

## Instructions for Construction of UWM Chemistry Mini Spectroscopes

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[www.uwm.edu/~awschwab/specweb.htm](http://www.uwm.edu/~awschwab/specweb.htm)

What you need: Spectroscope pattern, wedge of CD, scissors, glue or tape.

Optional: black marker, sharp knife.

1. If your copy of the pattern is on white paper, you should photocopy it onto dark paper, or print the downloaded version onto dark paper. Dark construction paper works well, or any paper if you photocopy black onto the reverse. Carefully cut out the pattern. Cut on the solid lines, but don't cut on dotted lines. The small slit is important. Cut the slit carefully with *straight smooth* edges, so as to let through some light, about 0.5 mm wide. A sharp knife can be useful for cutting slits, but must be used carefully with adult supervision. You will also need to cut out the rectangular eyehole (between g and h) to view through.
2. Now you need a wedge of CD. Choose a data or music CD that you don't want as a CD, (such as those you get unsolicited in the mail,) and cut it into wedges using a pair of stout scissors. You can get about 16 useful wedges out of one CD to use as diffraction gratings. If the CD tends to crack as it is cut, you can prevent that by putting it under warm water (about 50°C or 122°F) while cutting with scissors.
3. Crease on the dotted lines by folding over the edge of a ruler, so the pattern can fold to make a little box. Fold it so the dark side is inside, and the printing is on the outside. Attach a wedge of CD to the *inside* where indicated by the dotted outline, but on the other side of the paper (the unprinted side). Make sure the iridescent shiny side of the CD wedge is exposed, but cover the small mirror-like crescent near the tip. (See the pattern.) It's convenient to cover this with tape over the narrow point to hold the wedge in place, or to blacken this part with a permanent marker or a bit of black paper glued over the point of the CD. If you cover it with black paper or tape, make sure that the paper or tape is flat and does not stick up at all.
4. Complete the spectroscope by folding it into a little box. Glue or tape edges closed (a to a, b to b, etc.) so that they don't leak light, but do **not** cover the slit. Rubber cement can be applied to all the flaps on one side of the paper, and to all the lettered regions the flaps will contact on the other side of the paper. After the cement dries, the spectroscope can be neatly folded into shape, in alphabetical order. Unlabelled flaps need not be glued. It's convenient to tape at x less thoroughly or not at all so the back can be opened to look at or readjust the diffraction grating (CD piece). You're finished!
5. Using the spectroscope: Note the arrows at the side of the spectroscope. The trick is to point the slit at a light in the direction indicated by one arrow, while looking into the spectroscope in the direction indicated by the other arrow, with your eye quite close to the rectangular eyehole. This is much easier than it sounds, and most easily done by holding the spectroscope with your finger pointing along the arrow labeled "to light". Now hold the spectroscope to your eye, and turn until your finger points at the light. You will see the spectrum of colors that make up the light you are pointing at. Do **NOT** look directly at the sun! A bright spectrum of sunlight is visible if you point the spectroscope toward a window. Try looking at an ordinary incandescent light bulb, and then at a fluorescent light bulb. Are all fluorescent lights the same? Try streetlights and other light sources. Look at light reflected off of colored paper, or shining through transparent colored plastic, glass, or juice. How does white light from your computer monitor compare to white paper? Does the paper look the same under different lights? Can you tell why colors look OK under some streetlights and not others, despite the similar appearance of the lights themselves? (The lights look similar to your eye, but not to the spectroscope!) What happens if you cut the spectroscope slit wider, or narrow it with opaque tape?