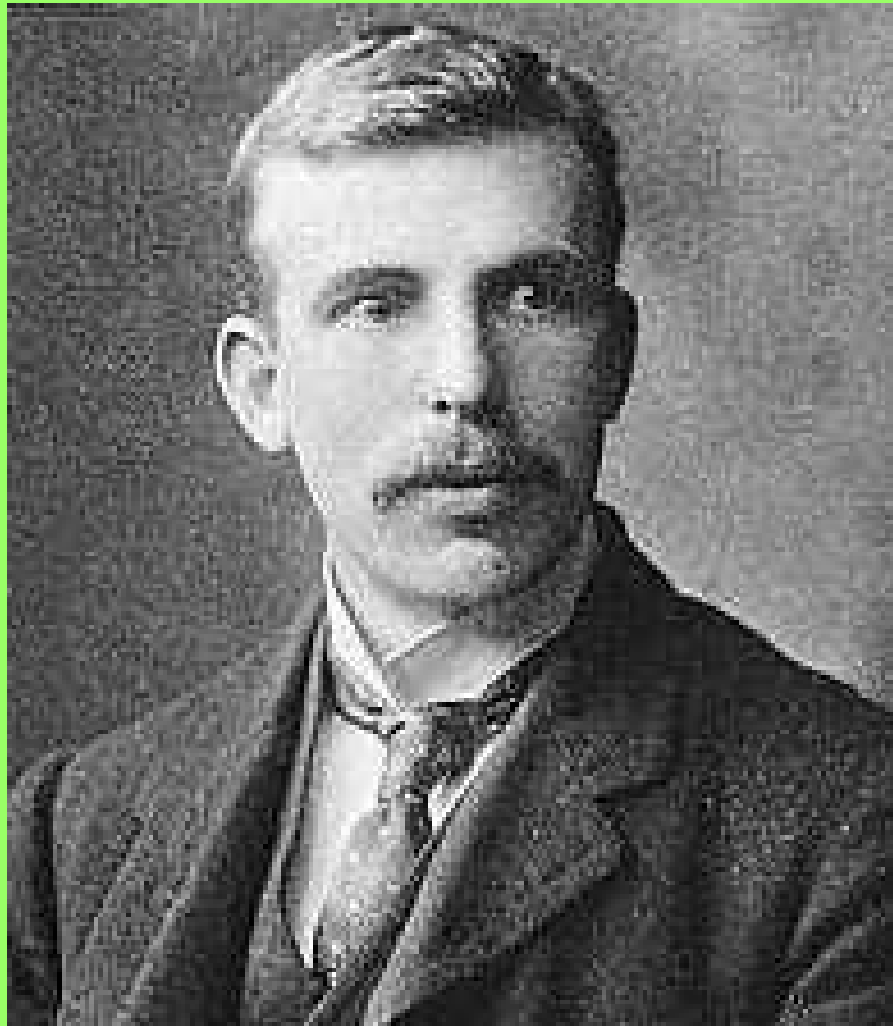
J.J. Thomson's Experiments

Using Crooke's tubes and other equipment, **J.J. Thomson** discovered the electron and measured its e/m (charge to mass) ratio.

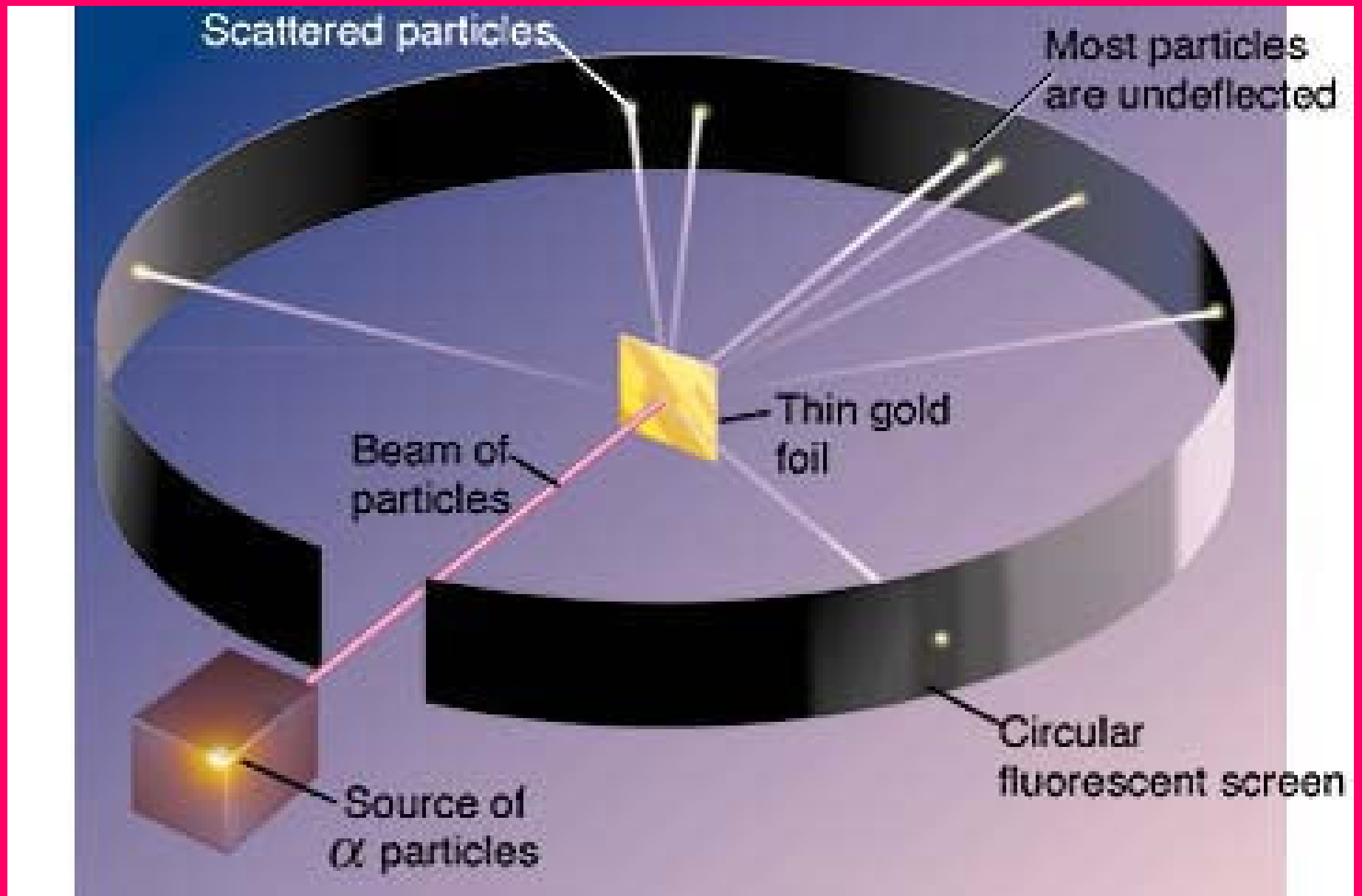
Later, "e" was found and the mass of an electron was found to be $9.10938188 \times 10^{-28}$ grams (much lighter than H)



Thomson's Plum Pudding Model



Ernest Rutherford

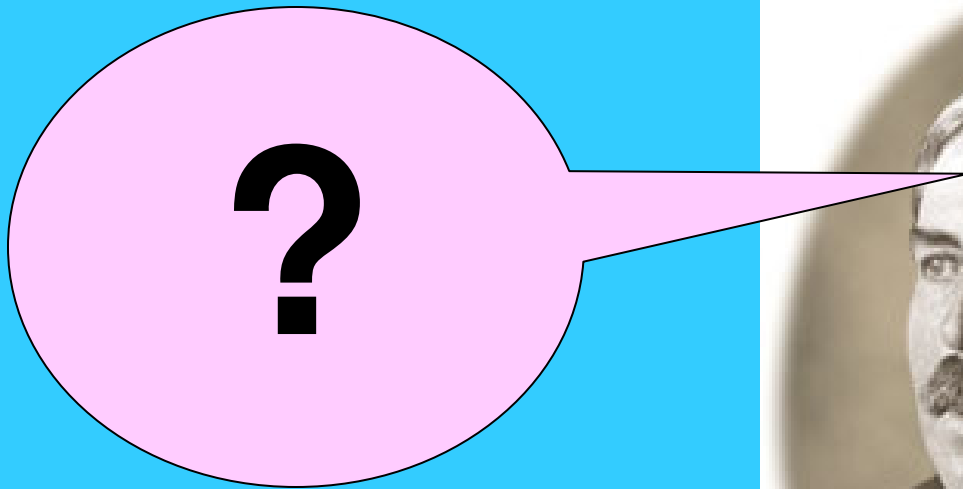


Rutherford's Scattering Experiment

Applet on Rutherford's Experiment



Rutherford could not explain why the electron didn't fall into the nucleus and destroy the atom.



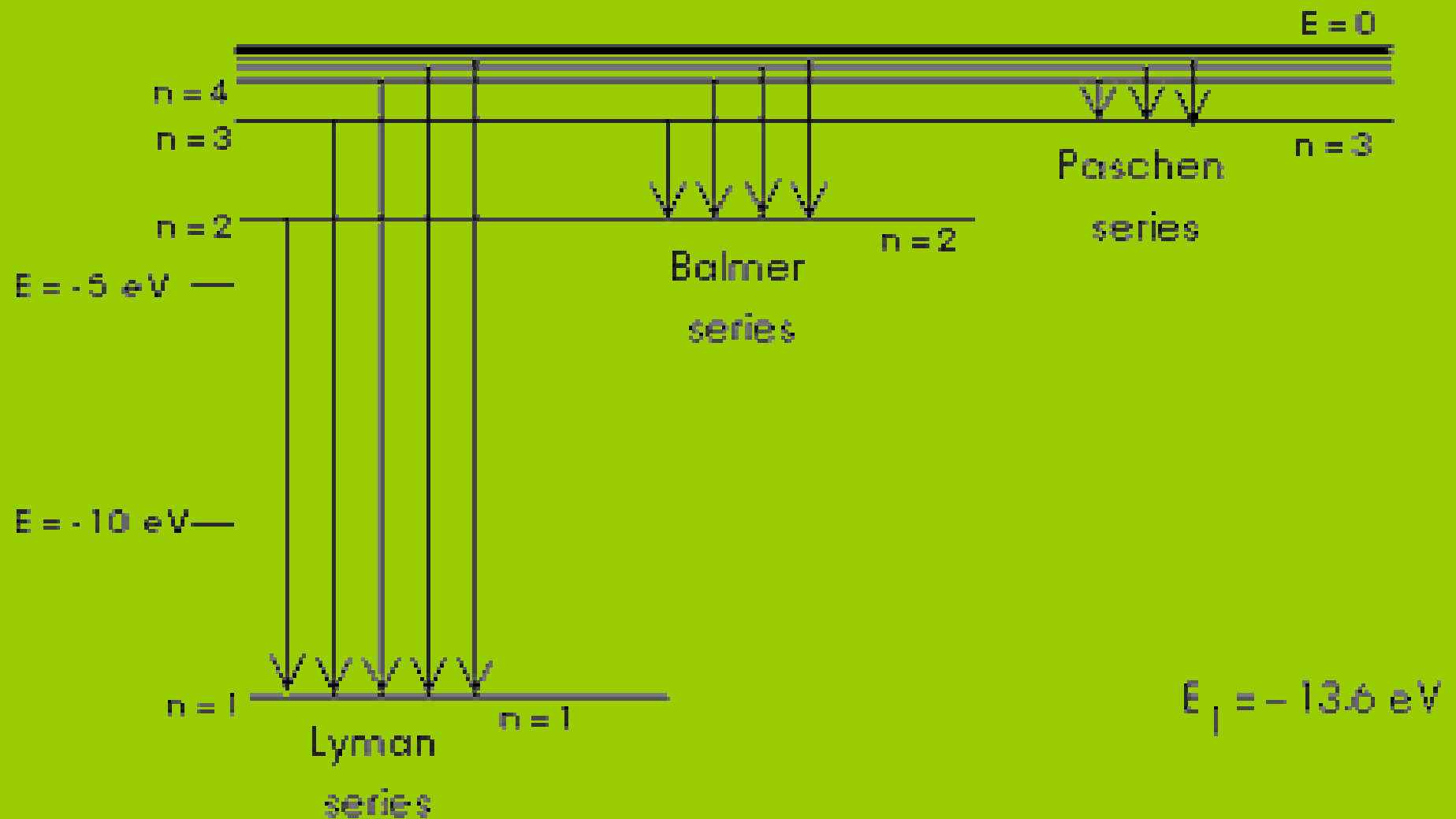
**Ernest Rutherford
(1871-1937)**



**I think I
can help!**

Neils Bohr

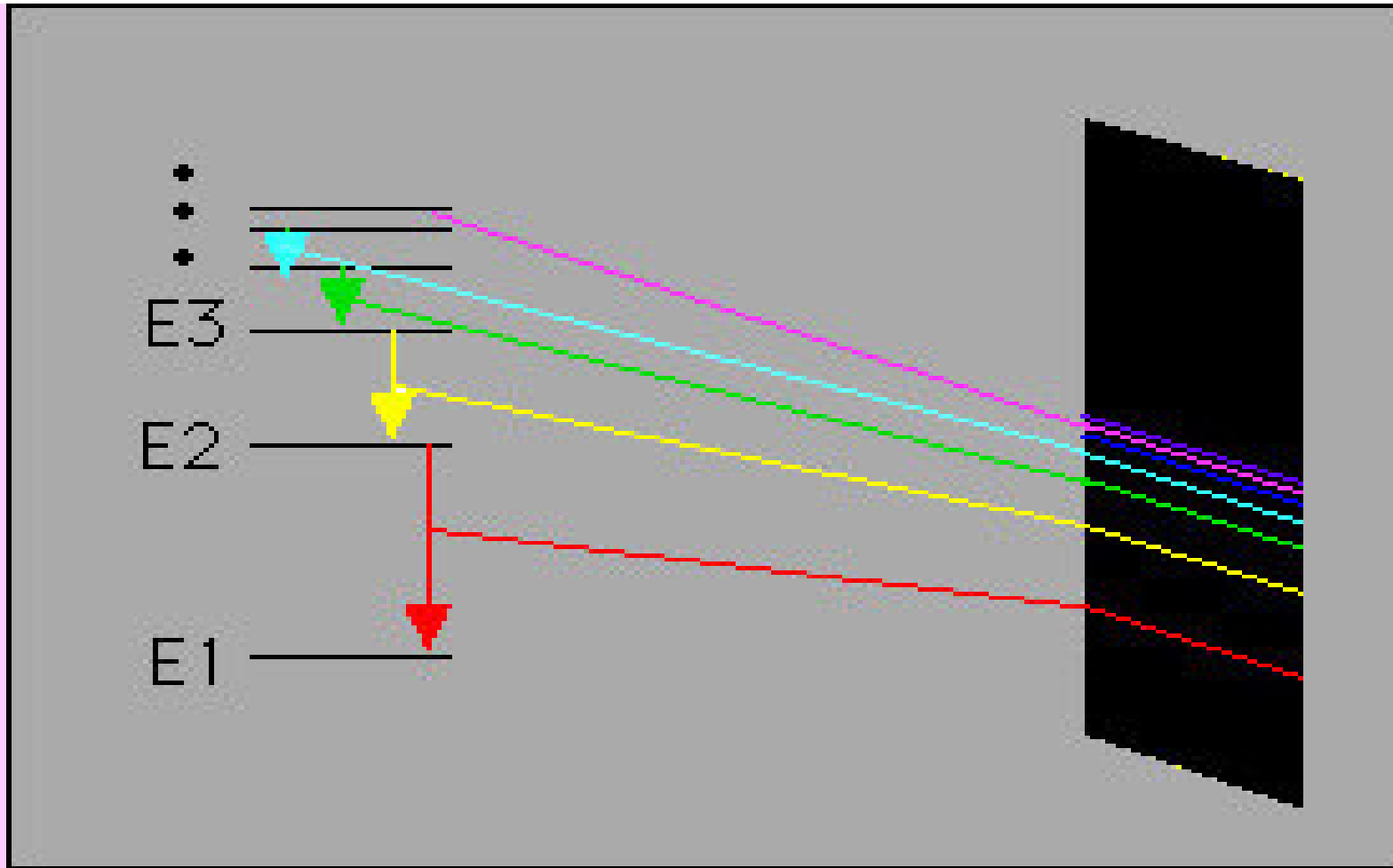
spectra and bohr



Bohr pictured the hydrogen atom as having discrete energy “levels” which the electron could “inhabit”. In its ground state, the electron would be in the lowest level ($n=1$)

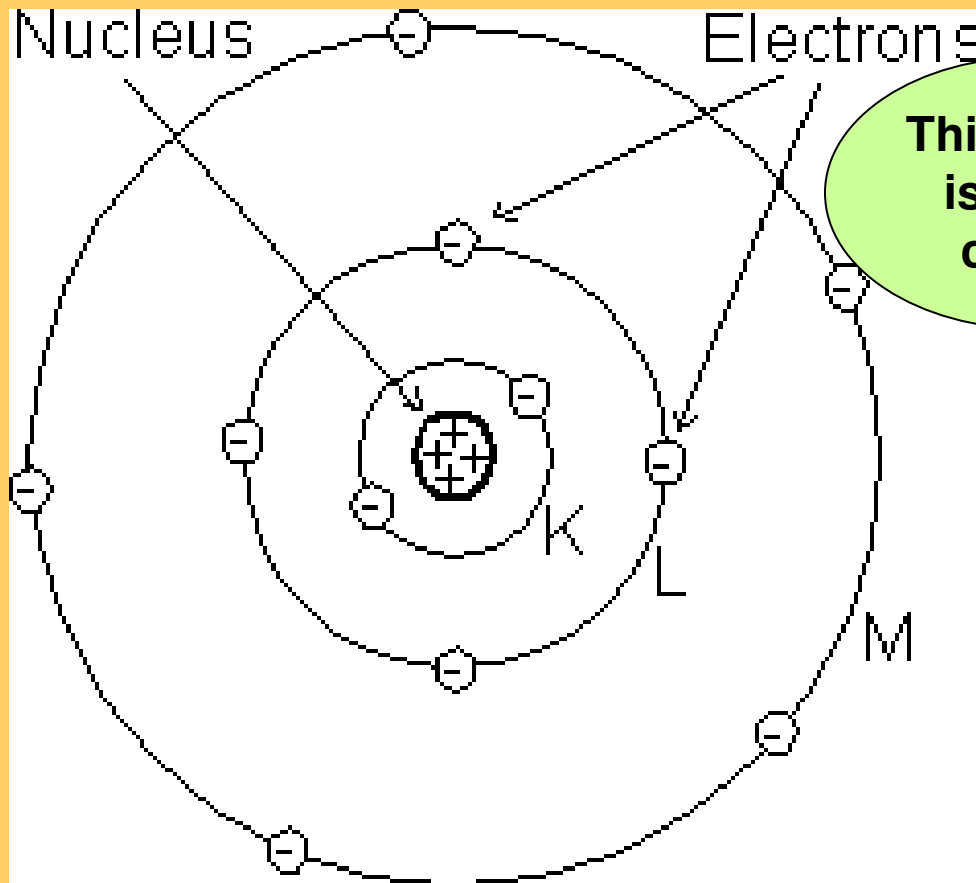
When the atom was “excited” the electron could “jump” to a higher level.

When the electron came back down, it released energy in the form of light.

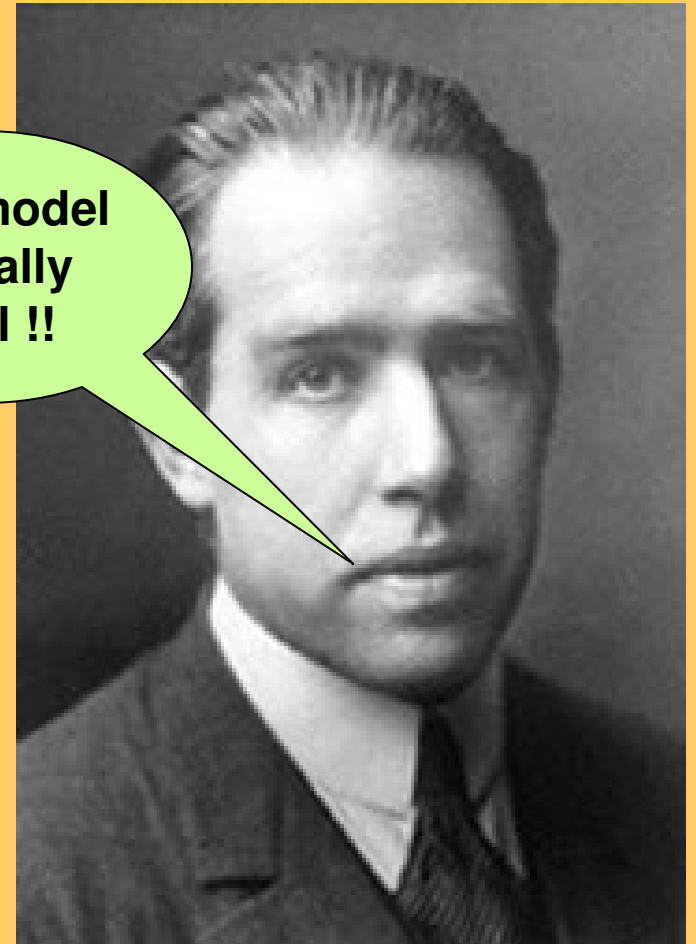


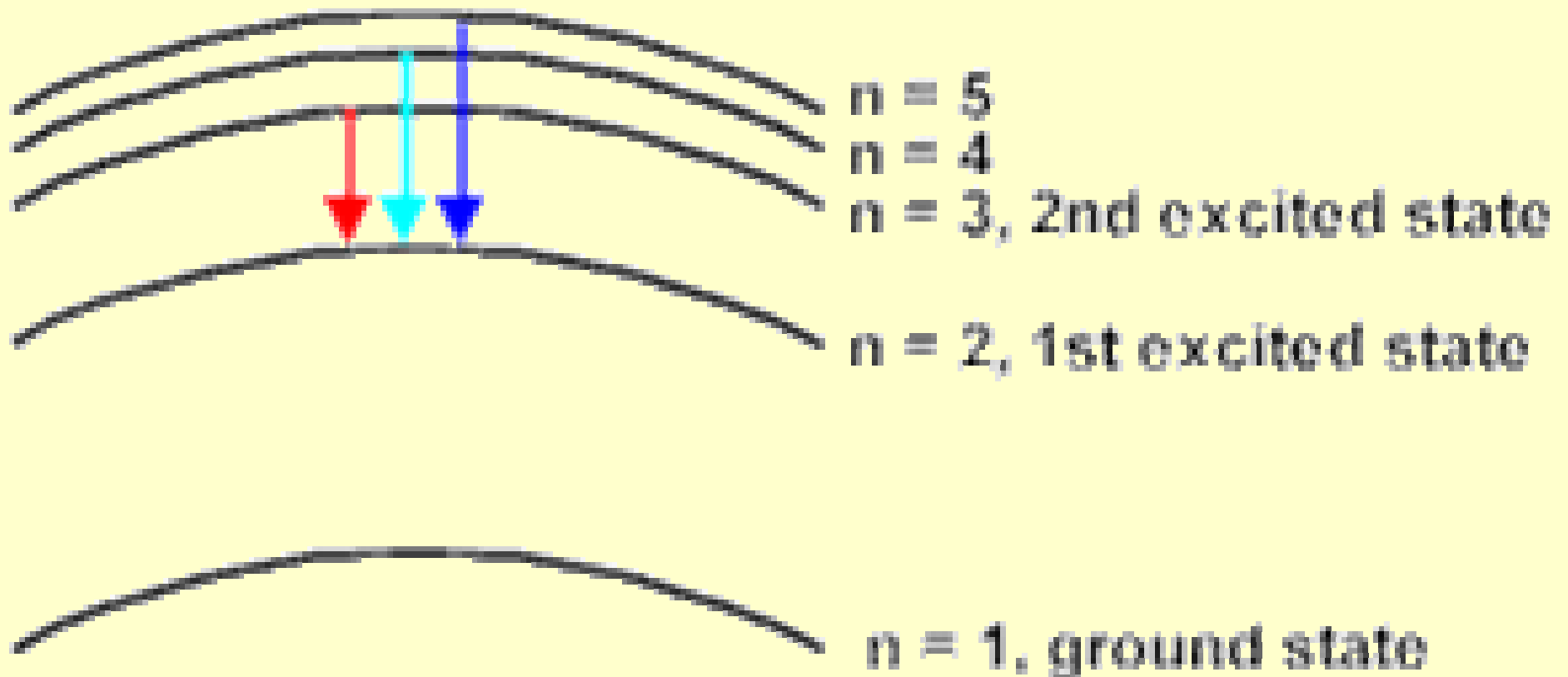
Each “jump” would give off light of a particular wavelength or colour. This gave rise to hydrogen’s spectrum.

According to Bohr, each energy “level” corresponded to a different “orbit” of an electron around the atom. (Like planets around the sun.)

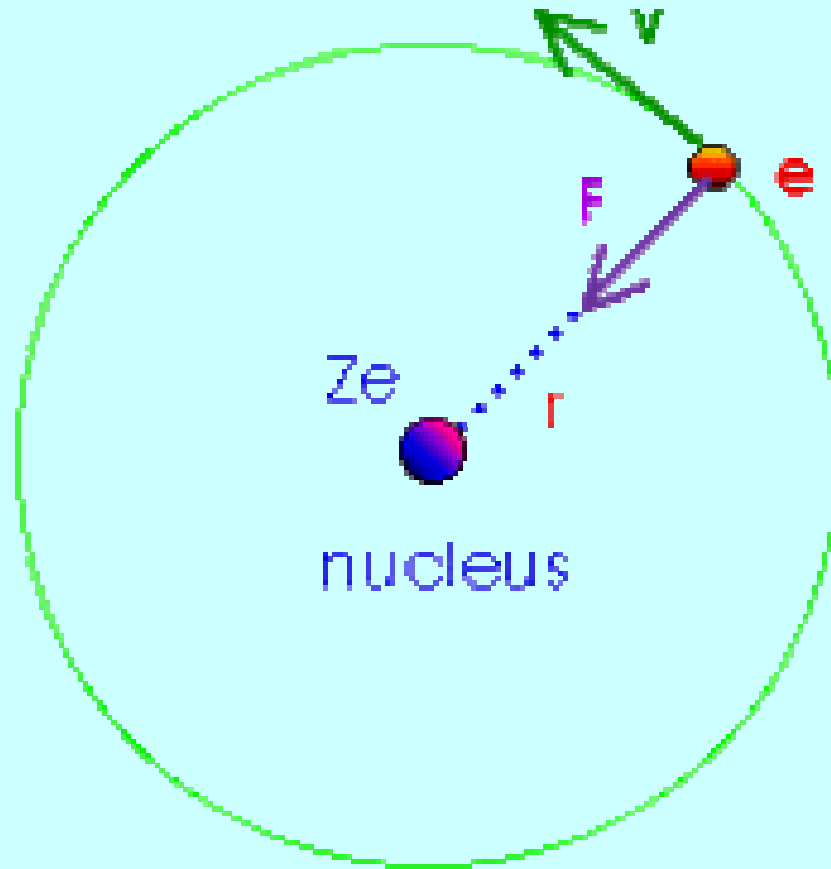


This model is really cool !!





Bohr even calculated what the radii of these orbits would be.



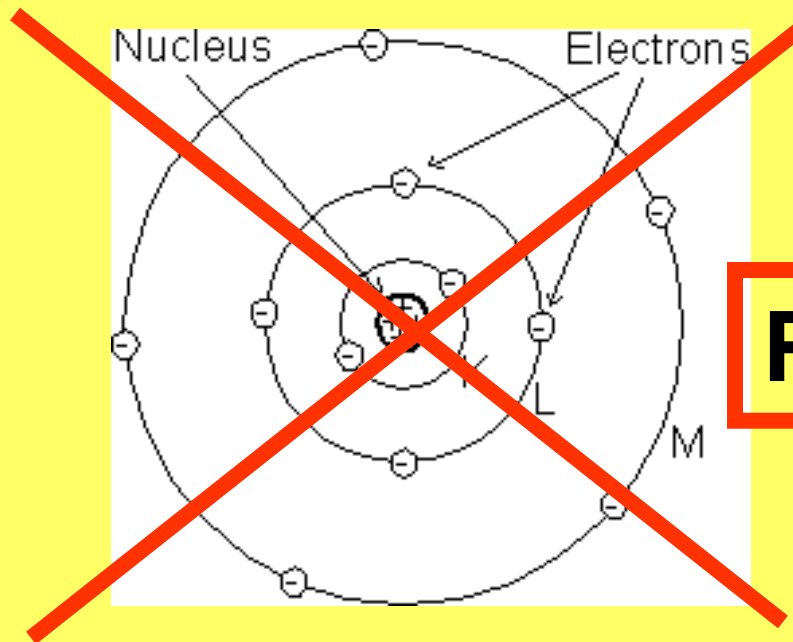
| | | | | | | | | | | |
|---------------------------------------|--|---|--|--|---|---|--|--|---------------------------------------|--|
| hydrogen 1 H 1.0079 | | | | | | | | | | |
| lithium 3 Li 6.941 | beryllium 4 Be 9.0122 | | | | | | | | | |
| sodium 11 Na 22.990 | magnesium 12 Mg 24.305 | | | | | | | | | |
| potassium 19 K 39.098 | calcium 20 Ca 40.078 | scandium 21 Sc 44.956 | titanium 22 Ti 47.867 | vanadium 23 V 50.942 | chromium 24 Cr 51.996 | manganese 25 Mn 54.938 | iron 26 Fe 55.845 | | | |
| rubidium 37 Rb 85.468 | strontium 38 Sr 87.62 | yttrium 39 Y 88.906 | zirconium 40 Zr 91.224 | niobium 41 Nb 92.906 | molybdenum 42 Mo 95.94 | technetium 43 Tc [98] | ruthenium 44 Ru 101.07 | | | |
| caesium 55 Cs 132.91 | barium 56 Ba 137.33 | lutetium 71 Lu 174.97 | hafnium 72 Hf 178.49 | tantalum 73 Ta 180.95 | tungsten 74 W 183.84 | rhenium 75 Re 186.21 | osmium 76 Os 190.23 | | | |
| francium 87 Fr [223] | radium 88 Ra [226] | lawrencium 103 Lr [262] | rutherfordium 104 Rf [261] | dubnium 105 Db [262] | seaborgium 106 Sg [266] | bohrium 107 Bh [264] | hassium 108 Hs [265] | | | |
| | | *lanthanoids | | lanthanum 57 La 138.91 | cerium 58 Ce 140.12 | praseodymium 59 Pr 140.91 | neodymium 60 Nd 144.24 | promethium 61 Pm [145] | samarium 62 Sm 150.36 | |
| | | **actinoids | | actinium 89 Ac [227] | thorium 90 Th 232.04 | protactinium 91 Pa 231.04 | uranium 92 U 238.03 | neptunium 93 Np [237] | plutonium 94 Pu [244] | |

Key:
 element name
 atomic number
symbol
 atomic weight (mean relative mass)

Element 107 on the Periodic Table is called Bohrium (Bh)

In the 1920's things changed!

Although Bohr's idea of energy levels was still accepted, his idea of planetary orbits for electrons was rejected!



REJECT !!

So.....

What's Next???

????????????????

QUANTUM MECHANICS

SORRY MA'AM, WE CAN'T TELL YOU ANYTHING WITH CERTAINTY, WE DEAL IN PROBABILITIES.
NOW, THINGS WOULD BE DIFFERENT IF YOU WERE DRIVING A NEWTON.

