

Spectroscopy Lab Teaching Notes

Set-up and Equipment:

Before you teach: Learn how to use equipment. Look at the spectra of the different lamps so you know what the students should see.

You will need to get to class early to set-up equipment!

There are 6 gas lamps total. Four go into the carousel: Hydrogen, Helium, Neon and Argon. The smaller blue box is the mercury lamp and the larger very bright lamp is the sodium lamp. Do not turn on the lamps until you are ready to use them, especially the sodium lamp because it gets extremely bright.

There are two sets of all the lamps. If you are the only one teaching that night I would recommend using both sets. If there is more than one class doing the lab you should talk to the other TA to make arrangements. Suggestion: You could set up the equipment in one room and have each class go in there when they are doing that part of the lab.

30 spectrometers are available and are stored in the same room as the lamps. You only need 12-15 of them, enough for groups of two.

25 sets of color pencils and 2 pencil sharpeners are available for the students to draw the emission lines with. Require the students to put the pencils away in the box when they are done!

The equipment is currently stored in the storage room attached to PSH 456. You can access this storage room from the hallway using the code 45312. For transporting materials to the room use the cart from the telescope room.

The lamps themselves have been labeled as follows:

1. Nitrogen
2. Helium
3. Neon
4. Argon
5. Mercury
6. Sodium (or Hydrogen)

Background/Introduction:

Spend time at the beginning of class reviewing the background material from the start of the lab. Focus on different types of spectrum and why the spectrum of each element is unique.

A good way to explain why we see emission and absorption spectrum and how they relate to elements and atoms is to show an electron level diagram and explain how different energy/wavelength photons can excite an electron. Emphasize how it is

only discrete energies that can move the electrons to different level and that they cannot be between levels.

There is a power point presentation on the teaching notes website that has a good diagram for you to use.

Procedure and Recommendations:

Demonstrate to the students how to use the spectroscope. When they are looking at the gas lamps make sure they are pointing it correctly. Also, show the students how to turn the carousel to look at the 4 lamps.

The best method to have your students complete the drawings for the gas lamp part is to have them work in groups of two. One student looks at the gas lamp with the spectroscope and reads off the line wavelength and color while the other records it on their sheet.

Suggestion: Instead of printing off copies of the example spectra, put them up using a projector if you have one in the room. (Wait until most have finished their drawings before putting them up because students will just copy them instead of doing their own drawings.)

One major problem we have run into when looking at the gas lamps with the spectroscope is contamination from other sources. Be aware of this problem and how it affects their drawings and identification of elements.

To save time have a few groups start with the lamps and the rest start with the other parts of the lab. Only have one group at a lamp at a time because the lamps are hard to see and they need to be very close to see the lines.

For the fluorescent lights they can look at ones in the classroom or the hallway. Some students seem to struggle identifying elements in the fluorescent bulbs (question 7).

For the incandescent lights there should be some the classroom. The incandescent bulb is a continuum spectrum.

For part 4 you might need to briefly review the spectral classification and how it relates to different types of stars. This Depends on your class and what they have learned in their lecture. Some students might need extra guidance through the last few questions about M stars.