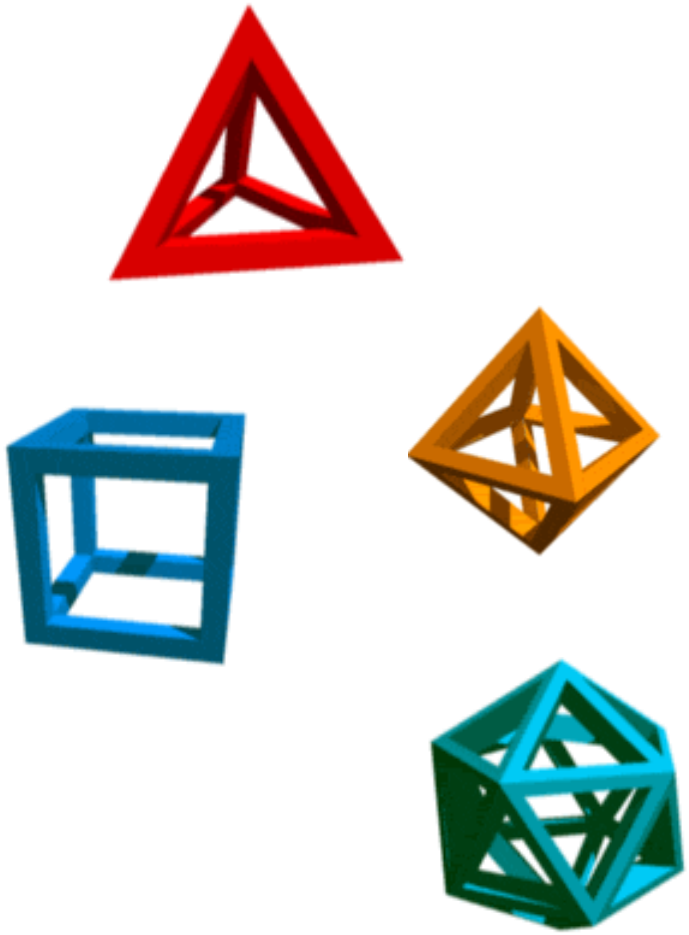
The Chemical Atom

In the 5c BCE Democritus suggested that matter was not infinitely divisible but was made of small particles that could not be cut - ATOMS.

Plato 4c BCE



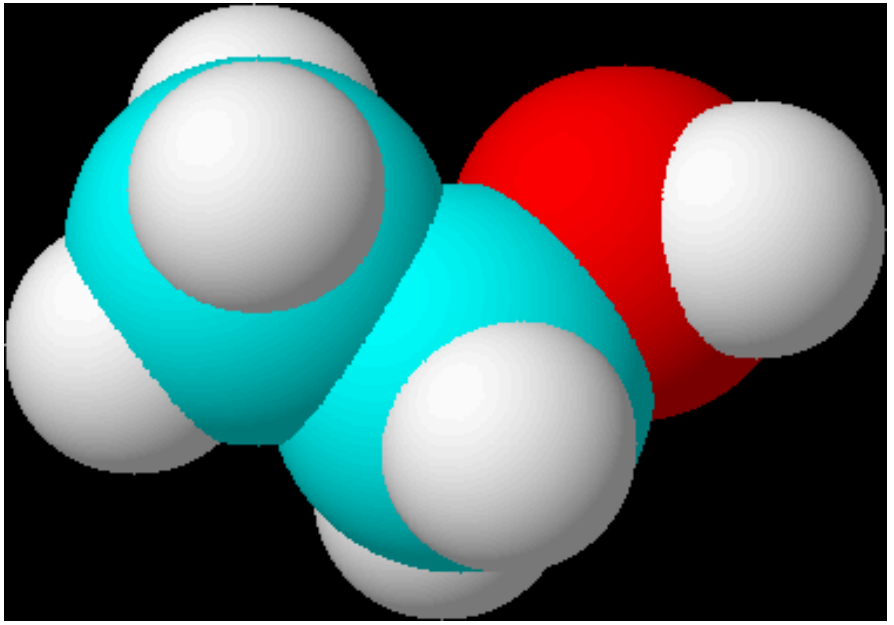
- Plato suggested that atoms of four Elements differed in shape
- Fire was a tetrahedron,air an octahedron, water an icosohedron and earth a cube.

Daltons Atoms

- In 1812 John Dalton suggested that atoms were indestructible but combined together, in simple proportions, to make compounds.
- Atoms of different elements differed in mass.
- He used assumptions about the formulas of compounds (assume 1:1 if no other evidence) to estimate relative atomic mass values.

- So as 1g Hydrogen combine with 8g of Oxygen
- If the atoms are combined 1:1
- The oxygen atoms must be 8 time heavier than hydrogen atoms.

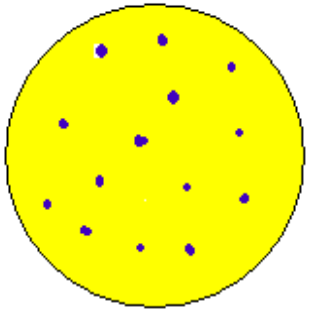
19th century



19th Century chemists developed Daltons ideas.

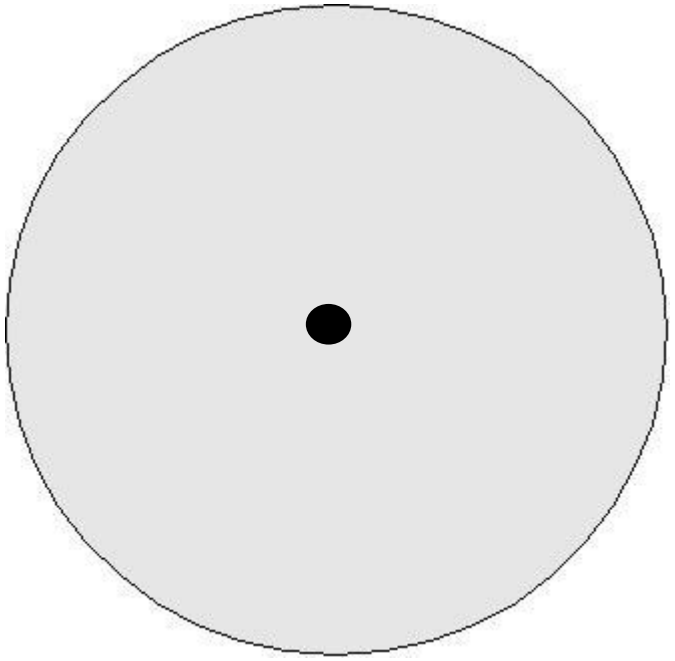
Atoms were seen as assembled together in three dimensions to make the molecules of all the new substances discovered.

Thompson's Atom 1890



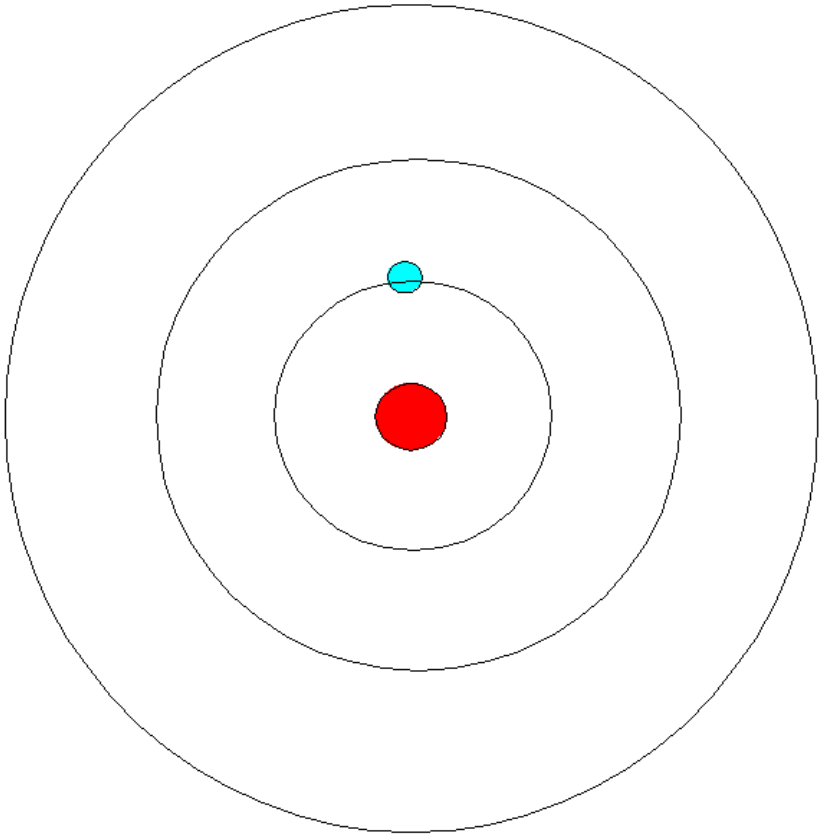
- Thompson showed that small negative particles could be ejected from atoms.
- This led to the picture of the atom as a currant bun with electrons embedded in a positive matrix

Rutherford 1910



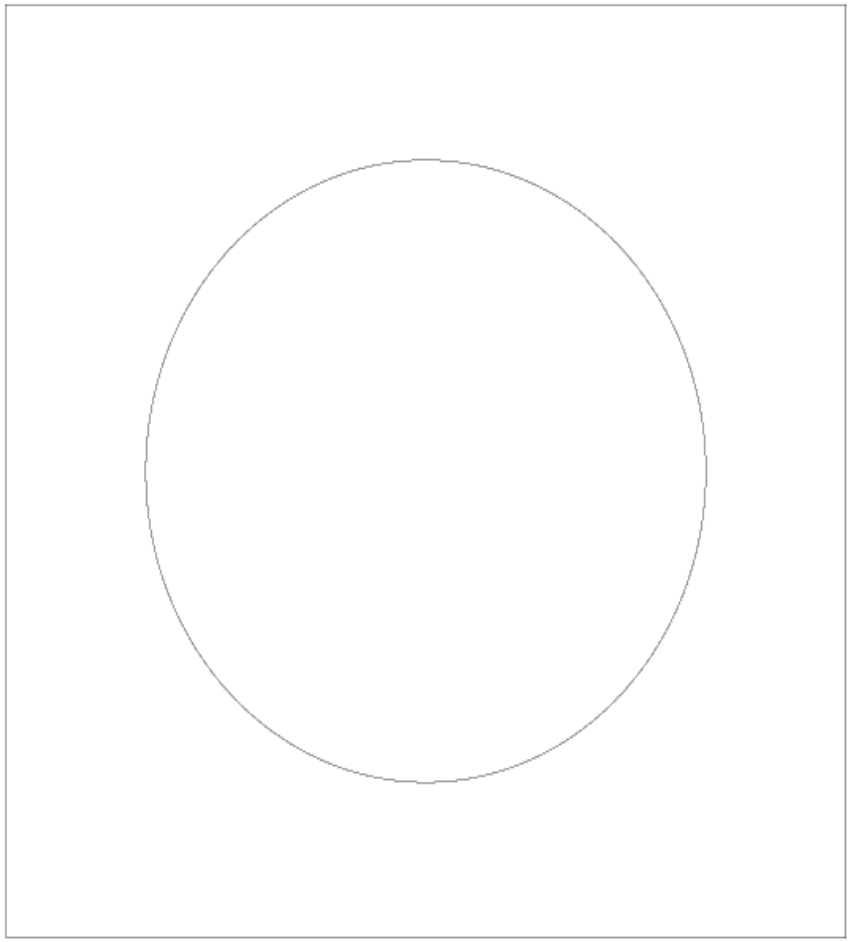
- Used the experimental results of Geiger and Marsden.
- The mass of the atom is concentrated in a small Nucleus.

Niels Bohr 1915

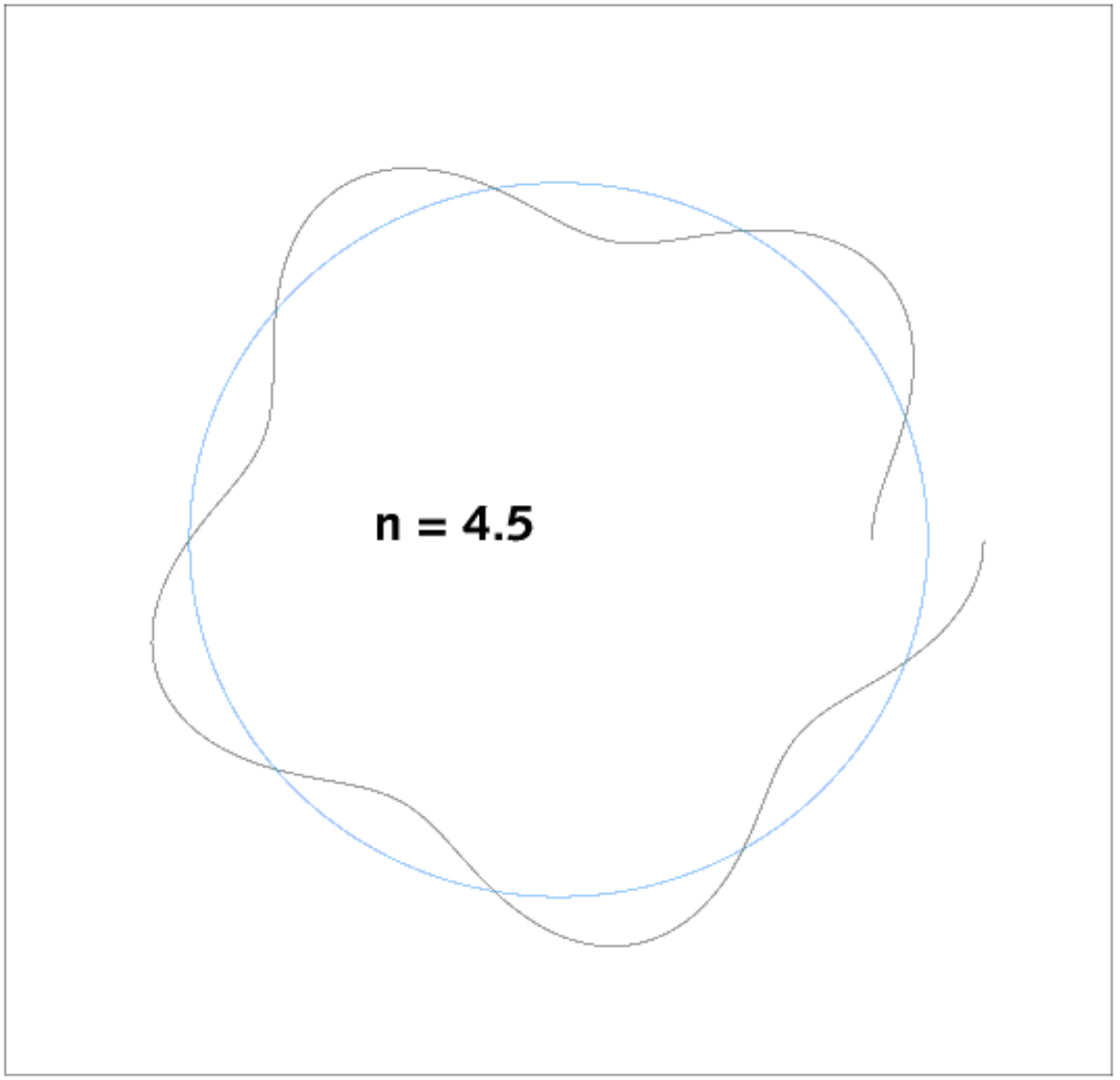


- Electrons move in orbits around the nucleus.
- Only certain orbits are allowed.
- When an electron falls from a higher to a lower orbit the atom emits a photon of light.

De Broglie 1924



- Developed Bohr's ideas
- Allowed orbits have whole numbers of electron wavelengths
- So standing waves can exist.



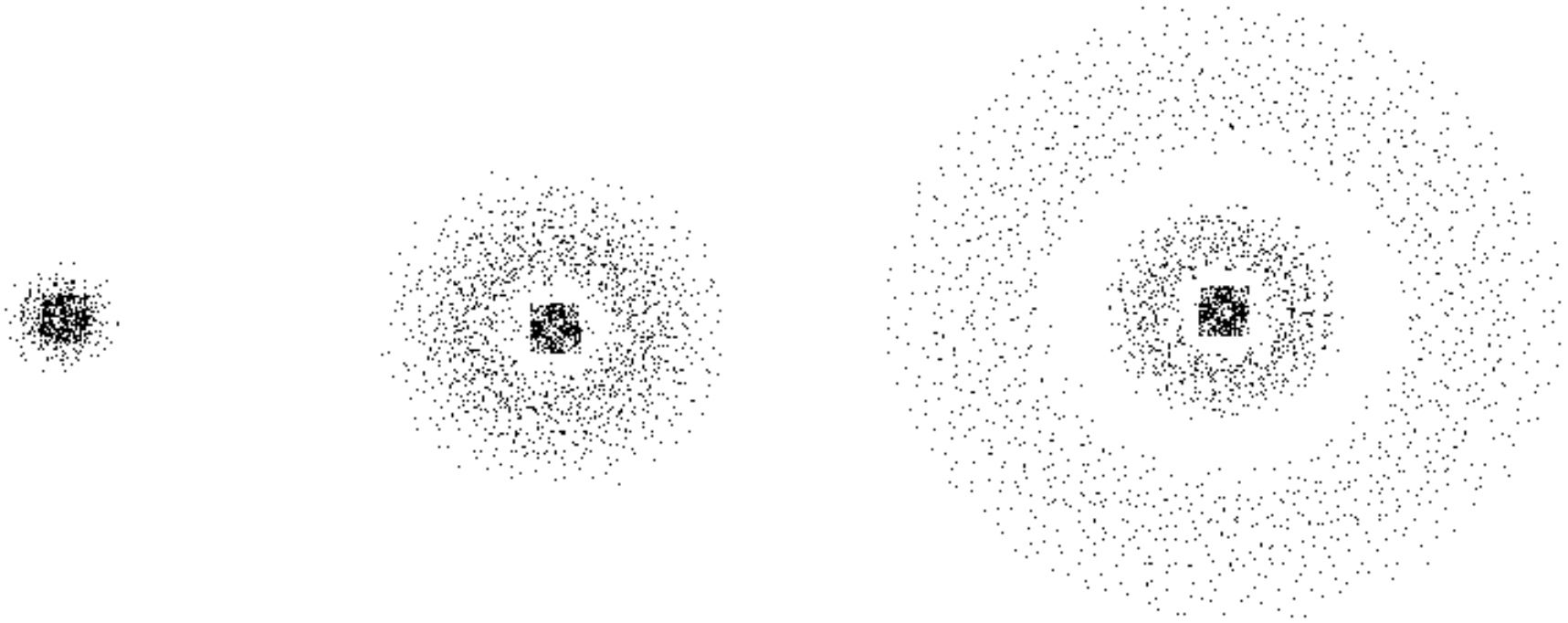
- If the orbit does not have a whole number of wavelengths it cannot exist.

Schrodinger 1926

- Electrons exist in 3 D standing waves.
- Called Orbitals.
- The square of the amplitude is a measure of the **probability** of finding an electron at that point.

The SHELL is indicated by the Principal Quantum Number n

As n increases the average distance of electrons in that shell from the nucleus increases.

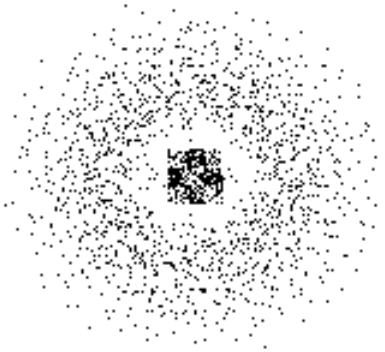


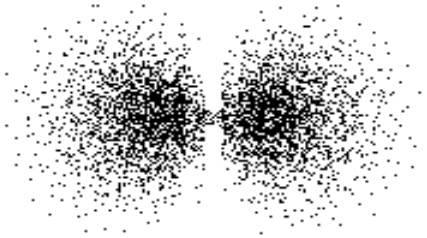
n=1 n=2 n=3

As **n** increases the number of **types** of orbital increases

for n=1 there is only one type of orbital (s)

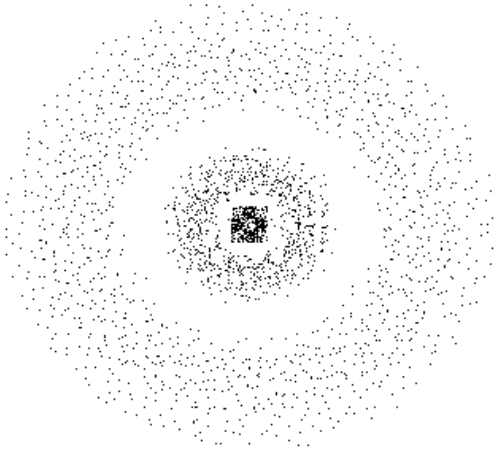
For n = 2 , there are two types of orbital (s and p)
s orbitals are spherical whilst p are dumbbell shaped



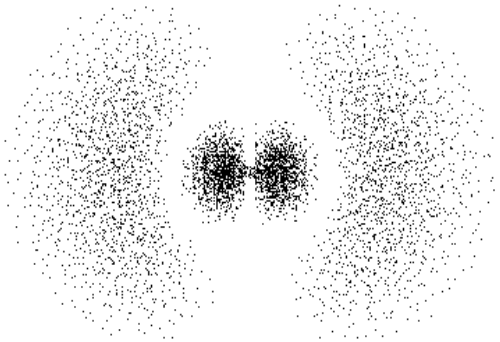


So for n=3 ?

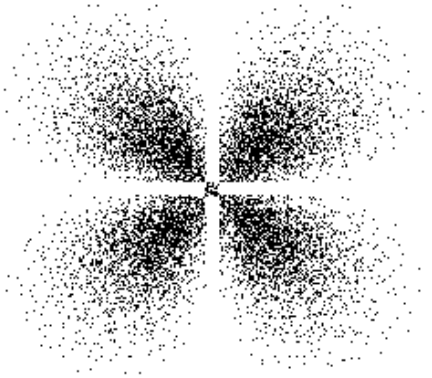
For **n=3** as you decided there will be **3** types of orbital:



3s



3p



3d

For n = 4 there will be

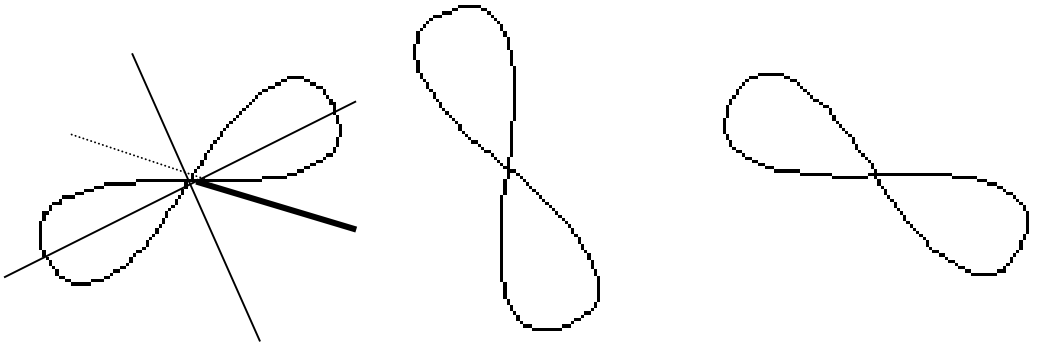
4

Types of orbitals

s p d f

There is only one s orbital in each shell

There are 3 p orbitals in each shell at right angles to each other.



How many d orbitals are there ? 5

How many f orbitals ? 7