

>>Forty grams of steam at 100 degrees C condenses cools to zero degrees C and freezes. How much heat is released? Okay. Again, here now you have to look at the problem itself, and we can see that there is more than one part to this problem. First off we're starting with steam. And the steam is condensing. Okay. In our second step the water that's been condensed from the steam is cooling from 100 to zero degrees. Okay. Once it gets to zero degrees it freezes. And so now we have a three step process here. We have to look at each step. Okay. So the first one is condensation. We have our 40 grams of steam. Again, we're going to be using this equation where heat equals grams times delta h of evaporation. So it's 40 grams times your 540 calories per gram. Grams or cancel, and 40 times the 540 give us 21,600 calories. Now, that's what it would – the heat released in the first step. The second step is the cooling step. Okay. With cooling now we have a delta t. The Delta t goes from 100 degrees, which is what the water was when it condensed all the way down to zero degrees. So for cooling our equation is going to be heat equals grams times our Delta t times specific heat of water, which is 1.00 calories per gram degrees C. Okay. Putting in our numbers now, 40 grams times the change in temperature, 100 minus zero, which is 100. And then times our specific heat. Multiplying those altogether we get 4,000 calories. The third step is the freezing step, and with freezing now remember we're changing from a liquid to a solid. So we're going to be using our delta h, a fusion. So heat would then be grams times delta h of fusion, which is our 40 times or 80 calories per gram, giving us 3,200 calories. Okay so we've got three steps. We had this many calories in the first step. This many calories in the second step. This many calories in the third step. Here you see we're adding them all together. We get a grand total of 28,800 calories or dividing that by the 1,000, 28.8 kilocalories. And that is the total amount of heat released in this three step process.