The RayZer Lightbox

djb microtech hope that you and your students enjoy using the RayZer Lightbox.
Most traditional rayboxes require blackout conditions to work properly. However with the RayZer Lightbox students can work in subdued lighting hence aiding classroom management.

Your Rayzer Lightbox is supplied with:

- baseboard
- 9V dc plugtop power supply
- this information sheet.

Safety

The Rayzer Lightbox consists of three laser diodes each emitting less than 1mW of visible red light. The product has been tested and is class 2 to current versions of IEC 60825-1 and BS EN 60825-1.
The Rayzer Lightbox has been fixed to a baseplate in order to reduce its potential misuse by students and also to provide a convenient work area.
Inside the Rayzer Lightbox there is a lens that causes the three laser beams to diverge. This results in three vertical beams leaving the unit. Consequently in the event of any radiation entering the eye, that radiation will only be a small fraction of the radiation leaving the laser diodes. However to encourage safety and good practice students should be instructed not to look into a laser beam.
A laser warning sign (Figure 1) has been placed above the unit and teachers should draw to their pupils' attention the symbol and its significance. An identical label has been placed on the underside of the Rayzer Lightbox. In the unlikely event that the unit requires servicing by a technician then there is a hazard warning symbol on the unit itself even when removed from the base board. At all other times the Rayzer Lightbox should be attached to the baseboard.
Another warning label (Figure 2) is placed below the Rayzer Lightbox. This label states that the RayZer Lightbox is class 2, output power is <1mW and the wavelength is 630 - 660 nm.
Caution - Use of controls or adjustments or performance of procedures other than those specified may result in hazardous radiation exposure.

Figure 1

Figure 2

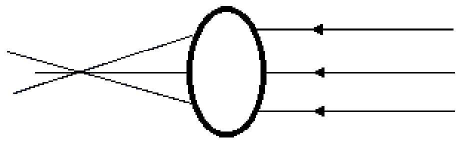
Using your Rayzer Lightbox

Using your Rayzer Lightbox is very straight forward.

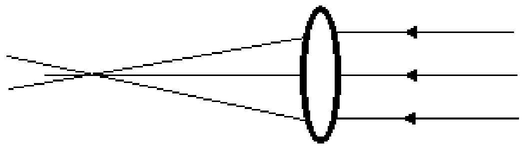
- Connect the plugtop power supply.
- Select one or three laser beams by positioning the slide switch.
- Place the object to be studied in the path of the rays.
- If you wish to trace the path of the rays a piece of white paper should be placed on the baseboard and then the paths of the rays can be marked on the paper.

Experiments to try

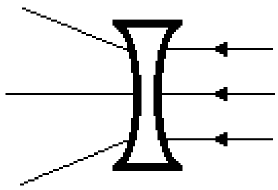
1) Position the switch so that there are 3 beams.
Place a 'fat' convex lens in the path of the rays.
Measure the distance from the focus to the lens i.e. the focal length of the lens.



2) Position the switch so that there are 3 beams.
Place a 'thin' convex lens in the path of the rays.
Measure the distance from the focus to the lens i.e. the focal length of the lens.
Compare the fat and thin lenses.

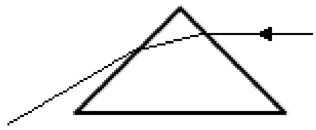


3) Position the switch so that there are 3 beams.
Place a concave lens in the path of the rays.
Projecting the rays back to a point produces a virtual focus.
The focal length of the lens is the distance from this point to the lens. A negative sign is put in front of it because its focus is on the other side of the lens.

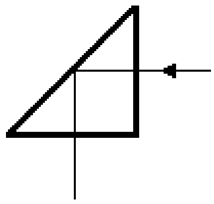


4) Predict what will happen when a convex and concave lens are combined then try it.

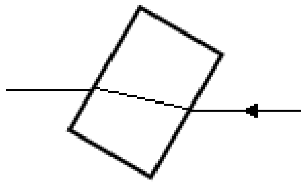
5) Position the switch so that there is 1 beam.
Place an equilateral prism in the path of the ray.
Repeat using 3 rays.



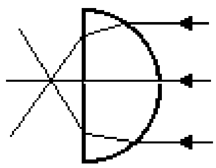
6) Position the switch so that there is 1 beam.
Place a 45° prism in the path of the ray.
Repeat using 3 rays.



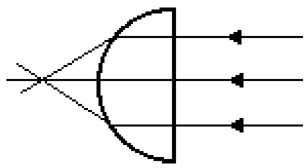
7) Position the switch so that there is 1 beam.
Place a rectangular block in the path of the ray.
Note where the ray enters and leaves the block.
Turn the block so that it is at right angles to the beam.
Repeat using 3 rays.
Repeat using a rectangular plastic container with some water in it.



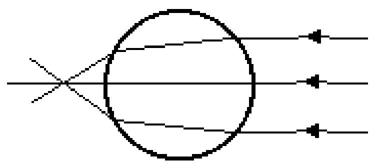
8) Position the switch so that there is 1 beam.
Place a semi-circular block in the path of the ray.
Ensure that the curved surface is closest to the Rayzer Lightbox.
Note the path of the ray at each edge of the block.
Repeat using 3 rays.



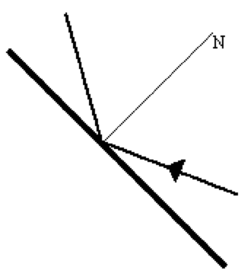
9) Position the switch so that there is 1 beam.
Place a semi-circular block in the path of the ray.
Ensure that the straight edge is closest to the Rayzer Lightbox.
Note the path of the ray at each edge of the block.
Repeat using 3 rays.



10) Position the switch so that there are 3 beams.
Place a circular block in the path of the rays.
Trace the rays.



11) Position the switch so that there is 1 beam.
Place a mirror in the path of the ray.
Trace the ray.
Draw a normal and measure the angles of incidence and reflection.



12) Position the switch so that there is 1 beam.
Place a diffraction grating in front of the beam and calculate the wavelength of light.

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