

Fun with Diffraction

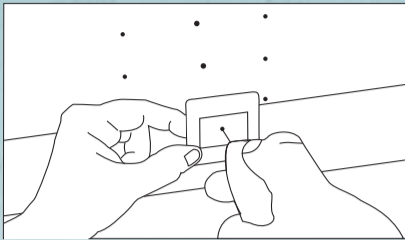
Whoa. Diffraction! What a big science word. What does "diffraction" mean? Let's use your diffraction grating to find out!

Procedure

1. Hold your diffraction grating upright in one hand (or use one of the mirror stands) and your laser in the other. Aim through the grating at a white wall. Start about 1 foot (0.3 meters) away from the wall. Now shine your laser through the diffraction grating and see what happens.
2. Move the grating toward and away from the wall.
3. Move the laser back and forth from the grating.
4. How many laser points do you see on the wall? Which ones are brightest?
5. Compare what happens when you shine the flashlight instead.

Results

Diffraction means that a light wave bends around a corner, like a water wave bending around a pier. The diffraction grating in your kit has lots of little lines that are like many different piers jutting into the water. When you shine your laser through, the light bends around each little pier. But why do you see multiple laser points when you started with just one? On the other side of the grating, those bent light waves bump into each other. Some get bigger and some cancel each other out. The laser light is separated into bands, with the brightest in the middle.



Materials

- Laser
- Diffraction grating
- White wall
- CD or DVD
- Flashlight
- Measuring stick or tape

More Laser Fun

Shining your laser off a CD or DVD at different angles will also produce diffraction.

See the Beam

Usually you can see only the point of your laser light, but the laser light is traveling in a straight beam to get there. To see the beam, the light must reflect off something, like dust or water particles suspended in the air. Here are some ways to see the beam.

Procedure

For this activity, please make sure you have a responsible adult help you. Do not handle boiled water by yourself! Make sure you have permission before dumping baby powder into the bathtub.

1. With the permission of a responsible adult, boil a kettle of water. Once you have a good head of steam, shine your laser through the steam.
2. Dump baby powder from as high as you can into your bathtub, turn off the light, and then shine the laser through the cloud.
3. Run the faucet on high in your bathtub. Shine your laser light into the turbulent water coming out of the faucet.

Results

We see light when something reflects it. Because your laser light travels in a straight line, to see the beam it must hit particles that reflect the light.



Materials

- Laser
- Household objects (kettle, bathtub)
- Baby powder

More Laser Fun

Try shining your laser through a steamy bathroom after a hot shower. What about on a foggy day? Through the smoke of a campfire? Try aiming your laser through the blades of a moving fan. Why does this show the beam?

Light Up Your Slide

Can your microscope slide control your laser beam?

Procedure

1. Shine your laser directly into the slide's edge and check out its other edges (Fig. a). The other edges on the same side of the central square should glow even though you are not aiming at them. Pretty neat!
2. Now try the same thing but at the edge near the central square.
3. Does your laser have to be right up against the edge, or can you aim at the edge from farther away to achieve the same effect?

Results

If you shine your light right at the top or bottom of your slide, it pretty much just goes through. If you shine your light at the edge of your slide, however, the light reflects inside the inner top and bottom faces of your slide. This produces the same effect as shining a light on one end of a prism to light up the opposite end. You see the other edges of your slide glow, even though you are not aiming at them. Once it's inside your slide, the light behaves similar to light in fiber optic cables, bouncing off the insides. It's like the light is trapped inside until it can come out the other end. That's why you see the edges glow but not the top or bottom.

More Laser Fun

Split the laser beam and bounce it around; just shine the laser right at the slide edge (this effect is easiest to see if you aim by the central square). Then tilt the slide slowly right and left, or up and down (Fig. b). Watch what happens on your white wall. Part of the beam will travel through the slide as a point of light, but part of it will bounce off the outside surface of the slide. You can control that point by tilting the slide left or right.

Materials

- Laser
- Plastic microscope slide
- White wall (note: works best in a dark room)

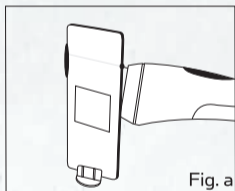


Fig. a

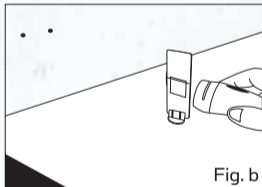


Fig. b

Ready, Aim, Periscope!

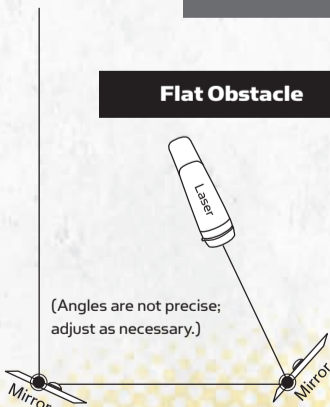
A periscope is something that lets you see around corners or obstacles. Submarine captains use periscopes to see above water. Periscopes use mirrors or prisms to make this happen. You can make your own periscope using the two mirrors in your kit! Then you can shine your laser in one direction, but its light will show up in a different direction.

Procedure

1. Set up the mirrors on the floor like in the picture.
2. Shine your laser in one direction, but watch the beam get reflected between the two mirrors back behind your laser.
3. Then adjust the second mirror to aim the light into another room.
Be careful of any people or any animals that might be in the other room.

Results

Light reflects (bounces) off mirrors. The angle that light hits the mirror determines the angle that light bounces off the mirror. Change the aim of your laser periscope by changing the angle of its mirrors.



(Angles are not precise; adjust as necessary.)

Materials

- Laser
- Mirrors
- Mirror stands
- Flat obstacle like a book or wall

More Laser Fun

How many more mirrors can you use to shine your laser around corners and into different rooms in your house? Think about using mirrors in your bathroom or other handheld mirrors. Can you bounce the laser beam all the way back to you? Practicing your aim close to the floor or carpet will help you see where the beam will bounce.