

OPTICS, FYSA13

Friday, June 5, 2020

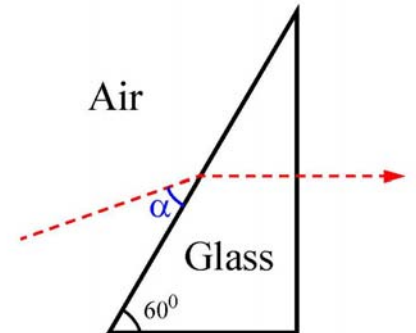
Allowed material: The enclosed formula collection and a calculator.

Total number of points: 20. Points required to pass: 10

Q1

A light beam from a HeNe laser with a wavelength of 632.8 nm and the speed 3.00×10^8 m/s is sent through a glass prism. When the α -angle shown in the picture is 40 degrees, then the outgoing light goes straight through the second surface of the prism.

- What is the speed of light in the glass? (2 p)
- What is the frequency of the light in the glass? (2 p)
- What is the wavelength of the light in the glass? (2 p)



Q2

A mirror has a radius of curvature that is 87 cm.

- At what distance from the mirror should one put an object to get a lateral magnification that is +2.00? (2 p)
- The mirror can also produce an up-side-down image that is 4 times as large as the object. What is then the distance between the object and its image? (2 p)

Q3

An optical system consists of two lenses as described in the picture below. The object is 13.5 cm in front of lens A and it is 3.8 cm high.

- Each lens has the same radius of curvature on both sides. Calculate this radius for each lens if the refractive index is 1.56. Note that the radius in the picture is not to scale. (2 p)
- How far from the object will lens B produce an image? (3 p)
- How high will that image be? And what direction will it have? (3 p)
- Copy the picture below and draw a ray diagram that shows where the images produced by lens A and B end up ! (2 p)

