

**Physics 2212**  
**Exam 1 (practice problems)**

1. The light with the wavelength 500 nm propagates through the medium with index of refraction 2.5. Find the speed and the frequency of the light in the medium.

**$1.2 \times 10^8$  m/s**  
 **$6 \times 10^{14}$  1/s**

2. A double-slit experiment is performed with light of wavelength 600 nm. The interference pattern is observed on a screen 70 cm away from the plane of the slits. The slit separation is 0.2 mm. What is the distance between the second and the fifth maxima?

**6.3 mm**

3. A double-slit experiment is performed with light of wavelength 600 nm. A very wide viewing screen is 2 m behind the grating. What is the distance between the two  $m=2$  bright fringes on the screen? The slit separation is 0.1 mm.

**48 mm**

4. A traveling wave is described by the following equation  $E(x,t) = 7.2 \sin(6.4 x - 3.2 t)$ . Find the speed of the wave.

**0.5**

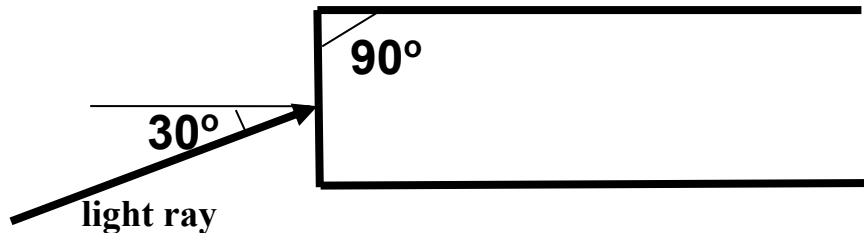
5. A laser beam with wavelength 500 nm is incident on two slits 0.1 mm apart. The interference pattern is observed on a screen 1 m away from the plane of the slits. Determine the number of maxima on the screen within an interval  $9.5 \text{ mm} < y < 15.5 \text{ mm}$ . Point  $y=0$  corresponds to the center of the pattern.

**2**

6. What is the actual thickness of a wall of aquarium if to a fish the wall appears to be 6 mm-thick? The index of refraction of the wall is 2.2.

9.9 mm

7. A light ray enters the film as shown in the figure. The film is made of material with index of refraction  $n=1.2$ . Determine if the light will experience total internal reflection or not.



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8. The image of the object formed by a lens is observed on a screen. The size of the image is 2 times the size of the object. The distance between the object and the lens is 10 cm. Find the focal length of the lens and the distance between the object and the screen.

6.7 cm,  
30 cm

9. A 2.0-cm-tall object is 10 cm in front of a lens that has a 20 cm focal length. Find the image position and its height.

-20 cm,  
4 cm

10. A 1.0-cm-tall object is 20 cm in front of a lens that has a -30 cm focal length. Calculate the image position and its height.

-12 cm,  
0.6 cm