

>> Diane Jewell: Atoms have what we refer to as energy levels. That's what I want to talk you through right now. We're going to be looking at a couple of different pieces of vocabulary. So energy levels are going to be starting with lowest energy would be 1, the second would be the second highest, number 3 is the third highest, 4 and 5. As the number of energy level on the energy level increases, the energy in that level increases. So this 1,2,3,4,5 those are referred to as energy levels. They are also referred to as shells. So I might refer to the first shell. I might refer to the 4th shell. Okay? In the 1st energy level, there is only one subshell. And that subshell is the S subshell. In the 2nd energy level, we have two subshells, the S subshell and the P subshell. In the 3rd energy level we have the S subshell, the P subshell, and d subshell. In the 4th energy level we have the S subshell, P subshell, d subshell, and f subshell. And then in the 5th energy level we have S, P, d, and f. And the higher energy levels, again, will be S, P, d, and f. And so it stays at S, P, d, and f. So the 1, 2, 3, 4, 5, 6, 7, those are the energy levels or shells. And then within each energy level or shell you have subshells. Okay? And as you get higher up it goes up to as many as four subshells. And it doesn't get any higher then. Now this is a different way of depicting our energy levels. Here is our 1S subshell. Here is our 2S subshell. Where did I come up with the 1 and the 2? Well, that's from here. So the S subshell is called the 1S. The S subshell in the 2nd energy level is called the 2S. And the P subshell is called the 2P. This would be referred to as the 3S, the 3P, and the 3d. The 4S, the 4P, the 4d and the 4f, et cetera. And so if I looked at them, here is my 1S subshell. Here's my 2S subshell. Here's my 2P subshell, 3S subshell, 3P subshell, 4S subshell. And – reason why you're seeing it going up is because the 1S is the lowest in energy. Remember the 1 is the lowest in energy. S – 2 is going to be a little higher, 3 will be higher, 4 will be higher, 5 will be higher. So if you just look at the Ss, you can see them going up, 1S, 2S, 3S, 4S, 5S. When you compare S and P on the same energy level, the P will always be higher in energy than the S. So you're going to go from 1S to 2S, 2S to 2P because, remember there was no P on the 1st energy level. You don't see the P until you get to the 2nd energy level. So 1S, 2S, 2P. Third energy level has 3S, 3P, and 3D. So it's 3S, 3P, and here's 3d. Now this is where it takes a little bit of an interesting turn. Because now we get the 4th energy level. We have 4S, 4P, 4d, 4f. And yet, 4S is actually lower in energy than 3d. And so after 3P, if you're going up the energy level, you actually come to 4S before you come to 3d. So that's kind of like one of those little quirky things. After 3d now we find the 4P and then here's the 4d up here. We're not going to go to the 4d, we're going to 5S, and then back down to 4d, and then back up again to 5P. And don't worry about the f because we're not even going to be going there. But the f also tends to be higher up in energy and they kind of skip around, too. And you'll see that in your book also in the online lecture you'll see that. Okay? Now, you'll notice that the S and the P look different, don't they? There is one box and there's three boxes. That's because for every S subshell you have one orbital. And that's what the one box indicates. With the P subshell, you have three orbitals, one, two, three. And you'll notice all the Ps have the three orbitals. D has five orbitals, one, two, three, four, five. If we had room to draw

the f on here, there would be seven. So 1, S has one. P has three, d has five, f has seven. For P, d, and f we call these degenerate because there's three of them, there's five of them, there's seven of them for f. But they're all the same energy level. And so, they're identical to each other, in other words, as far as energy goes. And so, because they are energetically identical, we just call them degenerate. I don't know why. But they're degenerate orbitals. I think that was all I wanted to say about this. We'll get more into [inaudible] in the next one.