

[SQUEAKING]

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**CLAIRE  
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Today, we're going to be doing goody bag 1, atoms and reactions. Our objectives today are to identify material based on its properties, observe a simple chemical reaction, and identify the limiting reagent, and estimate the number of atoms in a real object. To do this goody bag, you'll need vinegar, a plastic cup, a ruler, metal samples of aluminum, copper, iron, magnesium, and tin, but if you can only get copper and magnesium, it will work, and a pipette.

Some conceptual questions to think about while you're doing this goody bag are, how can we tell different metals apart, and how can we count atoms that are too small to see? First, we have five samples of metal that we would like to identify using their properties. The easiest to identify is copper by its orange-ish color. Next, we're going to try to find out which sample is iron by testing how easy they are to bend.

Iron will be the most difficult to bend. So this sample bends very easily just with my fingers, so it must not be iron. This sample is very difficult. I can hardly get it to bend at all with my fingers, and this sample also bends fairly easily just using my fingers. So we know that this sample, the hardest to bend, must be iron.

Next, we're going to try to compare the density of these different metals. So this metal feels the heaviest and most dense. This one's feels lighter, and this sample feels light as well. So we know that tin is the most dense metal, so this sample must be tin.

To identify which of these samples is magnesium and which of them is aluminum, we're going to test which one of them reacts with vinegar. So we're going to place each of these samples on the lid of our plastic cup to make sure we don't spill any of the vinegar and use our pipette to put a drop of vinegar on each of the samples, and the one that reacts will be magnesium, because we know magnesium reacts with vinegar watch closely.

It doesn't look like we're getting any reaction from this metal, so it must be the aluminum now, let's try the other. You can see that this material's forming tiny bubbles after we put the vinegar on it, so it must be magnesium. Those bubbles are hydrogen gas. Now, that the bubbling has stopped on our magnesium, we note that the reaction is over.

There's still plenty of magnesium left, so this indicates that the acetic acid inside of the vinegar must be the limiting reagent. Finally, we want to estimate how many atoms are in our sample of copper. To do so, we're going to use a ruler. Using our ruler, we can measure the width and the height of this copper sample. So using the metric side of our ruler, we align the 0 with the edge of our material and see that it is about 13 millimeter wide and 25 millimeter long. Today, we did goody bag 1.

We identified our metal samples based on their material properties, we observed a simple reaction and identified the limiting reagent, and we measured our copper to estimate the number of atoms in our sample.