>> Okay, now we're going to take a look again at our energy levels here. But we're going to look at them in regards to three concepts. The first one is called the Aufbau principle. The Aufbau principle – Aufbau stands for building up. It's a German word. And so, as you start to put electrons into orbitals, you are going to start at the bottom and fill up. It's kind of like when you're putting liquid into a pitcher. When you start pouring that liquid into the pitcher it doesn't fill from the top pitcher and go down until finally you fill up the bottom of the pitcher. It goes to the bottom of the pitcher and that pitcher starts filling up from the bottom up. And it's the same with this. As you put electrons in, you start at the bottom and you fill up going up. And so if you put one electron in, you would put it into the 1S. And you would not put anything into any other orbital until this one was full. Once this one is filled, you would start filling up the 2S. Once this is filled you would go to the 2P. Once that is filled, you go to the 3S. So you're filling them up based on which one is now available and lowest in energy. Okay. That's the Aufbau, building up. And this is the order it would go in, 1S, 2S, 2P, 3S, 3P, 4S, 3d, 4P, 5S, 4d, 5P, and now here we'll get into the fs, 6S, 4f, 5d, 6P. It starts getting a little bit difficult there. You don't have to worry about going into the six row like this. We won't be doing work in the six period. The second principle we're looking at when we're talking about this is the Pauli principle or Pauli exclusion principle. What Pauli says is that for each one of these boxes, and remember the boxes represent orbitals, for each orbital you may put in only two electrons and that's it. Once you have two electrons in an orbital, it's filled. So this one right here when we put one electron in it, it's not filled yet. We can put the second electron in. And look what I'm doing. You see how I'm doing arrows, one goes up and one goes down. What these are indicating is one is spinning clockwise, the other one is spinning counterclockwise. This is the second part of the Pauli exclusion principle. And that is that when there's two electrons in an orbital they must have opposite spins. Okay. So two electrons, it's like double occupancy. That's it. Okay. Double occupancy and they both have to have opposite spins. So if I only have two electrons, they're both going to go into that 1S orbital. If I have another electron, it's goes now into the 2S orbital. That's what I do with my three electrons. What happens if I have four? Well, this isn't filled yet. So I'm going to put the fourth one right here. So far, I've used Aufbau and I'm using Pauli. Let's go ahead and do the next one. The fifth one goes here. Now we've got three orbitals, they're degenerate, which means they're all the same energy level. So what's the rule for putting electrons in here? Well, we come to our third principle. Hund's rule says that electrons will always occupy and empty orbital when you're talking about degenerate orbitals if they're available. So this is where the fifth one goes. Number six will not go into here because look it, there's still two more empty orbitals. So electron number six will go here and electron number seven will go there based on Hund's rule. Okay. And you notice they're all lining up in the same direction. For some reason this is the most stable electron arrangement, is having the empty – you know, only one in each orbital and then each one also going in the same direction. I don't know if it's the reinforcement. But for some reason that's the most stable. I do know

why they fill up one at a time like that, though. And it's because each one of these electrons has what kind of charge? A negative charge. Right? So if you have something negatively charged and something negatively charged, you try to fit them together, what are they going to do with each other? They're going to repel. Okay. Well, rather than being forced to be so close to each other and repelling, they'll go wherever they can to stay away from each other. So they each go individually. Now look what's going to happen. We've got two, four, five, six, seven, electron number eight. Well, these are not filled, so we can't go on to the next energy level. So now eight is going to start buddying up with somebody. Nine buddies up. And 10 buddies up. Now you have a filled energy level here. Two more, six more. Two more, what do we have there? Let's go ahead and put those in. We've got next two electrons go in like that. Then we have one, two, three, and then the next three will be buddied up, four, five, six. Again, we go back to the S again. Now it's 4S. It'll buddy up immediately, one and two. Now, we're going into d. There's five empty orbitals. So we've got one, and then two, three, four, and five. Each one of those electrons is going to find its own room. If you have your choice of buddying up with a stranger or you know, having your own room. Wouldn't you rather have your own room if you went to a motel or hotel? Anyways, so these guys are all individuals. Now they have to start buddying up with more electrons coming, can't go here until you finish here. And so it goes on and on as we continue to put our electrons in. This is how we use together Aufbau, building up, Pauli, two electrons for each one, and then Hund's rule, saying that they're going two in degenerate orbitals, whether P, d, or f. You are going to see them individuals first, all one in each orbital until they're forced to start buddying up and having two in each orbital. That's how you use those three principles to figure out where to put your electrons as you're entering them into orbitals.