

Problem #1 (Ch 33)

A ray of light in air is incident on a flat piece of glass, at an angle of $\phi=67^\circ$ with respect to the normal. The glass has an index of refraction $n=1.5$. What is the angle θ between the reflected and refracted rays?

Problem #2 (Ch 33)

When unpolarized light from air ($n=1$) is incident on a piece of transparent material with index of refraction $n=1.23$, the reflected light is found to be completely polarized when the angle of incidence is θ_B . What is the angle of refraction in this case?

Problem #3 (Ch 33)

A glass plate whose index of refraction 1.55 is immersed in a liquid. The surface of the glass is inclined at an angle 54° with the vertical. A horizontal ray in the glass is incident on the interface. When a liquid is a certain alcohol, the incident ray arrives at the interface at the critical angle. Find index of refraction of the alcohol.

Problem #4 (Ch 33)

Dispersion of electromagnetic waves:

- (a) Refers to the fact that waves radiate out in all directions from a point source.
- (b) Result from the fact that waves of different frequencies travel at a different speed in matter.
- (c) Refers to the phenomenon wherein a ray changes direction when it passes from one material into another.
- (d) Is the underlying phenomenon utilized in some types of sun glasses.
- (e) Accounts for the fact that the sky is blue.

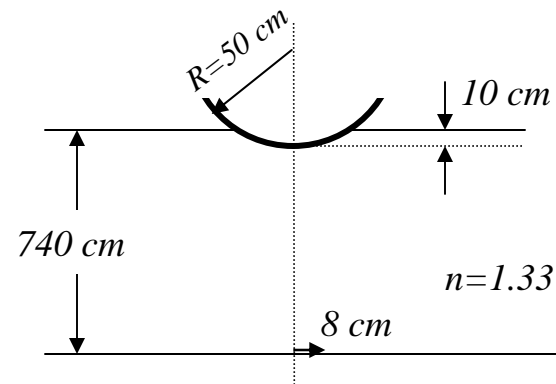
Problem #1 (Ch 34)

Carbon disulfide ($n=1.63$) is poured to a depth of 4 cm in a flask, and a layer of water ($n=1.33$) is poured on top of it to an additional depth of 6 cm. What would be the apparent depth of an object resting on the bottom of the flask when viewed by an observer looking straight down?

Problem #2 (Ch 34)

A thin hemispherical bowl of clear plastic floats on water ($n=1.33$) in a tank. The radius of the bowl is 50 cm and the depth of the bowl in water is 10 cm . The depth of the water in the tank is 740 cm . An object 8 cm long is on the bottom of the tank directly below the bowl. The object is viewed from directly above the bowl. Ignore the refractive effects of the plastic.

- Find the position of the image below the water level.
- Determine whether this image is virtual or real, inverted or erect
- Find the size of the image



Problem #3 (Ch 34)

Suppose you place face in front of a concave mirror

- A) If you position yourself between the center of curvature and the focal point of the mirror, you will not be able to see your image.
- B) No matter where you place yourself, a real image will be formed.
- C) Your image will always be inverted.
- D) Your image will be diminished in size.
- E) None of these are true.

Problem #4 (Ch 34)

As a treatment for cataracts (a cloudiness of the lens of the eye), the natural lens is removed and a plastic lens is implanted. After this is done a person can see distant objects clearly, but he cannot accommodate to focus on nearby objects. If for example such a person wanted to read a book at a distance of 25 cm , he would have to wear eyeglasses. What is the diopter power of these glasses?

Problem #5 (Ch 34)

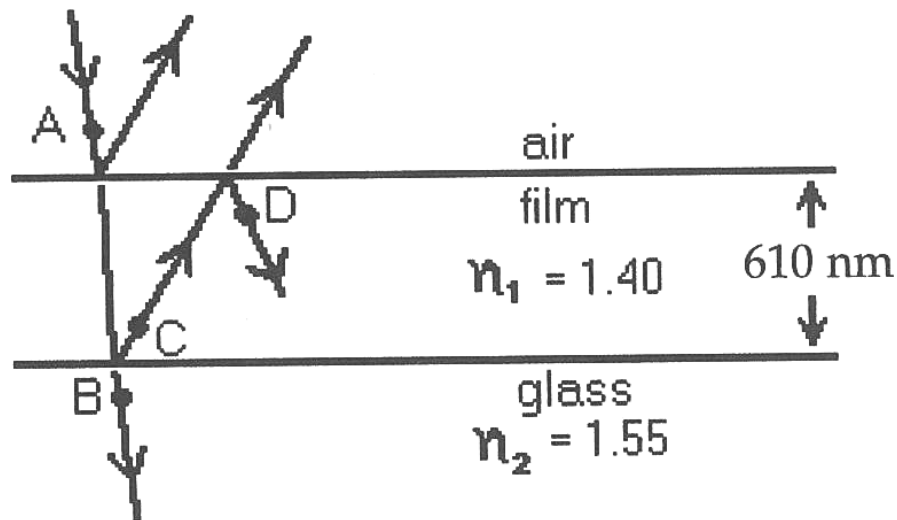
A compound microscope consists of an objective of focal length f_0 and an eyepiece with magnification 25. The microscope is designed so that the object is focused in a plane 16.0 cm away from the focal point of the objective lens. When properly adjusted, The eyepiece and the objective are 17.4 cm apart. What is f_0 ? (Assume that the eyepiece magnification is based on an image at infinity and a near point at 25 cm.)

Problem #1 (Ch 35)

Two radio antennas are 10 km apart on a north-south axis on a seacoast. The antennas broadcast identical AM radio signals, in phase, at a frequency of 3.7 MHz. A steamship, 200 km offshore, travels due north at a speed of 15 km/hr and passes east of the antennas. A radio on board the ship is tuned to the broadcast frequency. Four minutes after a radio signal of maximum intensity I_0 is received, the ratio of the intensity of the signal reduced to I . Find the ratio I/I_0 .

Problem #2 (Ch 35)

A 610 nm thick film, of index $n_1=1.40$, is on the surface of a glass plate, of index $n_2=1.55$. A ray of monochromatic light, of 500 nm wavelength, is incident normally upon the air-film interface, and undergoes reflections and transmissions. Consider points A, B, C, and D (at the figure) as being at a negligible distance from their nearest interfaces, respectively. What is the phase difference in the wave at B, at C, and at D with respect to the wave at A?



Problem #3 (Ch 35)

At most, how many bright fringes can be formed on one side
Of the central bright fringe (not counting central bright fringe)
When light of 625 nm falls on a double slit whose spacing is
 4.74×10^{-6} m?

Problem #4 (Ch 35) [35.21]

In a two-slit interference pattern, the intensity at the peak of the central maximum is I_0 .

- (a) At a point in the pattern where the phase difference between the waves from the two slits is 60° , what is the intensity?
- (b) What is the path difference for 480 nm light from the two slits at a point where the phase difference angle is 60° ?

Problem #1 (Ch 36)

A diffraction grating has 450 lines per mm. What is the highest order that contains the entire visible spectrum from 400 nm to 700 nm?

Problem #2 (Ch 36)

The lattice spacing of the principal Bragg planes in sodium chloride is 0.282 nm . For what wavelength will the first order diffracted beam be deviated by 70° ?

Problem #3 (Ch 36)

A camera set with f-number $f/4$ has a focal length of 50 mm. What is the minimum spacing of two objects positioned 12 m from the lens if the objects are barely resolved in the image? Assume the light wavelength is 500 nm.

Problem #4 (Ch 36)

If a diffraction pattern produced by a single slit, the phase angle β (the phase difference between wavelets from the top and bottom of the slit) is 9.6π rad at an θ angle of 0.770° from the central maximum. If the light used has a wavelength of 555 nm, find the slit width.