

[00:15] <Doos> today will be about atoms, isotopes, charge transfers etc
[00:16] <Doos> I don't know if we can do it all in one session, but we'll see
[00:16] <dav> can I make a question before we start pls?
[00:16] <Doos> sure dav
[00:16] <dav> 10x. Trigonal system has 4 or 3 POS?
[00:17] <Doos> could you rephrase that?
[00:17] <hehheh> 4
[00:17] <dav> 4 or 3 Planes Of Symmetry?
[00:17] <Doos> oh ok
[00:17] <dav> I also think 4.
[00:17] <Doos> yes 4
[00:17] <dav> ok 10x.
[00:18] <hehheh> But there is one for rotational symmetry
[00:18] <Doos> 3 trigonal and 1 digonal
[00:18] <dav> total of 4.
[00:18] <Doos> those are the axes
[00:18] <hehheh> oh
[00:18] <hehheh> messed up a little here
[00:18] <Doos> and they follow the planes usually
[00:19] <Doos> anyone else before we start?
[00:19] <Doos> who never had chemistry in school?
[00:19] <Sara> What about a date on Sunday? Hmm? Are you doing anything then?
[00:20] <Doos> heh
[00:20] <Doos> shall we go over the basics quickly?
[00:20] <hehheh> anything
[00:20] <Doos> ok
[00:20] <hehheh> Do I require my course notes?
[00:20] <Doos> nah
[00:20] <hehheh> Dips or foundation?
[00:20] Frank (~Frank@172.210.133.102) left irc: Ping Timeout
[00:21] <Doos> an atom is the smallest part of an element that still has all the properties of that element
[00:21] <Doos> both hehheh
[00:21] <hehheh> okay
[00:22] <Doos> an atom is made up of protons and electrons, in most cases also of netrons
[00:22] <Doos> neutrons
[00:22] <hehheh> I thought we were doing the em-wave, colours, and spectra part of atoms
[00:22] <Doos> only H (hydrogen) doesn't have neutrons
[00:23] <Doos> basics first for those who didn't know that
[00:23] <hehheh> k
[00:23] <Doos> H can also have neutrons, but then they are isotopes which we will cover later
[00:24] <Doos> the protons and neutrons bind together to form the necleus of the atom
[00:25] <Doos> the electrons orbit around that nucleus like planets orbiting the sun
[00:25] <Doos> protons have a positive electric charge, electrons a negative one
[00:25] <Doos> neutrons are neutral.
[00:26] <Doos> as every atom want to be neutral in charge, there are always as many protons as electrons in that atom
[00:26] <Doos> any questions so far?
[00:27] Frank (~Frank@172.211.204.163) joined #go.
[00:27] <Doos> wb Frank

[00:27] <Frank> ty...just aol letting me know who's boss
[00:27] <Sara> not on my end
[00:27] <hehheh> no questions so far
[00:27] <Doos> Frank, you are familiar with electrons, protons and neutrons right?
[00:27] <Frank> yes
[00:28] <Doos> ok
[00:28] <Doos> the electrons orbit the nucleus in what we call shells
[00:28] <Doos> actually it's a cloud
[00:29] <Doos> but we aren't chemists
[00:29] <Doos> from the nucleus outward there are several shells that each can occupy a certain amount of electrons
[00:30] <Doos> the first one can hold 2, the rest can hold $2n^2$
[00:30] <Doos> the n being the number of the shell
[00:30] <Doos> for the first shell that would result in 2×1^2
[00:31] <Doos> for the second $2 \times 2^2 = 8$
[00:31] <Doos> for the 3rd $2 \times 3^2 = 18$
[00:31] <Doos> etc
[00:31] <Doos> is that clear?
[00:32] <Frank> yes
[00:32] <Doos> ok
[00:32] <dav> yes
[00:33] <Doos> atoms not only want to be neutral in electricity, they also want their outershells filled with the maximum of electrons
[00:33] <Doos> and they fill them from the 1st shell first
[00:34] <Doos> in hydrogen, which has only one electron .. that means it has to find 7 other electrons elsewhere
[00:34] <Doos> oxygen has 8 electrons, so 6 in the second shell and just needs 2 to fill up that shell
[00:35] <Doos> if oxygen and hydrogen meet, it's easier for the hydrogen to donate an electron to oxygen than to take the 6 from the oxygen
[00:36] <Doos> as the latter would require higher energy
[00:36] <Frank> wouldn't hydrogen only need one to fill it's single shell?
[00:36] <Doos> uh one yes
[00:36] <Doos> thanks for the correction
[00:36] <Frank> :)...sorry
[00:36] <Doos> Annie isn't here to keep an eye on my errors
[00:37] <Frank> I can't fill her boots
[00:37] <hehheh> You are doing very fine for a one man show.
[00:37] <Doos> so now hydrogen donates one electron to oxygen and is electric unstable .. more positive
[00:37] <Frank> agreed...sorry for the interruption please continue
[00:38] <Doos> and oxygen has 7 electrons in its outer shell and becomes negative
[00:38] <Doos> all it needs now is to find another hydrogen friend and it forms water H₂O
[00:39] <Doos> so hydrogen has a valency of 1+ and oxygen of 2-
[00:40] <Doos> meaning that usually hydrogen will usually donate one electron (not that it has more)
[00:41] <Doos> oxygen is the acceptor of the electrons and needs 2 of them .. it will be negative in valence
[00:41] <Doos> so 2-
[00:42] <Doos> if you know the valency of the elements, you can do a simple trick to find out the formula
[00:42] <Doos> say you have H₁₊ and O₂₋

[00:42] <Doos> you could write that as H- and O--
[00:43] <Doos> all you have to do is to swap the dashes and you have the formula
[00:43] <Doos> was that understandable?
[00:43] <Frank> the dashes showing the valency number?
[00:43] <Doos> yes
[00:43] <Frank> yes
[00:44] <Frank> ;))
[00:44] <dav> yes
[00:44] <Doos> a few rules: 1, always put the element which has a positive valency first
[00:45] <Doos> and 2: if the swapping trick results in $1N1Cl$, then you don't write the 1's
[00:45] <Doos> NaCl rather
[00:46] <Doos> Not only atoms can have a positive or negative charge, groups of atoms can aswell
[00:46] <Doos> like SiO_4
[00:47] <Doos> NO_3 etc etc
[00:47] <Doos> we call them radicals
[00:47] <Doos> not the mathematic radicals ofcourse
[00:47] <Frank> I've been called that :)
[00:47] <Doos> heh
[00:48] <Doos> potty and tea, holdon
[00:48] <Frank> k
[00:48] <Frank> How are you Dave?
[00:49] <dav> ok
[00:50] <Frank> you got snow?
[00:51] <dav> I?
[00:51] <Frank> yes your in Montana aren't you?
[00:52] <dav> from where I am in LONDON, NO [neither snowflake....:)]
[00:52] <Doos> another dave Frank
[00:52] <Doos> ok, any questions sofar?
[00:53] <hehheh> Dav you are from London?
[00:53] <dav> Is there another Dave? (btw, I'm Dav)
[00:53] <Frank> yes Dave from Montana hangs around here
[00:53] <hehheh> :)
[00:53] <dav> No actually I'm Maltese and I am here to study Gemology for the June exams.
[00:53] <Frank> but welcome Dav
[00:54] <dav> 10x Frank.
[00:54] <Sara> Ok, SiO_4 etc
[00:54] <Frank> Doos why can some elements (iron and copper) have more than one valency value.?
[00:55] <Doos> the type of bonding I described earlier, the donating-accepting is called "covalent" bonding
[00:55] <Sara> *O
[00:55] <Doos> Frank, alot can have that
[00:55] <hehheh> I think that one's out of syllabus for FGA.
[00:55] <Frank> ok
[00:56] <hehheh> But you can read about spdf and pauli exclusion principle in wikipedia
[00:56] <hehheh> It will explain about energy levels etc.
[00:56] <Frank> k thanks
[00:56] <hehheh> Then it will be clear why transition metals can have so many valencies.
[00:57] <hehheh> * spdf orbitals

[00:57] <hehheh> sorry for the interruption
[00:57] <Frank> me too...carry on doos
[00:57] <Doos> uhm, the type is called ionic bonding
[00:58] <Doos> the other type, covalent, shares the electrons around different
nuclea .. so orbiting in an 8-figure
[00:59] <Sara> wait...
[00:59] <Doos> last in the basic atom is the mass and number of atoms
[00:59] <Doos> yes Sara
[00:59] <Sara> hehheh and frank were talking about ionic bonding?.
[00:59] <Doos> I was
[00:59] <Sara> you were... ok then I'm lost
[00:59] <Doos> the sharing and donating
[00:59] <Sara> ohhhh
[00:59] <Sara> ok
[00:59] <Doos> I needed to correct myself as I said it to be covalent
[01:00] <Doos> so last in the basic atom is the mass and number of atoms
[01:00] <Doos> the atomic mass of an atom is the number of protons and neutrons
in the nucleus
[01:01] <Doos> the electrons are not counted as they are about 1800 times lesser
in weight
[01:01] <Doos> the atomic number is the amount of protons alone
[01:01] <Doos> which is also the amount of electrons
[01:02] <Doos> for hydrogen, the mass is one and the atomic number aswell
[01:02] <Sara> Why/
[01:02] <Doos> because hydrogen has only one proton
[01:03] <Doos> and no neutrons
[01:03] <Sara> ok
[01:03] <Doos> oxygen on the other hand has a mass of 16 and an atomic number of
8
[01:03] <Doos> can you figure out how many neutrons it has?
[01:04] <dav> 8
[01:04] <Doos> indeed
[01:04] <Doos> the mass minus the number
[01:04] <hehheh> you make a good chem teacher
[01:05] <Doos> usually you see mass as 35.5 and a number of 17
[01:05] <Doos> how many neutrons would there be?
[01:06] <Doos> give up?
[01:06] <Frank> 17?
[01:06] <hehheh> 18 or 19
[01:06] <Doos> good gamble, but your mony is mine
[01:06] <Doos> very good hehheh
[01:06] <hehheh> Chlorine has 2 isotopes
[01:06] <Doos> indeed
[01:06] <hehheh> in equal proportion
[01:06] <Doos> shall I explain that a bit?
[01:07] <Doos> lets go back to hydrogen
[01:07] <hehheh> sure
[01:07] <Doos> hydrogen doesn't have any neutrons
[01:07] <Doos> but sometime it does
[01:07] <Doos> so now there is one proton and one neutron in the nucleus
[01:08] <Doos> hence increasing the mass number from 1 to 2
[01:08] <Doos> this form of hydrogen is called an isotope of H
[01:08] <Doos> and known by the name deuterium
[01:09] <Doos> it can also have 2 neutrons, then the isotope is called tritium
or so

[01:09] <Doos> is that clear sofar?
[01:09] <Frank> where do the neutrons come from?
[01:10] <Doos> maybe leaked from other atoms, don't know
[01:10] <Frank> k
[01:10] <Doos> almost all elements have isotopes
[01:11] <Frank> do these form naturally?
[01:11] <Doos> to a lesser or more extend
[01:11] <Doos> yes
[01:12] <Doos> in the case of chlorine it was discovered that half of it consist of an isotope with 18 neutrons and the other half with 19 neutrons
[01:12] <Doos> it also has 17 protons, which is stable
[01:12] <Frank> mixed together?
[01:12] <Doos> yes
[01:13] <Doos> so in some cases the atomic mass is $17 + 18 = 35$
[01:13] <Doos> and others have $17 + 19 = 36$
[01:13] <Doos> +
[01:13] <Doos> so that gives a nice averag of 35.5
[01:14] <Doos> in almost every element there is a mixture of isotopes, so most have odd numbers
[01:14] <Doos> what you usually do is to round it to the nearest whole number like 35
[01:15] <Doos> I keep thinking I'm forgetting something
[01:16] <Doos> everthing clear sofar?
[01:16] <dav> yes
[01:16] <Frank> yes
[01:16] <Doos> Sara?
[01:17] <Doos> okay, energy
[01:17] <Doos> lets stick to hydrogen again
[01:17] <Doos> but it works in all atoms
[01:18] <Doos> one electron orbits the atom nucleus in it's first shell
[01:18] <Doos> at about a few trillion km/sec orso
[01:18] <Sara> Yeah, ok.. sorry the dr. was on the phone
[01:18] <Doos> ok
[01:19] <Doos> if energy is applied to that atom, the electron will absorp it
[01:19] <Doos> and depending on how much energy it absorps .. it will jump from its current shell to a higher level/shell
[01:20] <dav> ie empty ok?
[01:20] <Doos> then after a short period .. very short .. it wants to get back to its ground state and emits the energy in the form of heat
[01:21] <Doos> yes dav
[01:21] <Frank> or fluorescence (light)?
[01:21] <Doos> yes
[01:21] <Doos> that depends
[01:21] <Doos> on the amount of energy and the level
[01:21] <dav> can u stop a little here pls.
[01:21] <Doos> sure
[01:21] <dav> I learnt that
[01:22] <dav> if transactions to $n=1$,
[01:22] <dav> it falls to the Lyman series which
[01:22] <dav> is the invisible part, hence
[01:23] <dav> the luminescence is only visible under UV. OK?
[01:23] <Doos> correct
[01:23] <dav> ok.
[01:23] <Doos> in the case of hydrogen the emitting occurs around 100nm
[01:23] <Doos> so not visible to us

[01:24] <Doos> not sure about all those numbers though
[01:24] <Doos> I never learned them ofcourse
[01:24] <Doos> this emission of light can be seen in a spectrum
[01:24] <Doos> of heat rather
[01:25] <Doos> and if that falls in the visible spectrum, we can see it with a spectroscope
[01:26] <Doos> this all happens very fast ofcourse ... 1×10^{-18} seconds orso
[01:26] <Doos> the -18 should be in superscript
[01:26] <Frank> so it's quick
[01:26] <Doos> electrons are fast buggers
[01:27] <Doos> so if you apply energy to an atom .. the electrons do their magic
[01:27] <Doos> and we can see it as colour
[01:28] <Doos> because the emission of the energy (when it falls back to its groundstate) produces heat .. and colour
[01:28] <dav> color when to $n=2$, ok?
[01:28] <Doos> no back to $n=1$
[01:29] <dav> Haven't we said $n=1$ is the invisible part?
[01:29] <Doos> it is produced when it gives up the energy, not when it bsorps it
[01:29] <Frank> the colour is caused by a release of energy as the electron steps down to its lower energy shell?
[01:30] <Doos> yes, but this is overall theory
[01:30] <Doos> yes Frank
[01:30] <dav> yes but its lower energy level is 1 or 2?
[01:30] <Doos> 1 is lower
[01:30] <Frank> and we can only realy see the colour if it falls between 400nm and 700nm?
[01:30] <Doos> indeed Frank
[01:31] <Frank> would an infra red spectroscope see it?
[01:31] <Doos> but it emits heat, that we observe as colour (to be correct)
[01:31] <hehheh> <http://upload.wikimedia.org/wikipedia/en/9/9b/Bohratommodel.png>
[01:31] <Doos> Frank, if you have a nifty device you could see them all
[01:31] <hehheh> The diagram explains beautifully.
[01:32] <Doos> thanks hehheh
[01:32] <Frank> nice hehheh
[01:32] <hehheh> The $E=hf$ part explains the production of the electromagnetic radiation.
[01:33] <Doos> which we will not discuss today
[01:33] <Doos> or ever lol
[01:33] <hehheh> If f (frequency) of the em wave falls in the visible spectrum, we can see it
[01:33] <hehheh> otherwise we have to use the spectrometer :)
[01:33] <hehheh> and best not to discuss it
[01:33] <hehheh> :)
[01:34] <dav> therefore all emission transactions fall to $n=1$ Lyman series?
[01:34] <hehheh> sorry for interrupting
[01:34] <Doos> I'm no chemist so I don't know every advanced topic
[01:34] <Doos> no dav
[01:34] <hehheh> Does not have to fall to the lowest state
[01:34] <Doos> from where it came
[01:34] <hehheh> it can make a series of drops to a lower state
[01:35] <dav> & what happens?
[01:35] <Doos> so in the case of oxygen which has 6 electrons in the second shell
[01:35] <hehheh> electron just loses energy

[01:35] <Frank> and if it takes long enough to change state we get phosphorescence?

[01:35] <hehheh> if we can see it :)

[01:35] <Doos> an electron can jump from 2 to 3 (or 4 or whatever)

[01:36] <Doos> but then it's groundstate is 2

[01:36] <hehheh> most electronic transitions occur outside of the visible spectrum

[01:36] <dav> can u take an eg, let us say from n=4 to n=5, then what happens?

[01:36] <Doos> ok

[01:37] <hehheh> say you give an electron one photon of energy, it goes from 4 to 5

[01:37] <Doos> if it gets energy .. then it jumps from 4 to 5

[01:37] <hehheh> when it cools off, it emits the same photon in the opposite direction and drops from 5 to 4

[01:37] <Doos> then it spins there happily for a bit

[01:37] <Doos> uhm

[01:37] <dav> then?

[01:38] <Doos> shall I do this hehheh?

[01:38] <hehheh> yah

[01:38] <Doos> so, it spins in 5 for a bit

[01:38] <dav> to 4!

[01:38] <Doos> then the energy is released and it drops back to 4 as that is where it came from

[01:39] <Doos> yes

[01:39] <dav> and?

[01:39] <hehheh> tough topic

[01:39] <Doos> then it stays there and wait for anothe bust of energy to jump to 5 again

[01:39] <Doos> or 6

[01:39] <Doos> and then drops back again

[01:40] <Doos> and so on and on and on

[01:40] <dav> so when it falls to n=6, is that visible (Balmer) or invisible (Lyman)?

[01:40] <Doos> depends on the material dav

[01:41] <Doos> and on the level in which it jumps to

[01:41] <Doos> let me give an example

[01:41] <dav> so can we learn that color is seen when transactions occur from higher to lower w/o mentioning the groundstate?

[01:41] <Doos> yes you could say that

[01:42] <dav> ok. I think it's better that way.

[01:42] <dav> 10x.

[01:42] <hehheh> what is 10x?

[01:42] <dav> thank short 4 thank you.

[01:42] <dav> thanks

[01:43] <Doos> lets say you give the electron enough energy to jump to a certain level

[01:43] <dav> btw, what is hehheh?

[01:43] <Doos> then it releases the energy and it emits light an 100nm

[01:43] <Doos> that we can not see

[01:43] <dav> right

[01:44] <Doos> but if we provide it energy that makes it jump to another level, it may release heat at 450nm

[01:44] <Doos> that we can see

[01:44] <hehheh> "hehheh" has no meaning, just an alias

[01:44] <Doos> is that undertandable?

[01:44] <Doos> +s somewhere
[01:45] <dav> yes
[01:45] <dav> and u have not to mention the term groundstate anymore!!! I agree.
[01:46] <Doos> it may also go down in steps eacht time releasing a bit of the energy .. some that we can and some that we cant see
[01:46] <Sara> with the spectroscope
[01:46] <Doos> eventually it will go back to were it came from .. the groundstate
[01:46] <Doos> yes Sara
[01:46] <Doos> is the term groundstate confusing dav?
[01:46] <Sara> I believe the SEM has a larger range
[01:46] <dav> the groundstate is n=1 or the e's original energy level?
[01:47] <Doos> original dav
[01:47] <Doos> I'm sure it does Sara
[01:47] <dav> I am confused because I have learnt during Chemistry that groundstate is n=1!!!
[01:47] <Doos> but I never used that stuff, so no idea
[01:47] <Frank> could this be termed fluorescence?...Just because we cant see visible light fluorecence is the emmision of energy when stimulated by a higher form of energy...sounds just like this??
[01:48] <dav> u can see Ramsden Chemistry textbook.
[01:48] <hehheh> this is more of physics
[01:48] <hehheh> <http://hyperphysics.phy-astr.gsu.edu/hbase/hyde.html>
[01:48] <hehheh> pretty diagrams
[01:48] <Frank> Dav I'd say groundstate +whicheckver shell the elctron originally came from...for that particular electron
[01:48] <Doos> I think so Frank
[01:49] <hehheh> <http://hyperphysics.phy-astr.gsu.edu/hbase/imgmod/hydspe.gif>
[01:49] <Doos> dav, if I say anything that contradicts your books .. use what is taught in your books
[01:49] <Doos> I'm not flawless
[01:49] <Frank> VVs at least doos
[01:49] <Doos> heh
[01:50] <dav> vvs1
[01:50] <hehheh> FL
[01:50] <hehheh> Under 10x
[01:50] <dav> that site state that n=2 is the visible part
[01:50] <dav> 10x hehheh
[01:50] <Doos> shall we keep the rest for next week? like the charge transfers etc?
[01:50] <Sara> Are you getting tired, Doos?
[01:51] <Doos> yah
[01:51] <hehheh> the site shows various possible transitions
[01:51] <dav> as u say Doos.
[01:51] <hehheh> as well as an emission spectra
[01:51] <hehheh> but this is just for hydrogem
[01:51] <Sara> Is it ok if we stop here, then?
[01:51] <Doos> yes, maybe best
[01:51] <hehheh> in gems we are largely working with the transition metals
[01:51] <Doos> its 2am here
[01:52] <hehheh> wow
[01:52] <hehheh> 2am
[01:52] <dav> 1am here
[01:52] <Frank> Shall we adjourn till next week then...it's 2am here?
[01:52] <Doos> yes Frank

[01:52] <hehheh> Okay
[01:52] <Sara> I need to go over this whole thing again anyway
[01:52] <Sara> ok, good
[01:52] <dav> ok we shall meet next Sat, then.
[01:52] <Doos> anything not clear Sara?
[01:52] <hehheh> I think the hydrogen part is a little confusing
[01:52] <Sara> I've been multi-tasking
[01:52] <dav> about IVCT, ok?
[01:52] <Doos> it's just an example
[01:52] <Doos> yes dav
[01:52] <dav> ok
[01:53] <hehheh> IVCT?
[01:53] <Doos> intervalence charge transfer
[01:53] <dav> good morning (1am) then to everybody.
[01:53] <Frank> see you guys next week themn...I'm for bed...got to go to work tomorrow...bummer
[01:53] <hehheh> I see
[01:53] <Doos> sweet dreams dav
[01:53] dav (~dav@213.120.103.105) left irc: dav
[01:53] <Doos> bye Frank
[01:53] <hehheh> bye Doos
[01:53] <Doos> I'm gone aswell
[01:53] <Doos> bye hehheh
[01:53] <hehheh> bye Frank
[01:53] <Doos> bye Sara
[01:54] <hehheh> bye Sara
[01:54] <Frank> bye doos...thanks...good job...tricky subject without a blackboard and chalk