

Problems of Refraction of light

1) A light beam passes from a medium whose index of refraction is 1.33 to a second medium. The angle of incidence is 25° and the angle of refraction is 13° . Calculate: **a)** The index of refraction of the second medium. **b)** The speed of light in the second medium.

Data: $c = 3 \times 10^8$ m/s.

Answer: **a)** 2.5, **b)** 1.20×10^8 m/s.

2) A light beam passes from air ($n = 1.0003$) to a thick slab of material whose thickness is 16 cm and its index of refraction is 2.65. The incident angle is 41° . The emerging beam is parallel to the incident beam, the slab does not alter the direction of the beam. It does, however, offset the beam parallel to itself by a distance d . Determine: **a)** The first refracted angle. **b)** The offset distance d .

Answer: **a)** 14.34° , **b)** 7.41 cm.

3) A light ray passes from a medium whose index of refraction is 1.81 to a second medium with an index of refraction of 1.44. If the angle of refraction must be 25° , find: **a)** The angle of incidence. **b)** The speed of light in the first medium.

Data: $c = 3 \times 10^8$ m/s.

Answer: **a)** 19.65° , **b)** 1.66×10^8 m/s.

4) A light ray traveling in air ($n = 1$) is incident on a glass whose index of refraction is 2.85. If the angle of incidence is 29° , calculate: **a)** Angle of refraction. **b)** Speed of light in the glass.

Data: $c = 3 \times 10^8$ m/s.

Answer: **a)** 9.794° , **b)** 1.05×10^8 m/s.

5) The critical angle for total reflection for a light beam travelling from medium 1 to medium 2 is 43.83° . If index of refraction of medium 1 is 2.83, determine the index of refraction of medium 2.

Answer: 1.96.

6) A light ray passes from air ($n = 1$) to a glass whose index of refraction is 1.54. If the angle of refraction is 19° , find: **a)** The angle of incidence needed. **b)** The speed of light in the glass.

Data: $c = 3 \times 10^8$ m/s.

Answer: **a)** 30.09° , **b)** 1.95×10^8 m/s.

7) A light beam passes from glass to air. The critical angle for total reflection is 53.13° . If index of refraction of air is $n = 1$, calculate the index of refraction of glass.

Answer: 1.25.

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8) A light ray passes from a medium whose index of refraction is 2.66 to a second medium with an index of refraction of 1.2. If the angle of incidence is 21° , calculate: **a)** The angle of refraction. **b)** The speed of light in the second medium.

Data: $c = 3 \times 10^8$ m/s.

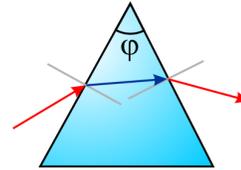
Answer: **a)** 52.6° , **b)** 2.50×10^8 m/s.

9) Determine the critical angle for total internal reflection for light travelling initially in a liquid of index of refraction 3.01 that is incident on a liquid–gas interface if index of refraction of gas is 1.08.

Answer: 21.03° .

10) A triangular glass prism with apex angle $\phi = 68^\circ$ has an index of refraction $n = 1.46$. A light ray passes through the prism with an angle of incidence of 46° . Find:

- a) Angle of refraction at the first surface.
- b) Angle of incidence at the second surface.
- c) Angle of deviation.



Answer: **a)** 29.52° , **b)** 38.48° , **c)** 43.3° .