a sheet of transparent plastic that has thousands of tiny grooves ruled on it. The way in which the grating works to separate light into colors is by wave interference. The actual details of this process won't be covered in this discussion.

In the procedure to follow, you will build a simple 'shirt-box' spectroscope and investigate its uses and limitations. The spectroscope will be calibrated using the 'known' lines of the mercury emission spectrum. Once the spectroscope has been calibrated, it will then be used to measure the wavelengths of the visible emission spectrum of hydrogen.

Procedure

A. Construction of a Spectroscope

The spectroscope will be constructed from a spectroscope construction kit. This includes a cardboard box, two single-edged razor blades, a piece of replica transmission diffraction grating (handle by edges only!), a small piece of graph paper, and a ruler. Both the bottom and top of the box will probably have to be taped in the inside corners so that they will not flatten in use.

1. Follow the directions on the "construction instruction" sheet (included inside the box) to cut the entrance slit, sighting hole, and illuminating slit. Use the razor blades given you to cut the required box openings.

1. Center the graph paper on the inside of the box bottom over the illuminating slit. **Carefully number every tenth line for reference later, and then tape the paper in place. The numbers should be directly over the illuminating slit. Use a dark colored pen to do this.**

3. Refinement of the entrance slit, as well as adjustment of the width, can now be made by utilizing the two razor blades. They should be taped to the outside of the box top with the sharp edges facing each other. The separation between the edges of the blades can then be adjusted to give optimum intensity and resolution; usually the optimum is near one millimeter. This is about the thickness of the cardboard box, so the piece of cardboard removed when cutting the slit may be utilized as a spacer between the razor blades when taping the second blade in place. Try to keep the slit absolutely vertical.

4. The diffraction grating is now mounted over the sighting hole, oriented so that the spectrum observed will consist of colored replicas of the slit seen on the graph paper. This orientation may be found by holding (by the edges!) the grating in place over the sighting hole and aiming the spectroscope toward the room lights. You should see the colored images of the slit on the graph paper. If you've put the grating over the hole with the wrong orientation, you'll see a blur of light above and below the entrance slit (rotate the grating 90 degrees in that case). When the proper orientation is found, tape the grating in place over the sighting hole.

B. Exploring Spectroscope Specifications

It is always wise to explore the good points and the limitations of any instrument before launching out and spending time and money (your tuition, in this case!) using it. Obviously, the spectroscope which you have built has many limitations. However, the nice thing about an inexpensive, simple, self-built instrument is that you should have no inhibitions about using it, breaking it, changing it, or fixing it. In fact, you have a unique opportunity to write the specifications of your own spectroscopic instrument. Spend a few minutes familiarizing yourself with your spectroscope and experiment as necessary to answer the following questions. **Write the answers to these questions in your lab notebook.**