Laboratory simulation: Refraction

Name:_____

Learning goals

- Familiarize with simulations of physical processes.
- Log raw data and plot graphs.
- Partially familiarize with the scientific method (phenomenon, prediction, experiment, conclusion).
- Derive the dependence of the angle of refraction on the angle of incidence and the index of refraction.

Simulation used

"Refraction of light" ("bending-light_el.jar")

Additionally: Spreadsheet application (like Microsoft Excel or OpenOffice Calc)

Theory / Definitions

1. Optical (or transparent) medium:

_____

_____

_____

_____

2. Index of refraction: _____

_____

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_____

3. Refraction:

_____

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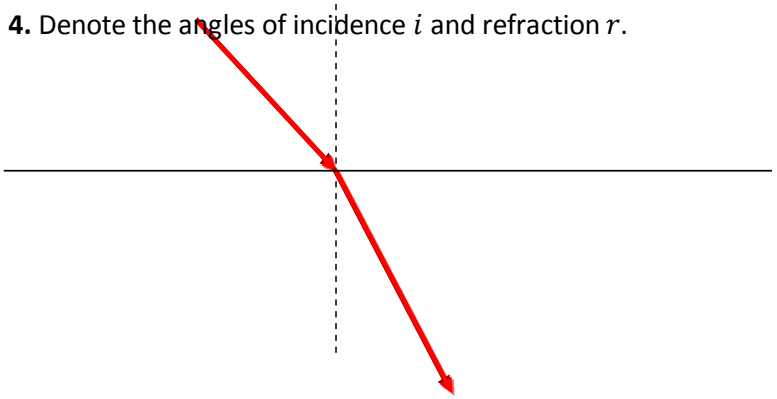
_____

4. Denote the angles of incidence i and refraction r.



Experiment 1: Dependence of angle of refraction on the angle of incidence

Laser light falls from air to a transparent medium.

Prediction: What do we expect to happen to the angle of refraction as the index of refraction of the transparent medium increases? Explain.

_____

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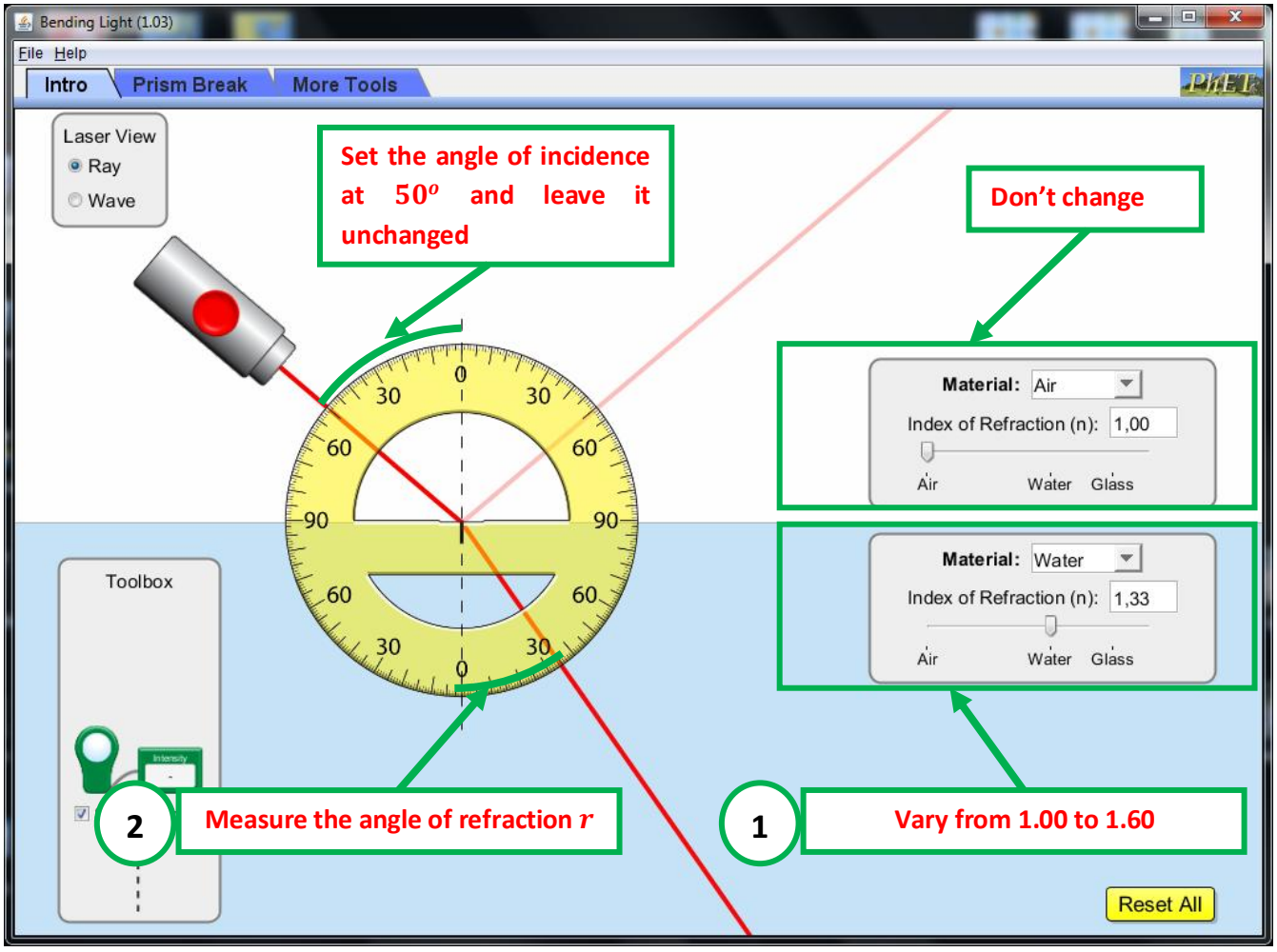

The laser is placed so that the angle of incidence equals 50 degrees.

Table 1: Angle of reflaction vs the index of refraction

Measurement	Index of refraction n	Angle of incidence (degrees)
1		
2		
3		
4		
5		
6		

Graph 1: Angle of reflaction vs the index of refraction

Conclusion compared to our prediction:

_____

_____

Experiment 2: Dependence of the angle of refraction on the angle of incidence

Predictions/Hypothesis: What do we expect to happen to the angle of refraction as the angle of incidence increases? Explain.

_____

_____

_____

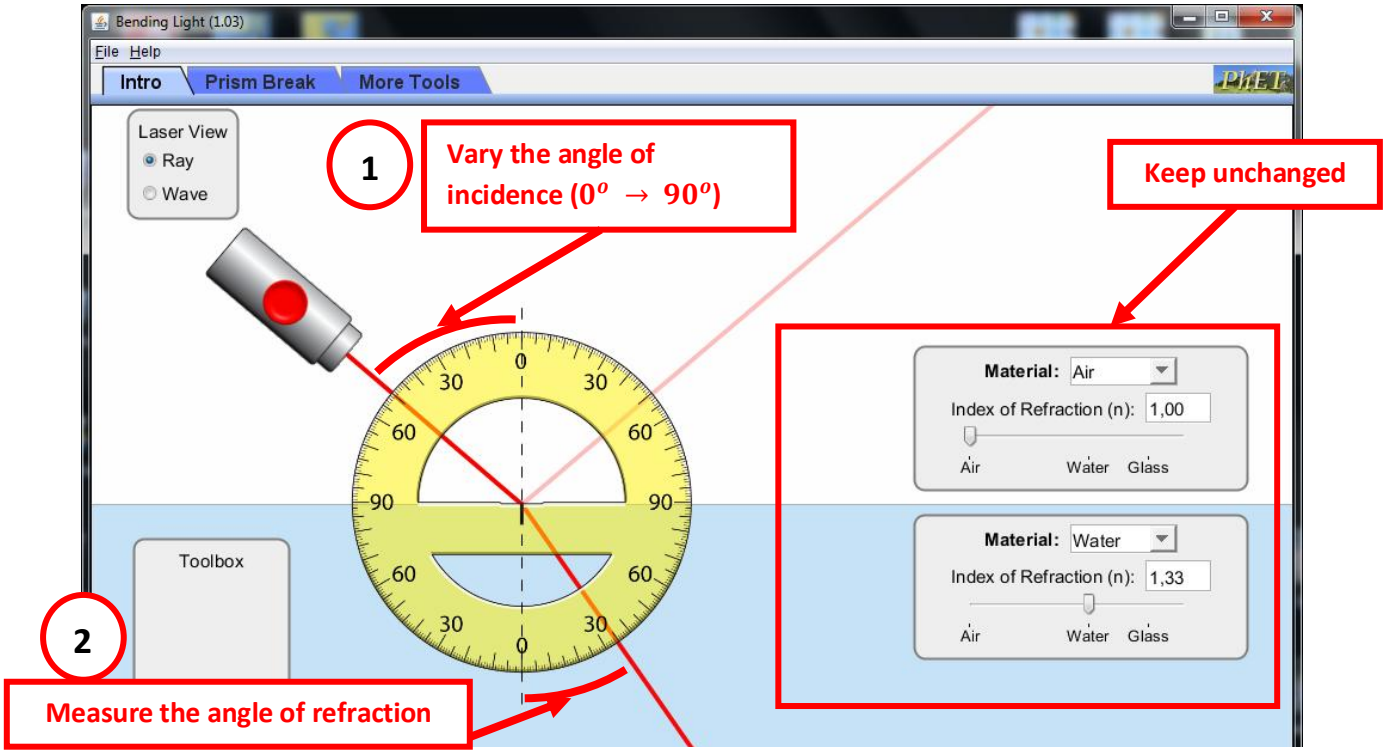

Table 2: Angle of refraction vs angle of incidence

Measurement	Angle of incidence (degrees)	Angle of refraction (degrees)
1		
2		
3		
4		
5		
6		
7		
8		

Graph 2: Angle of refraction vs angle of incidence

Conclusion compared to the prediction:

_____

_____

_____

Conclusion: Theory predictions versus the results of the 2 experiments.

A number of scientists between the 10th and the 17th centuries (Sahl, Snellius, Descartes) concluded that the following formula should relate the angle of incidence i with the angle of refraction r:

$$sini = \frac{sinr}{n}$$

Explain if the results of the 2 simulated experiments above are compatible with the formula.

Experiment 1:

_____

_____

_____

_____

_____

Experiment 2:

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_____

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