

>> Chemistry, Diane Jewell: Iodine-131 has a half-life of 8 days. How much activity is left in 60 g after 24 days? Okay, a half-life is the amount of time it takes for half of what you have to decay. And so if you start with, say, 100 g of radioactivity, after a half-life, you're only going to have half of that 100, or 50. After another half-life, that 50 is going to be halved again to 25. So that's what they're asking here. In this case, they're saying the half-life is 8 days. And so we can actually take half-life in 8 days and make it into a conversion factor of one half-life is 8 days, or flip it over to 8 days is one half-life. So right there, we have one conversion factor. Let's see what else we have. We have – we're given 60 g, so let's go ahead and write that down as information – and 24 days. We'll write that down as information, okay? We want to know how much activity is left – in other words, how many grams? We're just going to say, how many grams of the material remains, okay? So, looking at our conversion factor, we have half-lives and days. Grams is not half-life and grams is not days so we can't really use these two together, but can we this one with this? This one has units of days and this has units of days in the denominator – so yes, we can use these two together. So that's where we're going to start. Instead of starting with 60, we're going to start with the 24 days. So if we set it up 24 days and then use our conversion factor of one half-life is 8 days, we see now those days cancel and 24 divided by 8 gives us 3. Our units is half-lives. So what has happened to this Iodine-131 is it's gone through 3 half-lives. It's been divided by 2 and then it's been divided by 2 again, and then it's been divided by 2 again. And so now this is where we're going into the 60 g, because the 60 g is what we're talking about when we were talking about initial activity, which has been used here. And we end up with 7.5 g of activity remaining after the 24 days. This is one way you can – one way you can solve this. Another way you can solve it is simply by this. Starting with 60 g, you have to do this though because you need to know how many half-lives. But then, when you get to this step here, you're starting with 60 g and you're going to be dividing by 2 this many times. And see, we did that by divided by 2 divided by 2 divided by 2 – how many times did we divide by 2? We divided by 2, 3 times. So we're dividing by 2 to the 3rd power because 2 the 3rd power is 2 times 2 times 2, okay? And so 60 divided by 2 to the power of how many half-lives we've got – that we're going through – 2 to the 3rd power is 8, 60 divided by 8 is the 7.5 g. And so either way, you get your half-lives – I mean, your activity after 24 hours of 7.5 g.