

W10.01**Refraction (Snell's Law)**

$$c = 3 \times 10^8 \text{ m/s}$$

Indices of refraction:

Substance	n	Substance	n
Air	1.0003	Leaded Glass	1.63
Benzene	1.50	Ice	1.31
Diamond	2.42	Quartz	1.46
Ethyl Alcohol	1.36	Water	1.33
Glass	1.50	Zircon	1.92

1. Find the speed of light in ice, glass, quartz, and diamond.
2. A beam of light comes out of a block of ice at an incident angle of 37° . At what angle does it refract? (Draw a diagram)
3. A beam of light enters an unknown liquid at an incident angle of 30° and is bent 5° further toward the normal. What is the index of refraction of the liquid? What is the speed of light in that liquid? (Draw a diagram)
4. A ray of light goes from water into diamond at an angle of incidence of 60° . At what angle does it refract into the diamond? (Draw a diagram)
5. If light coming from under water into air is incident on the boundary between the two at an angle of, for example, 60° , it will only reflect, not refract. Do a Snell's law calculation for refraction angle and see what you get. Draw a picture, and try to explain why the light will not refract.
6. What are the units of index of refraction? Explain how you know this using the definition of n in terms of velocities.
7. Explain why the index of refraction can never be less than 1.
8. Diagram the cheese dish (refraction) lab, and explain how it is used to determine the index of refraction of the liquid in the dish.
9. Explain why it is important that one side of the dish in the refraction lab be curved, rather than straight.
10. What happens to light when it is incident on an interface (junction) at an angle of 90° ?

KEY 10.1:

1. 2.29×10^8 ; 1.84×10^8 ; 2.05×10^8 ; 1.23×10^8 all m/s
2. 52°
3. 1.18; 2.54×10^8 m/s
4. 28.4°