

Construction of Optical Elements with Gelatin

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A 1997 paper¹ in this journal described the construction of optical elements using gelatin. Lenses, prisms, and light pipes are simply cut out of a gelatin block. Since our students sometimes find it difficult to cut the shapes accurately, we have devised an alternate method. We pour the liquid gelatin into molds that we can easily make using readily available material. The gelatin is simply allowed to harden and then removed from the mold. Common brands of unflavored gelatin (see Ref. 1) work very well. The use of molds allows the replication of the optical element many times. To trace light rays in the elements, we use a low-intensity laser pointer. Figure 1(a) shows how lens molds may be made using plastic soft-drink bottles. Prism molds may be constructed by taping microscope slides together [Fig. 1(b)].

In casting the elements, it is necessary to prevent the gelatin liquid from leaking out of the bottom of the mold. We create a kind of gasket by pouring a thin (1- to 2-mm) layer of gelatin into a petri dish and positioning the mold on it. Once that layer has hardened (after an hour or so), gelatin may be poured in to the desired thickness. Allow the liquid to cool to lukewarm before pouring in order to avoid fusion of the gasket. After the elements have been removed from the molds, we place them on plastic bases in order to facilitate handling. Figure 2 shows the setup for measuring the refractive index of a semicircular piece of gelatin.

The use of gelatin optical elements has some obvious advantages: they are very inexpensive and students may be directly involved in their construction. A drawback is that they soon become rather cloudy and cease to transmit light well. They must be used within about 72 hours of construction or a food preservative must be added.

Reference

1. Patrick Bunton, "Edible optics: Using gelatin to demonstrate properties of light," *Phys. Teach.* 35, 421–422 (Oct. 1997).

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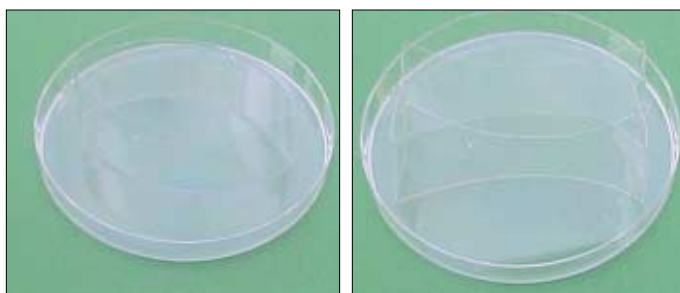


Fig. 1. (a) Molds for converging and diverging lenses.



Fig. 1. (b). Prism molds.

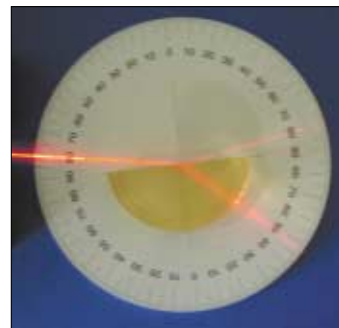


Fig. 2. Measurement of the index of refraction of a semicircular gelatin element.