

Thoughts for the Day  
CH301H Fall 2010  
08/26/10

Chapter 1

Make up of the atom

We covered three key experiments.

Thompson's experiment

Use a cathode ray tube to show electrons were negatively charged and measured their mass to charge ratio.

How?

Used a beam of electrons (cathod rays) and deflected them with an electric field. However, this could not be used to figure out the mass/charge ratio as the velocity of the electrons passing through the plates was unknown. A perpendicular magnetic field was applied to offset the force from the electric field. The mass/charge ratio of the electron could then be found from the ratio of the applied electric and magnetic fields.

Milliken's oil drop

Showed that charge is quantized (comes in fixed amounts). Measured the charge on the electron thus yielding the electron mass.

How.

Ionized oil drops and watched them fall. First examined drop in falling at a terminal velocity without an electric field. He measured both the size of the particle and how fast it was falling. The size allowed him to quantify both the mass as well as the drag on the particle. Then he repeated the experiments with an applied field to determine the extra force from the electric field. From this is found the charge on many oil drops. He then used this data to deduce the smallest unit of charge possible to explain all of the data and concluded this was the charge on the electron. KEY IDEA: charge comes in tiny units of the charge on the electron

Rutherford's scattering experiments

Showed that nucleus of an atom is very small compared to the internuclear spacing and that the mass to charge ratio is extremely large. Essentially measured the size, spacing, mass, and charge of the nucleus.

How.

Shot a beam of alpha particles (He nuclei) at a thin metal foil. A small number were deflected and a much smaller number were scattered backwards. Using some

Other random thoughts tossed out today.

Atoms are all about  $1\text{\AA}$  in size (give or take)

Pb is denser than Al because Pb atoms are more massive

Things to keep in mind for the future. When you eventually work on electrochemistry you have to remember which electrode has the oxidation reaction and which electrode has the reduction. Reduction is the gaining of electrons. I always remember this is happening at the cathode as this is the electrode that the electrons come flying off of (the source of the cathode rays).