Transcripts of mass\_spec\_101\_ipod\_lg

[music, sound effects]

NARRATOR: What happens if you have something like this, and you want to find out if something like this is inside? Obviously, you can like this is inside? Obviously, you can't tell just by looking at it, but if you separate things out, the answer becomes clear.

Scientists have the same problem. How do you know if there was once water on Mars...or, for that matter, life? Obviously you can't tell just by looking at pictures of Mars, but scientists think the answer may lie hidden in tiny molecules in Martian soil.

So, how do you take apart a molecule to see what's inside? Luckily, scientists have a tool to do just that. It's called a mass spectrometer, and it lets us take an extremely close look at whatever we're studying. And even though Mars immediately comes to mind, mass spectrometers are used in multiple NASA missions. They're also used in labs for hundreds of scientific purposes. But the important question is: How does it work?

Today, we'll be looking at a special kind of spectrometer called the quadrupole mass spectrometer. It's called this because of the four long poles that make up the center of the instrument. So say you have a sample that's been turned into a gas, and you want to find out if it contains certain things. The gas is sent into the mass spectrometer first hitting a piece called the ion source. Here, a stream of electrons hits the molecule, breaking it into fragments and giving each fragment a charge.

Next, the fragments enter what's called the analyzer. Here, they're separated based on their mass, and the analyzer is tuned so that only the fragments we want to see make it through. Everything else flies off in a different direction.

After this, the fragments hit what's called the detector, and scientists record the data. If you're looking for more than one kind, the analyzer can scan across a range of fragments, building up a record of not only what kind, but how many. Once you have these results, called a mass spectrum, you can verify that your sample in fact contains what you're looking for. And here, the real work begins.

The mass spectrometer is a powerful tool, and by taking many samples, looking at the results, and studying what we find, scientists can work to discover not only the secrets of water and life on Mars, but also answers to bigger questions about the universe. And all by studying something as tiny as a molecule.

[music, beeping] [beeping] [beeping, silence] [silence]