

6.6 Theories of an Atom

Theories Evolve

- A theory expresses our best understanding of something.
- We improve a theory if suddenly it doesn't 'hold' anymore (evidence says it doesn't work)
- Atomic Theory (our theory of what an atom is) has been evolving for a long time!

1. The Atom

- About **400 B.C.** a Greek philosopher named Democritus said all matter is made up of tiny particles.
- These tiny particles he called 'atoms' which means 'indivisible'.
- Democritus said atoms were

- of different sizes, in constant motion and separated by space

2. 4 Elements

- Another Greek philosopher, Aristotle, rejected the 'atom' and supported an earlier theory that everything was made of 4 substances.
- Substances - earth (dry) - water (wet) - air (cold) - fire (hot)

3. Billiard Ball Model

- **1807** – John Dalton (English) brought back Democritus idea of atom.
- Main ideas:
 - atom is invisible
 - All atoms of an element are identical
 - Different elements made of different atoms
 - Atoms can be rearranged but never destroyed
 - BUT..... Dalton's model did not explain why some objects attract other objects (ie: static balloon sticks on clothes).
 - Hmmmm.....

4. The Electron

- J.J. Thomson in **1897** helped solve this problem.

- A substance in a vacuum tube emits particles when very very hot. These particles are attracted to a positive (+ve) plate.
- Thomson decided atoms must contain negative (-ve) 'electrons' inside a mass of positive stuff.
PLUM PUDDING MODEL

5. Protons in nucleus

- **1909** – Ernest Rutherford improved Thomson's model.
- Rutherford aimed +ve particles called alpha particles at very very thin gold. (so thin it's called 'gold foil' like tinfoil)
- Most alpha particles went through but a few deflected to the side and a very, very few rebounded straight back!
- Rutherford's experiment looked like this: (See teacher's diagram or check textbook/student)
- Rutherford concluded there must be a very small dense +ve centre.
- He called this +ve dense centre the nucleus.
- The +ve particle he called a 'proton'.
- The electrons must be in a 'cloud' around the nucleus.
- There is an equal amount of protons + electrons so atom is 'neutral' in charge.

6. The Neutron

- James Chadwick (one of Rutherford's students) in **1932** found a particle without charge that could penetrate and break apart atoms.
- These neutral particles he called 'neutrons'.
- Neutrons are found in the nucleus too.

7. Electron Orbits

- **1913**, Niels Bohr, discovered electrons exist not just anywhere around nucleus but in specific orbits (like planets orbiting the sun).
- When Helium is heated up or electricity is run through it, it emits light of certain colours.
- See chalkboard for full diagram. (See teacher's diagram or check textbook/student)
- Do I understand?? Homework: Read 6.6 Do # 2-6 on page 233