

## Lab 8. Continuous, Emission, and Absorption Line Formation

### Equipment

- Project Star Spectroscopy Kit
- A Light bulb plugged into a Variable Light Switch
- Fluorescent Lamps of unknown gases; Spectral Line poster that will be used to identify the gases (Make sure to use those Fluorescent Lamps which are also on the Spectral Line Poster)
- Black Tape (in addition to the tape provided by Project Star)
- The Sun (well,...), or the Moon (though this is reflected light) – but neither are totally essential

### Mini Lecture

- Not much preparation or introduction is needed, but it would make sense to coordinate this lab with the lectures and do it after (or during) the discussion of the properties of light.

### General Procedure and Lab Setup

- Please have the spectroscope kits already on the desks when the students arrive. Let them build the Spectroscope, but please give them a time limit. The room will have to be darkened for the remaining part of the lab.
- Use the extra black tape to cover up the two corners of the spectroscope, but make sure the “slit” is not covered.
- Time part II – for part III the room needs to be absolutely dark (you might even want to cover the red light on top of the Fluorescent Lamps as this contaminates the spectrum.
- Parts IV and V can be assigned as homework (Part IV even as an extra credit option) which would make this lab even shorter

### Notes & Suggestions

- This is a fully qualitative lab and quite enjoyable
- Part III can be done a little more qualitatively by asking the students to read the scale inside the spectroscope. However sometimes the Fluorescent Lamps are too faint to see the numbers. In that case ask the students to describe the color of the emission lines as precisely as they can.
- What to watch out for: In part II students will often just draw the Black Body spectra they have seen in their book (and drew in the pre-lab), however the main point is to draw this graph totally from first principles (not all colors are equally bright at each setting) and then arrive at a similar curve. They should make the connection between the experiment and that “somewhat theoretical” graph.

### General Concepts & What students might get out of this Lab

- Obtain a deeper understanding of Black Body Radiation and the Planck Spectrum
- An understanding of light emitted from different types of gases and how (and why) this is different from black body spectra (i.e., understanding Kirchhoff’s law’s)
- Get a feel of how astronomers can tell the chemical composition of nebulae and stellar atmospheres through an analysis of their spectra

### Scientific Methodologies

- In the case of the Black Body Spectrum, how to make the connection between careful observations, scientific principles and formulae that they have seen before.