Name _____
Date _____

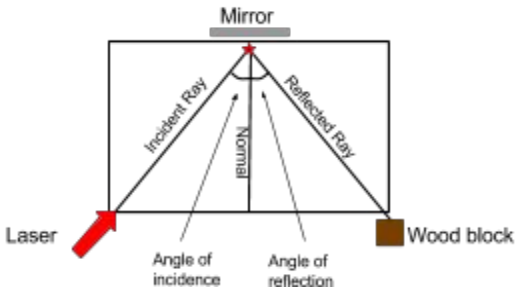
Light Waves

Aim:
To observe how light behaves and come up with rules that describe this behavior.

Materials:

Laser	Protractor	2 mirrors	Acrylic block
Diffraction slide	Ruler	Wood block	White paper

Experiment 1: Reflection off a mirror



Method:

____ 1. Place a piece of white paper on the table. Place the wood cube at the bottom right corner of the paper, and place the mirror *right on* the opposite side of the paper (as shown in the figure).

____ 2. Shining the laser from the bottom left corner of the paper, reflect the laser off the mirror and onto the wood block. You can adjust either the direction you point the laser or the position of the mirror to make this work, but make sure the mirror stays *right next to* the piece of paper.

____ 3. Mark the spot on the paper right next to where the light hits the mirror.

____ 4. Use a ruler to draw a line from the laser pointer to the spot marked in step 3. This is the ***incident ray***.

____ 5. Use a ruler to draw a line from the wood cube to the spot marked in step 3. This is the ***reflected ray***.

____ 6. Draw a line through the spot marked in step 3 that is ***perpendicular to*** the edge of the paper. This is the ***normal line.***

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____ 7. Measure the angle of incidence and angle of reflection using a protractor. Record below.

____ 8. Measure the distance from the mirror spot to the left and right edges of the paper. Record below.

Results:

Distance to left edge of paper (cm)	Angle of incidence	Angle of reflection	Distance to right edge of paper (cm)

Observations: Look at your results. What do you notice?

What rule can you come up with that describes ***reflection***?

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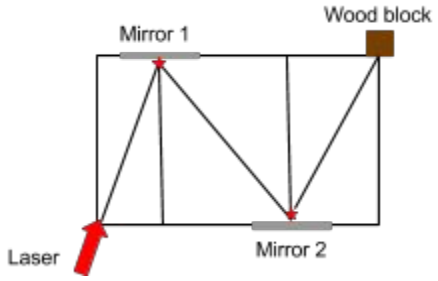
Experiment 2: Reflection off two mirrors



Method:

____ 1. Place a piece of white paper on the table. Place the wood cube at the top right corner of the paper, and place two mirrors on the top and bottom sides of the paper as shown above.

____ 2. Shining the laser from the bottom left corner of the paper, reflect the laser off the two mirrors and onto the wood block. Adjust laser direction or mirrors as needed.

____ 3. Mark the spots on the paper right next to where the light hits each mirror.

____ 4. Draw the path of the laser traveling to the wood block, as shown above.

____ 5. Draw perpendicular lines through each spot, as in step 6 above.

____ 6. As you did in step 7 above, measure the angle of incidence and angle of reflection for each mirror. Record below.

____ 7. Measure the distance from the spot near mirror 1 to the left edge of the paper. Record below.

____ 8. Measure the distance from the spot near mirror 2 to the right edge of the paper. Record below.

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Results:

Mirror 1			Mirror 2		
Distance to left edge of paper (cm)	Angle of incidence	Angle of reflection	Angle of incidence	Angle of reflection	Distance to right edge of paper (cm)

Observations: Look at your results. What do you notice?

Does the same ***reflection*** rule determined in the first experiment still hold? If not, what new rule applies now?

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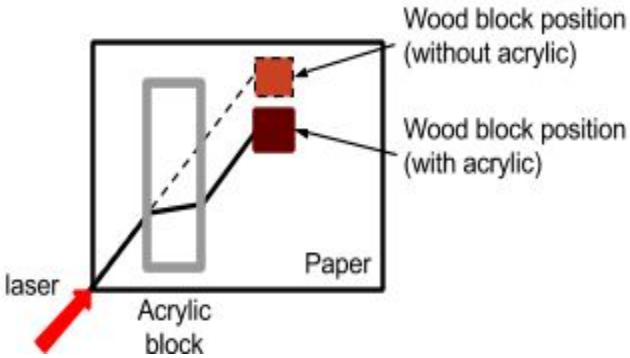
Experiment 3: Refraction through an acrylic block



Method:

____ 1. Place a piece of white paper on the table. Put the wood block near the top right corner of the page. Draw an outline of the wood block.

____ 2. Place an acrylic block on the left-hand side of the paper.

____ 3. Shine the laser through the acrylic so that it hits the middle of the wood block.

____ 4. Keeping the laser in the same position, remove the acrylic block. Move the wood block so that the laser hits the middle of the wood block. Draw a dotted outline of the wood block's new position.

____ 5. Measure the distance that the wood block moved. Record this below.

____ 6. Repeat the experiment one more time, record your results below, and calculate the average distance the wood block moved.

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Results:

	Distance wood block moved (cm)
Trial 1	
Trial 2	
Average	

Observations: Look at your results. What do you notice?

What rule can you come up with that describes ***refraction***?

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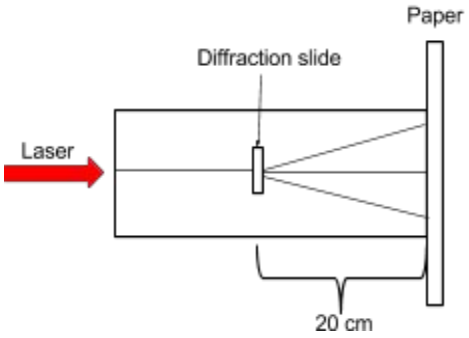
Date _____

Experiment 4: Diffraction through a grating



Method:

____ 1. Place a piece of white paper on the table.

____ 2. Place the diffraction slide 20 cm from the right edge of the paper.

____ 3. Hold up a second piece of white paper along the right edge of the first piece of paper.

____ 4. Shine a laser coming from the left, going through the diffraction slide, and mark where you see laser spots on the paper. Make a special mark for the center spot.

____ 5. Measure the distance between the center spot and some other spots on the paper. You will measure several different distances.

____ 6. Repeat the experiment with the diffraction slide 40 cm away from the edge of the paper.

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Results:

Diffraction slide position	Distances of spots from the center (cm)
20 cm	
40 cm	

Observations: Look at your results. What do you notice?

What rule can you come up with that describes ***diffraction***?