

# Chapter 35 End-of-Chapter Problems

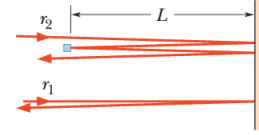
Halliday & Resnick, 10th Edition

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Hit me where it Matters

# 1 Problem 1

In Fig. 35-31, a light wave along ray  $r_1$  reflects once from a mirror and a light wave along ray  $r_2$  reflects twice from that same mirror and once from a tiny mirror at distance  $L$  from the bigger mirror. (Neglect the slight tilt of the rays.) The waves have wavelength 620 nm and are initially in phase. (a) What is the smallest value of  $L$  that puts the final light waves exactly out of phase? (b) With the tiny mirror initially at that value of  $L$ , how far must it be moved away from the bigger mirror to again put the final waves out of phase?



## 1.1 Solution (a)

For the two to be completely out of phase, one of the light waves would have to travel half a wavelength more. We can approximate the distance traveled between big and little mirrors to be equivalent to the distance between the big and little mirror.

$$2L = \frac{\lambda}{2} \quad (1)$$

$$L = \frac{\lambda}{4} = \frac{620 \text{ nm}}{4} = \boxed{155 \text{ nm}} \quad (2)$$

## 1.2 Solution (b)

Replace  $\frac{\lambda}{2}$  with  $\frac{3\lambda}{2}$ .

$$2L_2 = \frac{3\lambda}{2} \quad (3)$$

$$L_2 = \frac{3\lambda}{4} = \frac{3 \times 620 \text{ nm}}{4} = 465 \text{ nm} \quad (4)$$

Now find the change in  $L$ .

$$\Delta L = L_2 - L = 465 \text{ nm} - 155 \text{ nm} = \boxed{310 \text{ nm}} \quad (5)$$

## 2 Problem 3

### 2.1 Solution

## 3 Problem 5

### 3.1 Solution

## 4 Problem 9

### 4.1 Solution

## 5 Problem 15

### 5.1 Solution

## 6 Problem 17

### 6.1 Solution

## 7 Problem 19

### 7.1 Solution



## 8 Problem 23

### 8.1 Solution

## 9 Problem 25

### 9.1 Solution

## 10 Problem 27

### 10.1 Solution

## 11 Problem 29

### 11.1 Solution

## 12 Problem 31

### 12.1 Solution

## 13 Problem 35

### 13.1 Solution

## 14 Problem 39

### 14.1 Solution

## 15 Problem 43

### 15.1 Solution



## 16 Problem 45

### 16.1 Solution

## 17 Problem 51

### 17.1 Solution

## 18 Problem 63

### 18.1 Solution

## 19 Problem 69

### 19.1 Solution

## 20 Problem 71

### 20.1 Solution

## **21 Problem 73**

### **21.1 Solution**

## 22 Problem 75

### 22.1 Solution

## 23 Problem 85

### 23.1 Solution



## 24 Problem 91

### 24.1 Solution

## 25 Problem 103

### 25.1 Solution

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