

## **203-NYC-05: Waves, Optics & Modern Physics**

### **Experiment # 5: Thin Lens**

#### **OBJECTIVE:**

To verify the thin lens equation and the magnification equation for a thin lens.

#### **INTRODUCTION:**

The position and size of the image formed by a thin lens is related to the position and size of the object by the following two equations:

$$1/p + 1/q = 1/f \qquad m = y_i / y_o = - q / p$$

where:  $p$  = distance from object to lens

$q$  = distance from image to lens

$y_o$  = object height

$y_i$  = image height

The following sign conventions are used:

positive  $p$  = real object

negative  $p$  = virtual object

positive  $q$  = real image

negative  $q$  = virtual image

positive  $f$  = converging lens

negative  $f$  = diverging lens

positive  $y_i$  = upright image

negative  $y_i$  = inverted image

**Note:** A negative magnification (for instance if  $p$  and  $q$  are both positive) means that the image is inverted with respect to the object.

#### **PROCEDURE:**

**1)** Choose one of the **converging lens** from the set. Select a lens yellow-blue<sup>1</sup>. Find the focal length of the lens by focusing the image of a distant object on a white card (e.g. Daytime: the trees outside the window or the tower on H building; Nighttime: an ceiling lamp in the corridor outside the lab). **Repeat the measurement at least three times and calculate the average and mean deviation.**

**2)** Set up the object (illuminated box) on the optical bench. Mount the lens and the screen on the bench; lens in between the object and the screen. Fix the distance lens-screen to 50.0 cm. Make sure that all three are vertical and perpendicular to the bench axis. Start with the object as far as possible from the lens. Move it close to the lens until a sharp image of the object is projected on the card. Measure the object distance with a meter stick and estimate the uncertainty of this measurement. Move the object back and forth to find the location of the sharpest image. Use a meter stick to measure the object distance. Move the card back and forth again to locate the sharpest image and measure

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<sup>1</sup> Do not use either the red-yellow lens or the red-blue lens.

# Physics 203 General Physics Waves Optics And Modern

**Mahāwitthayālai Chīang Mai**



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*Chiang Mai University - Bulletin* Mahāwitthayālai Chīang Mai,1999      **Bulletin** Mahāwitthayālai Chīang Mai,1997  
*Catalog* Kennesaw College,1976      *Record ... Catalog ... Announcements* Clemson Agricultural College of South Carolina,1970      *Bulletin* Aurora College,1970      **Catalogue** Florida State College for Women,1976      Annual Catalogue Massachusetts Institute of Technology,1929      **The University of Virginia Record** University of Virginia,2007  
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**General Catalog** Orta Doğu Teknik Üniversitesi (Ankara, Turkey),2002      **Hearings** United States. Congress. Senate. Committee on Labor and Public Welfare,1967      **Announcement** Douglass College,1961      **Annual Report** University of Ghana,2008      *Education Legislation, 1967, Hearings Before the Subcommittee on Education* United States. Congress. Senate. Committee on Labor and Public Welfare,1967      University of Nebraska-Lincoln, Catalog: GRADUATE. University of Nebraska--Lincoln. Graduate College/Graduate Studies,1971      **Education Legislation, 1967** United States. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Education,1967      General Catalogue Massachusetts Institute of Technology,1932      **Announcements** University of Nebraska (Lincoln campus). College of Engineering,1965  
**Annual Report** Punjab Agricultural University,1974

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### **Table of Contents Physics 203 General Physics Waves Optics And Modern**

1. Understanding the eBook Physics 203 General Physics Waves Optics And Modern
  - The Rise of Digital Reading Physics 203 General Physics Waves Optics And Modern
  - Advantages of eBooks Over Traditional Books
2. Identifying Physics 203 General Physics Waves Optics And Modern
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Physics 203 General Physics Waves Optics And Modern
  - User-Friendly Interface
4. Exploring eBook Recommendations from Physics 203 General Physics Waves Optics And Modern
  - Personalized Recommendations
  - Physics 203 General Physics Waves Optics And Modern User Reviews and Ratings
  - Physics 203 General Physics Waves Optics And Modern and Bestseller Lists

5. Accessing Physics 203 General Physics Waves Optics And Modern Free and Paid eBooks
  - Physics 203 General Physics Waves Optics And Modern Public Domain eBooks
  - Physics 203 General Physics Waves Optics And Modern eBook Subscription Services
  - Physics 203 General Physics Waves Optics And Modern Budget-Friendly Options
6. Navigating Physics 203 General Physics Waves Optics And Modern eBook Formats
  - ePub, PDF, MOBI, and More
  - Physics 203 General Physics Waves Optics And Modern Compatibility with Devices
  - Physics 203 General Physics Waves Optics And Modern Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Physics 203 General Physics Waves Optics And Modern
  - Highlighting and Note-Taking Physics 203 General Physics Waves Optics And Modern
  - Interactive Elements Physics 203 General Physics Waves Optics And Modern
8. Staying Engaged with Physics 203 General Physics Waves Optics And Modern
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Physics 203 General Physics Waves Optics And Modern
9. Balancing eBooks and Physical Books Physics 203 General Physics Waves Optics And Modern
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Physics 203 General Physics Waves Optics And Modern
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Physics 203 General Physics Waves Optics And Modern
  - Setting Reading Goals Physics 203 General Physics Waves Optics And Modern
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Physics 203 General Physics Waves Optics And Modern
  - Fact-Checking eBook Content of Physics 203 General Physics Waves Optics And Modern
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

#### 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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