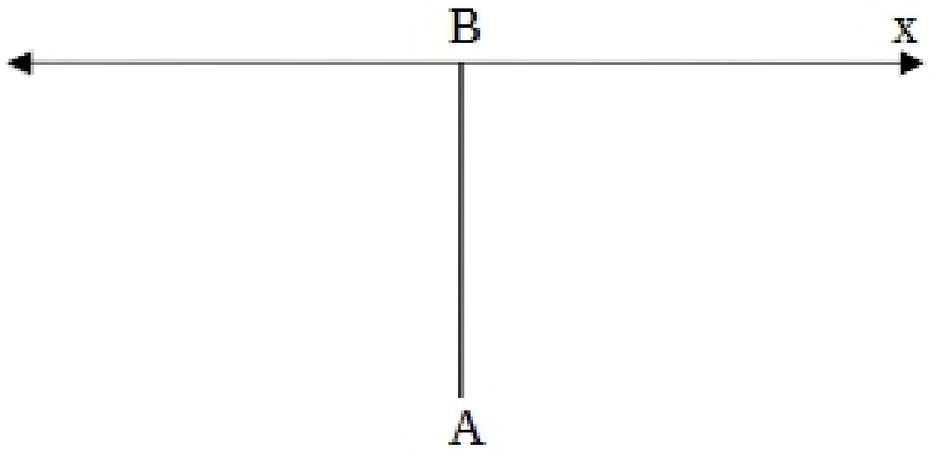
Physics 235 Exam 3 Review Winter 2014

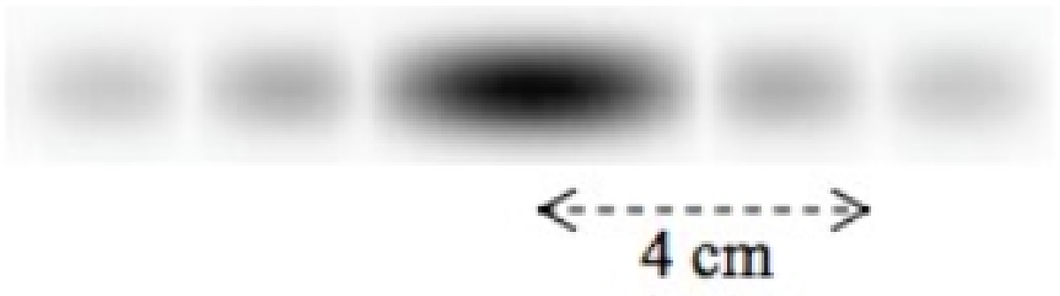
1. Two speakers are placed a distance of 12m apart at locations A and B with each emitting sound at 85Hz. At how many points along the x-axis will the sound from the speakers interfere destructively?



A) 2
B) 4
C) 6
D) 7

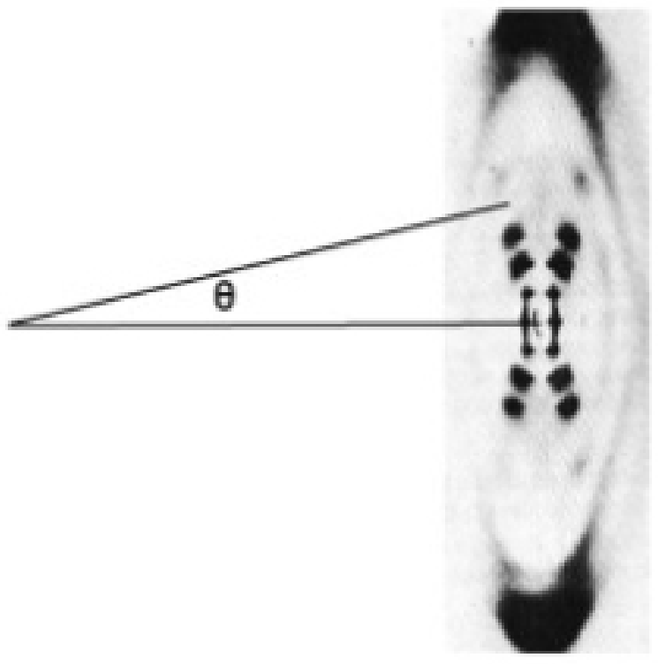
2. A 2m aluminum “singing rod” is held one eight the distance from the end. Assuming that the speed of sound through the metal is 3200m/s, what are the first three harmonics that can be produced?

3. Monochromatic light with a wavelength of 450 nm passes through a single narrow slit. On a screen 1.5 m away it produces the diffraction pattern shown below. What is the width of the slit?



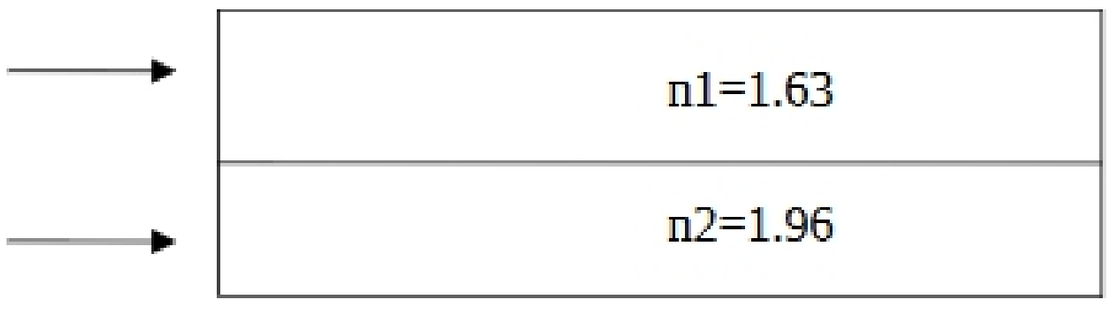
a. 35 um
b. 4.2 um
c. 95 um
d. 24 um
e. 3.1 um

4. Consider Rosalind Franklin's famous x-ray diffraction image of DNA viewed from the side as shown in thee figure. In DNA, the repeat spacing of the helix is 3.4 nm. Franklin used x-rays with a wavelength of 0.15 nm to take this picture. What is the angle at which the (missing) feature shown would appear?



A. 2.5 deg
B. 6.4 deg
C. 10 deg
D. 32 deg
E. 42 deg

5. Light with a wavelength of 450 nm (shown as arrows) arrives at the surface of two blocks, each 2.0 m long but with different indexes of refraction. How much longer does it take the light to move through one of the blocks than the other?

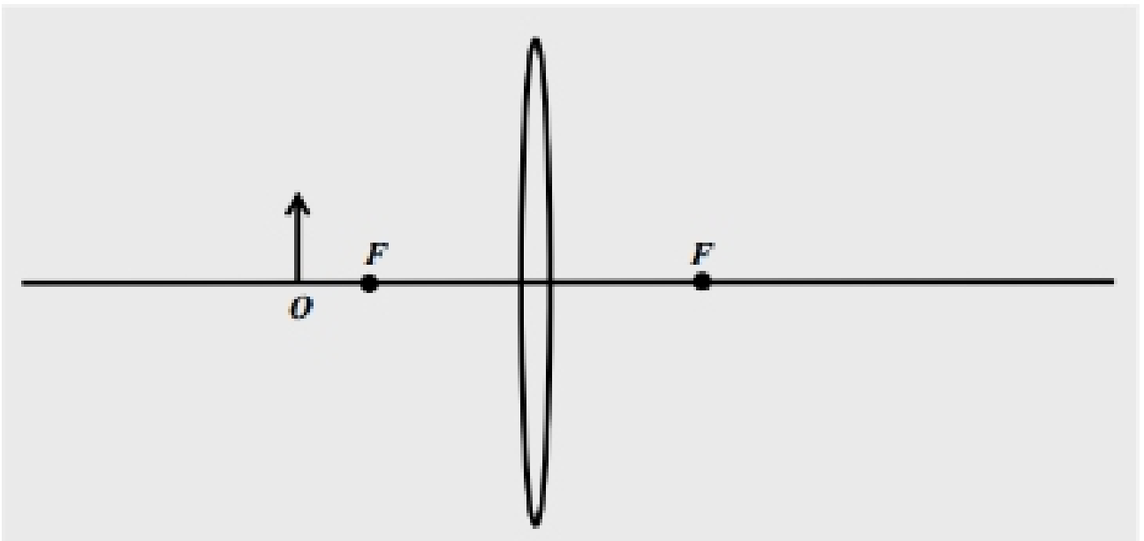


6. A 4 cm tall object is placed in front of a symmetrical converging lens with a focal length of 10 cm.

    a) For an object placed 30 cm from the lens, describe the height, orientation (upright or inverted), lens distance, and type (real or virtual) of the image produced.

    b) What type of image does a magnifying glass produce?

7. An object is placed 44 cm from a converging lens with a focal length of 20 cm. What is the location of the image and magnification?



A)58.5cm, -3.32
B)87.5 cm, -2.23
C)22.5cm, -1.24
D)36.6cm, -.833

8. Contrast in x-ray images arises from differential absorption. The absorption coefficient u in flesh is .76cm. In bone, this coefficient u in bone is .33cm. What would be the contrast between the signal through 7cm of bone and 12cm of flesh? That is, what is the ratio of transmitted intensities iflesh/ibone?

    A) 0.00110
    B) 0.1252
    C) 2.292