The title of this student is “What is Spectroscopy?”

Spectroscopy is a technique used to measure electromagnetic radiation that chemical substances emit, absorb, or scatter.

These substances can be elements like hydrogen, or compounds such as water.

Each substance has its own spectral “pattern”. That is, a substance absorbs or emits only certain wavelengths of radiation.

So spectroscopy can be used to identify whether a specific substance, such as water, is present in a given sample.

Deep Impact spectroscopes observed both absorption and emission patterns from the surface of Tempel 1 and from the ejecta plume after impact.

They imaged wavelengths from one to almost five micrometers. These wavelengths are in the infrared region of the electromagnetic spectrum.

So Deep Impact used infrared Spectroscopy to determine what substances are present on the comet’s surface and inside the comet’s nucleus.

A computer analyzes the data from a spectroscope. Scientists read the results that are printed out in the form of a spectrograph.

Tactile Card 10 is a sample spectrograph of an infrared emission spectrum of water and water ice in a mixture of other chemicals, including some organic compounds and carbon dioxide.

This spectrum is just a sample and was not taken from Tempel 1.

Find the card number in the upper left corner of the card.

Just to the right and down from the card number you will find a broken vertical line.

Follow the broken line going down. The intensity of the radiation is plotted on this vertical axis.

As you go up down this axis, the intensity of the radiation decreases. The first horizontal mark you feel on the axis indicates an intensity of fifteen.

Going on down the axis, you will feel marks for ten, five and zero on the intensity scale.

Continue down the vertical line until you find a filled circle.

From the circle, follow the horizontal broken line.

The wavelength of the emitted radiation is plotted on this axis.

As you move to the right, the wavelength increases from two to five micrometers.

Each small vertical mark is an increase of two tenths of a micrometer.

Go back to the starting dot.  Move to the right until you feel a solid line going up and slightly to the right.

Follow it as it forms a sharp peak, goes down and then back up to a higher broader peak.

This peak indicates that there is liquid water in the sample.

Keep following the solid line as it goes down and then forms another smaller peak.

Water ice emits infrared radiation at this wavelength, so there is water ice in the sampe.

Follow the solid line as it dips and then starts climbing again to a series of small peaks.

These peaks indicate that there are some organic compounds in this sample.

Following the line to the right, you will feel another sharp peak.

This peak tells us that there is carbon dioxide in the sample.

There is also some carbon monoxide in this sample, but it is difficult to feel its peak because it is one of the very small peaks to the right of the carbon dioxide peak.

So the wavelength at which the emission peaks occur indicates what substances are present in a sample being tested.

The height of, or the intensity of, the peak is a measure of how much of the substance is present in the sample.