

>> Chemistry Diane Jewell: How much heat is released when 35.0 grams of nitrogen gas is used? Now, we're using this equation. So, you can see we have 3 moles of hydrogen gas reacting with 1 mole of nitrogen gas to yield 2 moles of ammonia gas. And to give off 22.0 kilocalories of heat. We're starting with our 35.0 grams of nitrogen. So, I list it right under the nitrogen. We know that when we're working with an equation, we have to put everything in the form of moles. We cannot compare grams to grams. We have to compare moles to moles because each one of these coefficients in front of the different species in our equation represents moles, not grams. So, the first thing we're going to have to do is change grams to moles. We don't know what that is, yet. But, once we calculate moles of nitrogen we can compare based on the fact that we have 1 mole here of the nitrogen. We can compare the 1 mole of nitrogen to the 22.0 kilocalories of heat being given off. So, that's what we're going to do in our two-step process. We have our 35.0 grams of nitrogen. Here's our molar mass for nitrogen. Nitrogen has a mass of 28.02 grams per every mole. So, we're going to put it in this form so that we can cancel out the grams of nitrogen. Now, we have 35 divided by the 28.02 equals 1.25 moles of nitrogen. We round it off to the three places since we started with three significant figures in our first number. Second step, now, is to go from moles to kilocalories. We know that for every 1 mole of nitrogen we are making 22 kilocalories of heat. So, we're going to use that as our second conversion factor. We're starting with our 1.25 moles of nitrogen. Here's our 22.0 kilocalories per 1 mole of nitrogen. Notice I put a negative sign in there. That's to indicate the fact that this energy is being made, it's being given off. So, it's an exothermic reaction. And we always indicate exothermic energy as being negative. So, we have our negative 22.0 over 1 mole of nitrogen. We can go ahead and cancel out those. We end up with units of kilocalories. Multiplying 1.25 times the negative 22 will give us negative 27.5 kilocalories of energy that are released during this reaction.