

# Optics – The Study of Light

## Refraction

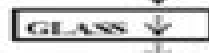
Light *refracts* when passing between two substances at an *angle*.

Light slows down in glass. Here the left side slows down first causing the light to bend to the left.



Light speeds up in air. Here the left side speeds up first causing the light to bend to the right.

The right side hits first and slows down causing the light to bend to the right.



If the light does not enter at an angle, it does not bend.

## Reflection

Light reflects at shiny boundaries we call mirrors.

**Normal** – an imaginary line 90° (perpendicular) to a surface.

**Angle of Incidence** – the angle between the incoming ray and the normal.

**Angle of Reflection** – the angle between the outgoing ray and the normal.



angle of incidence = angle of reflection

## Focus

Every lens or mirror has a place where all of the parallel rays will meet. This is known as the *focal point* or *focus*.



## Straight Lines

Mirrors and lenses can make things look bigger or smaller because our eyes always think that light comes from straight lines, even if they have been refracted or reflected.



## Object vs. Image

The **object** is what you are looking at: the actual thing.

The **image** is what you think you see: the object enlarged, reduced, or moved.

## Lenses

Lenses work by refraction, by the light bending when moving between two substances.

A convex lens magnifies.



A convex lens is **convergent** – the light rays come together.

A concave lens reduces.



A concave lens is **divergent** – the light rays spread apart.

Lenses and mirrors work opposite of each other. If a convex lens reduces, then a concave mirror magnifies.

## Concave or Convex



Concave looks like the sides have curved in.



Convex – the middle is bigger than the ends.

## Optical Systems



Microscopes and telescopes are **optical systems** that use combinations of lenses and/or mirrors to magnify light. Combining optical devices allows us to see very distant or very small objects.

## Mirrors

Mirrors work by reflections, by the bouncing of light off of a shiny surface. **Images in mirrors always look twice as far away as the object.**

Ex. An image looks 20 m away in a mirror. How far away is the object?  
 Answer: Half the distance: 10 meters.

A convex mirror reduces.



A convex mirror is **divergent**.

A concave mirror magnifies.



A concave mirror is **convergent**.

# Optics The Study Of Light Answers

**Rumi Michael Leigh**



## **Optics The Study Of Light Answers:**

The Christian Science Journal ,1911      Physics for Engineering Alphonso Hendricks, Loganathan Subramony, Charmaine Van Blerk, 2000 In this volume the fundamental knowledge and concepts of engineering science are introduced progressively throughout the text It is designed as a one year introductory physics course using algebra and trigonometry      **Science** ,1925 Vols for 1911 13 contain the Proceedings of the Helminothological Society of Washington ISSN 0018 0120 1st 15th meeting      **CUET-PG Forensic Science Previous Year Solved Question Paper With Chapter Wise 1000 Question With Solution As Per Updated Syllabus** ,2025-01-21 CUET PG Forensic Science SCQP13 Question Bank Solved PYQ 1000 Chapter wise question With Explanations As per Exam Pattern Highlights of CUET PG Forensic Science Question Bank 1000 Questions Answer Chapter Wise MCQ Solved Question Paper 2022 to 2024 with Detail Explanations As Per the Updated Syllabus Include Most Expected MCQ as per Paper Pattern Exam Pattern All Questions Design by Expert Faculties JRF Holder      **The Handy Physics Answer Book** Charles Liu, 2020-09-01 An informative accessible easy to use guide to physics covering the fundamental concepts and amazing discoveries that govern our universe We don't need a U S Supreme Court ruling to know that everyone is governed by the laws of physics but what are they How do they affect us Why do they matter What did Newton mean when he said For every action there is an equal and opposite reaction What is gravity What is Bernoulli's Principle Einstein's Theory of Relativity How do space time matter and energy all interact How do scientific laws theories and hypotheses differ Physics can often seem difficult or complex but it's actually beautiful and fun and it doesn't need to be hard to understand Revised for the first time in a decade the completely updated third edition of The Handy Physics Answer Book makes physics and its impact on us the world and the universe entertaining and easy to grasp It dispenses with the dense jargon and overly complicated explanations often associated with physics and instead it takes an accessible conceptual approach never dumbing down the amazing science yet all written in everyday English The Handy Physics Answer Book tackles big issues and concepts like motion magnetism sound and light and lots of smaller topics too like why don't birds or squirrels on power lines get electrocuted and makes them enlightening and enjoyable for anyone who picks up this informative book For everyone who has ever wondered about the sources of energy production in the United States or how different kinds of light bulbs shine or why wearing dark colored clothes is warmer than light colored ones or even what happens when you fall into a black hole The Handy Physics Answer Book examines more than 1 000 of the most frequently asked most interesting and most unusual questions about physics including How can I be moving even while I'm sitting still If the Sun suddenly disappeared what would happen to the Sun's gravity What is the energy efficiency of the human body Why do golf balls have dimples How can ice help keep plants warm What kinds of beaches are best for surfing What do 2G 3G 4G and 5G wireless networks mean Why shouldn't metal objects be placed in microwave ovens Why does my voice sound different on a recording Can a light beam be frozen in time Why are soap bubbles sometimes so colorful Why

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who engages with and judges the worth of any creative effort and what it contributes to an understanding of the seen and the unseen The illustrations and the many coloured plates accompanying the text offer an overview of the subject      **Optics** Rumi Michael Leigh,2023-05-24 Optics Things You Should Know Questions and Answers presents the study of light through a question and answer format The text covers reflection refraction mirrors lenses and prisms with explanations supported by worked examples Problems progress from simple calculations to more advanced exercises showing how formulas are applied across different optical situations Key topics include image formation focal length magnification prism deviation and the properties of converging and diverging lenses Additional sections illustrate how optics connects to vision instruments and physical principles in science This book will interest students physics learners and exam candidates who want to study optics and its applications in physics      **The Handy Physics Answer Book** Paul W Zitzewitz,2011-02-01 Eschewing the usual mathematical explanations for physics phenomena this approachable reference explains complicated scientific concepts in plain English that everyone can understand Tackling the big issues such as gravity magnetism sound and what really happens in the Large Hadron Collider this engaging look at physics also spells out why cats always land on their feet why people appear to have red eyes in photographs and the real danger of looking at an eclipse For everyone who ever wondered how a light bulb works or how squirrels avoid electrocution on the power lines this handbook supplies answers on the physics of everyday life and examines the developments in the exploration of subatomic particles In addition to the question and answer section an addendum of facts about physicists explains what the Nobel prize is and who has won it and tells the story of the scientist who was incarcerated for agreeing with Copernicus Answers more than eight hundred questions about physics ranging from everyday life applications to the latest explorations in the field      **The British Journal of Photography** William Crookes,T. A. Malone,George Shadbolt,J. Traill Taylor,William Blanchard Bolton,Thomas Bedding,1919 *North America Skyline* ,1961      New York Review of the Telegraph and Telephone and Electrical Journal ,1899      **The Optician and Scientific Instrument Maker** ,1930      English Mechanic and Mirror of Science ,1873      **The comprehensive English dictionary, the pronunciation adapted to the best modern usage by R. Cull John Ogilvie**,1893      **Transactions of the Optical Society** Optical Society (Great Britain),1929

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