

>> Chemistry, Diane Jewell: We have two different kinds of bonds or compounds that we can form. The first one is called an ionic bond or ionic compound. The second one is called a covalent bond or covalent compound. So let's take a look at those individually, starting with the ionic bond. [audio skips] An ionic bond, you have to have a metal and a nonmetal coming together. And so we've shown that with a capital M for metal and NM for nonmetal. An example of a metal would be sodium. Sodium has 1 valence electron. It comes with the group 1A. An example of a nonmetal would be chlorine. Chlorine has 7 electrons – you see them here in the dot formula – 2, 4, 6, 7, okay? This is a metal, that's a nonmetal. When we put them together now, you'll see what happens is this electron here is actually taken away from sodium and placed with chlorine. Over here you see the result. We end up with a sodium ion, which is positively charged, and that is attracted to a chloride ion that's negatively charged. Notice the sodium ion no longer has that 1 electron and the chloride ion now has 8. It has all 8 electrons, okay, and it has a negative charge here. Okay, you might ask yourself, why – why does this become positive and this becomes negative? So let's take a look at what's happening here in regards to our subatomic particles. Sodium has 11 protons, which are positively charged and 11 electrons which are negatively charged, okay? 11 plus 11 and a minus 11. They cancel each other out so that we end up with no net charge, there's a charge of 0. And now we have chlorine here. Chlorine has 7 protons (sic) – positively charged again – and 17 electrons, negatively charged – plus 17, plus -17. When you put them together, they balance out again – cancel each other out. Again, we have no net charge or a 0 charge, okay? So as elements, these are not going to have a charge, they're going to be neutral. But once we put them together now, look's what happened. Because this now has lost its electron, it now has only 10 electrons. It still has 11 protons, but now it's got 1 negative charge less. And so we have plus 11 from the protons and negative 10 from the electrons, giving us a positive 1 charge. And so that's what you see here with sodium is a plus 1 charge. Chlorine has now 8 electrons. It had the 7 it started with plus this eighth one is now here. So it's got 8 electrons. It had 17 protons and it did have 17 electrons but, with that extra one, now it has 18 electrons. So when we put those charges together, we have plus 17 from the protons plus negative 18 from the electrons. Put them together, we get a negative 1 charge. And so this is negatively charged, this is positively charged, and they're always going to stay together in what we call an ionic bond because they're both ions and they're very strongly attracted to each other, so they'll stay very close together. Okay, now what happens when we put two nonmetals together, okay? Here's an example. We've got a nonmetal plus a nonmetal giving us a covalent compound or – by forming a covalent bond. With a covalent bond now, we don't see electrons being given and taken. We see electrons being shared. And so look at bromine here. Bromine has 7 electrons. This bromine has 7 electrons. What are they going to do? If they come together, how can they – how can they come together and both have 8 electrons around them? Well, one of them certainly is not going to lose all 7 of its electrons because to pull each electron off takes a tremendous amount of energy. The first amount isn't so hard but

as you pull each electron off, it becomes harder. But rather, they're going to go ahead and put those together between them and share them. And so what you see here now is they've come close enough together so that this electron and this electron is equally close to both of these bromines. This is called a covalent bond. These electrons actually orbit back and forth between both of these elements here – both of the atoms. This is an electron dot structure, also called Lewis dot structure. So is this. This is the Lewis dot structure of an ionic compound. This is a different way to write an ionic – a Lewis dot structure. The only difference between this and this is that I've taken the bonding pair and replaced it with a single line to indicate that these two electrons form a single bond. But when you do it in this way you have to remember, always put in your non-bonding electrons so that you can show each of those bromines has an octet – 2, 4, 6, 8, around this bromine – 2, 4, 6, 8 around that bromine.