

# Chapter 35 End-of-Chapter Problems

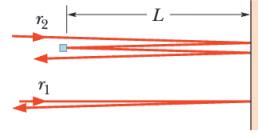
Halliday & Resnick, 10th Edition

Donald Aingworth IV

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.

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

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

## 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  $L$ .

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

## **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**

# Contents

<b>1 Problem 1</b>	<b>2</b>
1.1 Solution (a) . . . . .	2
1.2 Solution (b) . . . . .	2
<b>2 Problem 3</b>	<b>3</b>
2.1 Solution . . . . .	3
<b>3 Problem 5</b>	<b>4</b>
3.1 Solution . . . . .	4
<b>4 Problem 9</b>	<b>5</b>
4.1 Solution . . . . .	5
<b>5 Problem 15</b>	<b>6</b>
5.1 Solution . . . . .	6
<b>6 Problem 17</b>	<b>7</b>
6.1 Solution . . . . .	7
<b>7 Problem 19</b>	<b>8</b>
7.1 Solution . . . . .	8
<b>8 Problem 23</b>	<b>9</b>
8.1 Solution . . . . .	9
<b>9 Problem 25</b>	<b>10</b>
9.1 Solution . . . . .	10
<b>10 Problem 27</b>	<b>11</b>
10.1 Solution . . . . .	11
<b>11 Problem 29</b>	<b>12</b>
11.1 Solution . . . . .	12
<b>12 Problem 31</b>	<b>13</b>
12.1 Solution . . . . .	13

<b>13 Problem 35</b>	<b>14</b>
13.1 Solution . . . . .	14
<b>14 Problem 39</b>	<b>15</b>
14.1 Solution . . . . .	15
<b>15 Problem 43</b>	<b>16</b>
15.1 Solution . . . . .	16
<b>16 Problem 45</b>	<b>17</b>
16.1 Solution . . . . .	17
<b>17 Problem 51</b>	<b>18</b>
17.1 Solution . . . . .	18
<b>18 Problem 63</b>	<b>19</b>
18.1 Solution . . . . .	19
<b>19 Problem 69</b>	<b>20</b>
19.1 Solution . . . . .	20
<b>20 Problem 71</b>	<b>21</b>
20.1 Solution . . . . .	21
<b>21 Problem 73</b>	<b>22</b>
21.1 Solution . . . . .	22
<b>22 Problem 75</b>	<b>23</b>
22.1 Solution . . . . .	23
<b>23 Problem 85</b>	<b>24</b>
23.1 Solution . . . . .	24
<b>24 Problem 91</b>	<b>25</b>
24.1 Solution . . . . .	25
<b>25 Problem 103</b>	<b>26</b>
25.1 Solution . . . . .	26