

614-0470 (50-300) Giant Water Prism

Introduction: Prisms are very old devices. Isaac Newton famously used one to demonstrate that white light is made of many colors, although this was not proven conclusively until years later. They are simple enough to be used by essentially anyone, but are still used on the cutting edge of science. Prisms are a staple of every science classroom, and also find their way into high technology applications, such as telescopes and digital projectors.

What is a prism? A prism is a polygon made of some refractive material. This means that the material will bend a beam of light. Common materials are glass, acrylic, or in our case, water.

Prisms work by forcing light to slow down. For example, the speed of light in water is only three quarters of what it is in a vacuum. When light slows down, different wavelengths slow to different degrees. For example, the long wavelength of red will cause it to slow down quite a bit.

Blue, with a much shorter wavelength, does not slow down as much. This effect ‘decouples’ the different colors from each other, and they leave the prism at slightly different angles. To the eye, this means that the colors are splayed out in a rainbow. Any material with a high refractive index (meaning it slows light appreciably) can work as a prism. Water, acrylic, and glass are often used because they are effective, cheap, and easy to construct. Some high end prisms are made out of fused quartz, but these are very expensive. A diamond prism would work very well, but is obviously impractical.

Some prisms exploit the tendency of light to reflect off of the inside surfaces, a property known as *total internal reflection*. These prisms are used in the place of mirrors in some applications. Digital projectors often use specially designed prisms to help bend light into convoluted paths.



Operation: Using your giant prism is easy. You will require a bright light, such as very bright laboratory light, or natural sunlight. Sunlight works well because it is white and extremely bright. To use sunlight, simply place the prism near a window in direct sunlight. Other light sources that will work are very bright laboratory lights, in the 200-300 watt range. You will need a light source that produces white light. If, for example, you used a blue light, you would not get a spectrum out of it. The best you could get is various shades of blue. Next, you will need to fill the prism with a refractive material, usually water. Simply pour the fluid in the hole at the top until full. For more advanced classes, you can use mineral oil, alcohol, colored water, or any other fluid you wish to examine the refractive properties of. The prism body is completely leak proof. However, **do not use** ketones or ammonia, as they will damage the prism!

The more perpendicular the light source, the longer the rainbow will be. In the morning when the sun is low, it is possible to throw a spectrum almost a meter long! You may wish to lay down some paper or throw the spectrum against a white wall for greater contrast. With a spectrum this large, the whole class will be able to see it. Maintaining your Giant Prism is very easy. The body is constructed with high quality acrylic, and is joined using the same techniques used to build aquariums. This makes the body extremely tough and leak proof. Periodically, you may wish to wipe down the outer surfaces with a damp towel and fully rinse the interior with distilled water. Drain the unit and allow it to air-dry after each use. **Do not** use ketones or ammonia to clean the unit, as they can cause crazing on the surface. While the prism is robust, avoid dropping it, especially when full.

Warranty and Parts:

We replace all defective or missing parts free of charge. Additional replacement parts may be ordered toll-free. We accept MasterCard, Visa, checks and School P.O.s. All products warranted to be free from defect for 90 days. Does not apply to accident, misuse or normal wear and tear. Intended for children 13 years of age and up. This item is not a toy. It may contain small parts that can be choking hazards. Adult supervision is required.