

How light bounces, bends and is absorbed

Grade 7 science (Year 8 · Class 7) · Lab

Name: _____ Date: _____ Class: _____

Does light really bounce off a mirror at the same angle that it arrives? In this lab you measure angles of incidence and reflection with a ray box, then see how a clear block bends the ray, so that you can test the law of reflection and describe refraction.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS4-2

Aim

To test the law of reflection with a plane mirror and to see how a ray bends when it enters a clear block.

Equipment

- Ray box, or a torch with a slit made from card
- Small plane mirror with a block to stand it up
- Rectangular block of clear plastic or glass
- Sheet of plain A4 paper, pencil and ruler
- Protractor

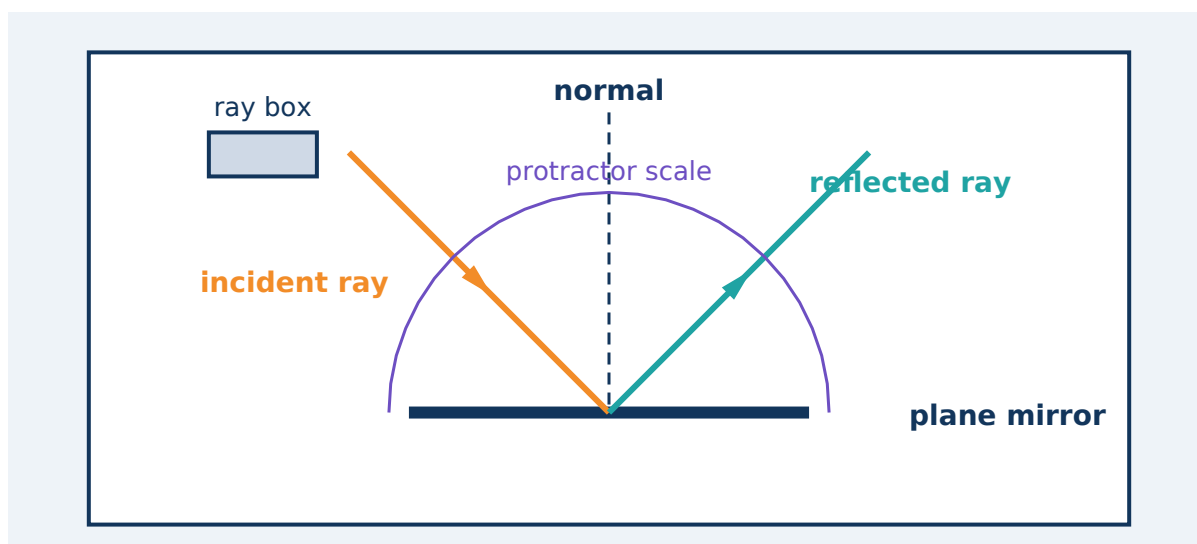
Safety

Safety

Use a low-power ray box or torch and never shine a laser pointer into anyone's eyes. Handle the glass or mirror by the edges and tell your teacher if a piece is chipped or cracked.

Method

1. Draw a straight line across the paper and stand the mirror on it. Draw the normal at right angles to the mirror at its centre.
2. Shine a narrow ray along the paper to hit the mirror at the normal, at an angle of incidence of 15° . Mark two dots on the incident ray and two on the reflected ray.
3. Remove the mirror, join the dots and measure the angle of reflection from the normal.
4. Repeat for angles of incidence of 30° , 45° , 60° and 75° .
5. Replace the mirror with the block. Direct a ray into it at 20° , 40° and 60° and draw the ray inside the block. Measure the angle of refraction each time.



Top view of the reflection set-up.

Results

Sample measurements for reflection:

Angle of incidence i ($^{\circ}$)	15	30	45	60	75
Angle of reflection r ($^{\circ}$)	16	29	45	61	74

Sample measurements for refraction into the block:

Angle of incidence i ($^{\circ}$)	20	40	60
Angle of refraction r ($^{\circ}$)	13	25	35

Analysis questions

Question 1 Differences

Calculate $i - r$ for each reflection reading.

Question 2 Plotting r against i

Describe the graph of r against i and calculate its gradient from the first and last points.

Question 3 Conclusion

State a conclusion about the angles of incidence and reflection.

Question 4 Uncertainty

A protractor can be read to about $\pm 1^{\circ}$. Explain why the small differences do not disprove the law.

Question 5 Refraction results

Calculate $i - r$ for each refraction reading and describe the pattern.

Question 6 Prediction

Predict the angle of refraction for an angle of incidence of 50° by reading between the readings at 40° and 60° .

Question 7 Light speed

Explain, using speed, why the ray bends towards the normal in the block.

Question 8 Improvement

Suggest two improvements that would make the angle readings more reliable.