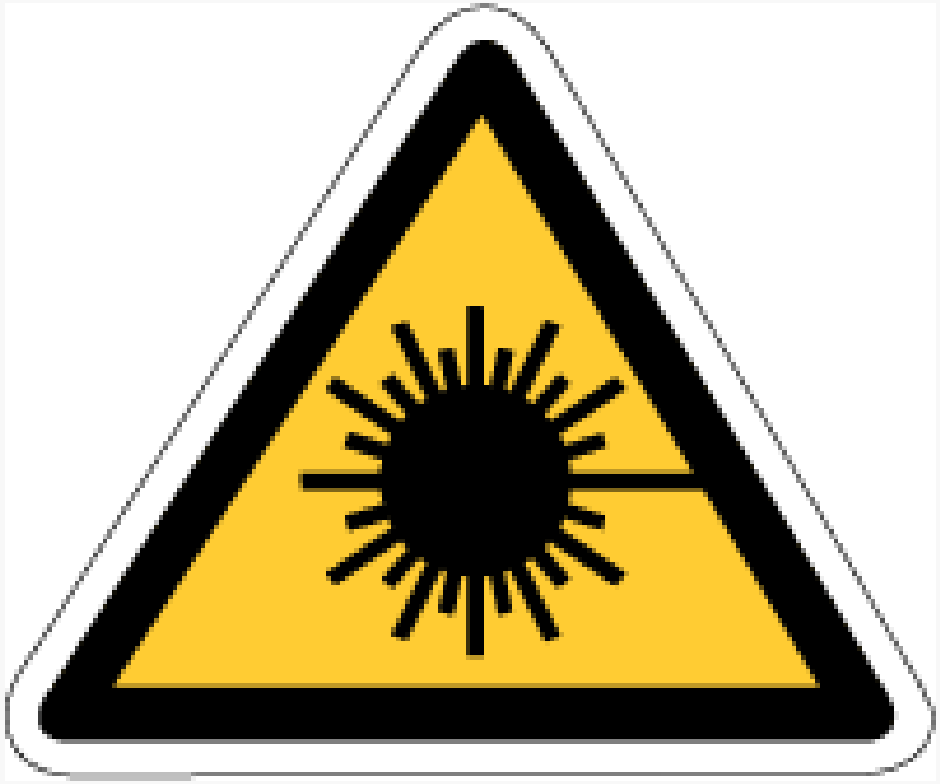
# Science Olympiad 2012

## Optics



## Divisions B & C

# Event Supervisors


- Carlos Lopez : clopez@kestrel.nmt.edu
- Richard Sonnenfeld: rsonnenfeld@gmail.com

# Description

- Team size:Up to 2
- Time: 50 mins
- Event parameters: Rulers,Protractors,Premade Templates, Calculator(any type without communication capabilities).

Competition:

- Geometric Optics
- Physical Optics
- LASER Shoot

# Scoring

| Part | Points |
| --- | --- |
| • Geometric Optics | %Correct Answers X 30 |
| • Physical Optics | %Correct Answers X 30 |

# Points from LASER Shoot

- Number of mirrors the laser reflects off X 4

- LASER Shoot Accuracy (20-d[mm]) / 10

  if d > 200mm set contribution to zero.

- Our first choice to break TIES is the LASER Shoot Setup time in seconds.

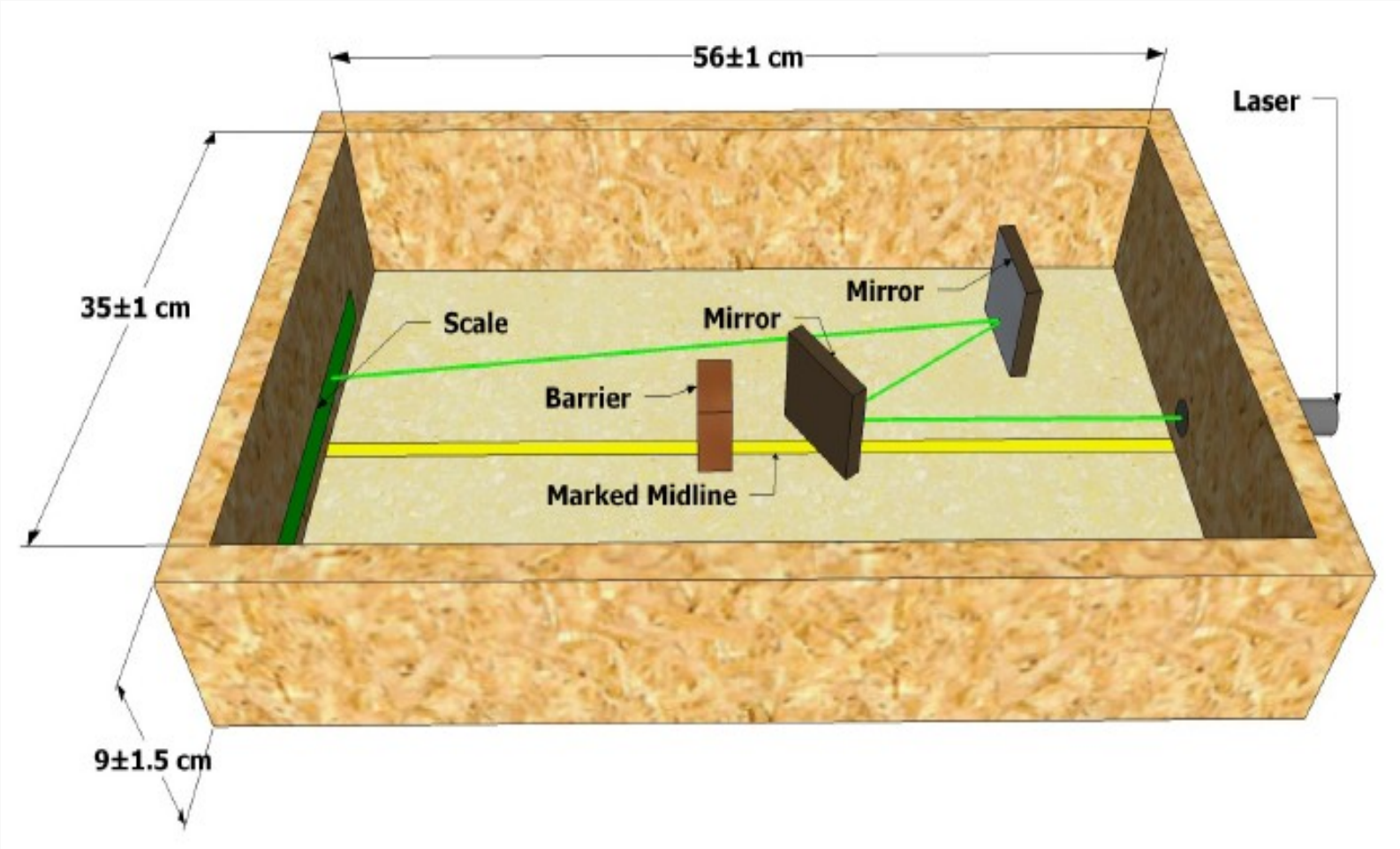
  Hands Off at t = 240s

# Team Rotation

Last Year 20 and 24 teams C and B divisions, respectively with two setups per division.

- Time on station 4 minutes max.
- Time to reset 2 min .
- 1 station  accommodate 8 teams in 50 minutes
- We will use two stations and break up each division in two groups.

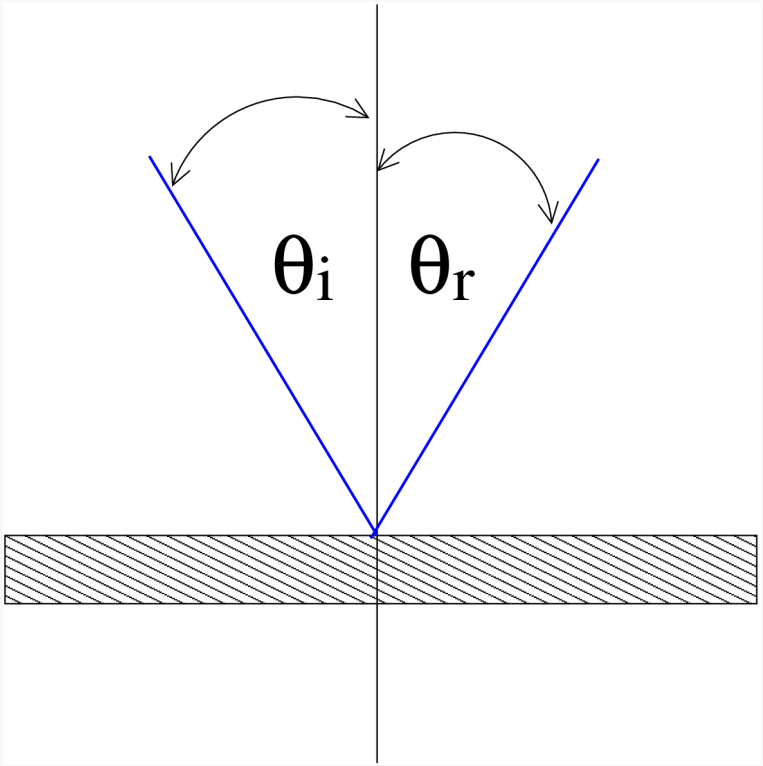
# Optics-LASER Shoot Setup



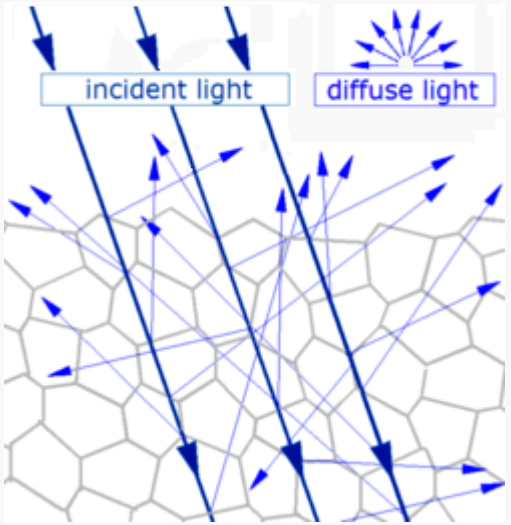

http://soinc.org/

# Geometric Optics

- Law of Reflection Specular

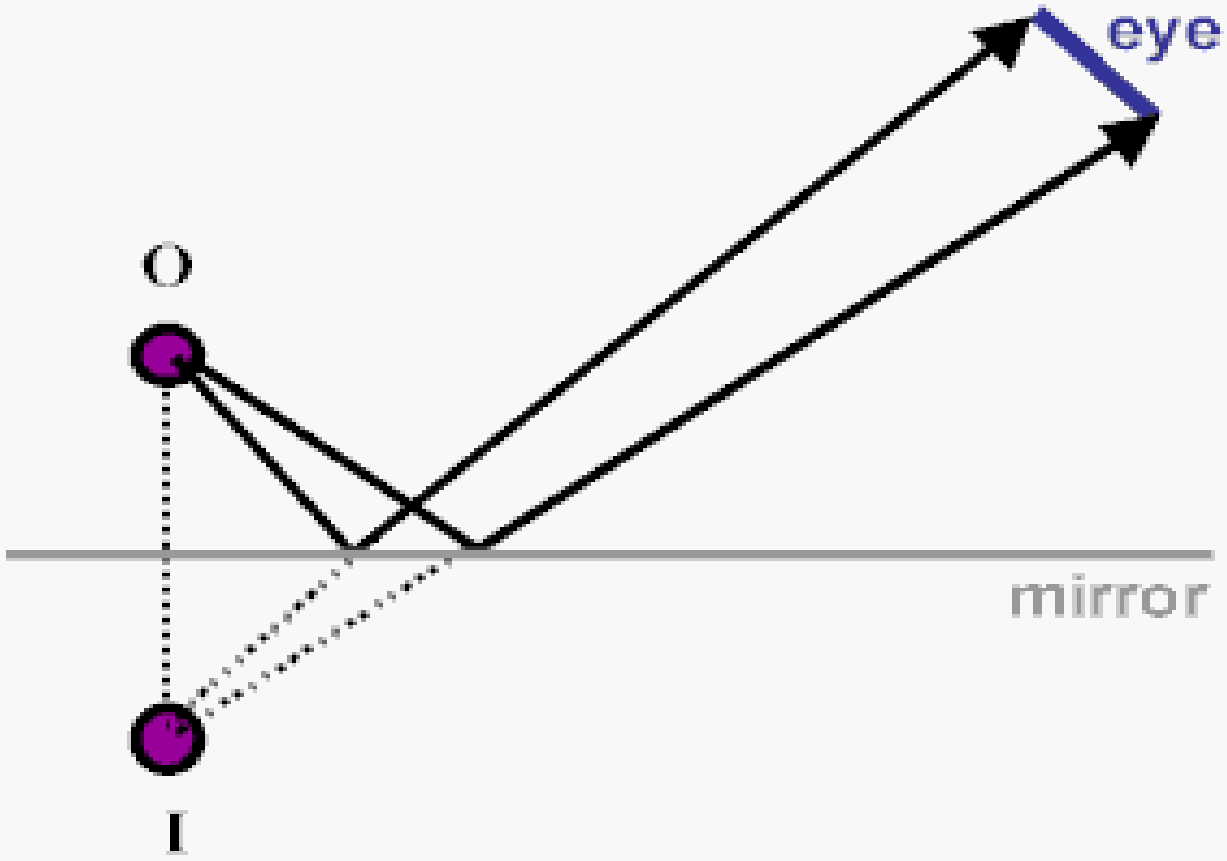



- Diffuse reflection

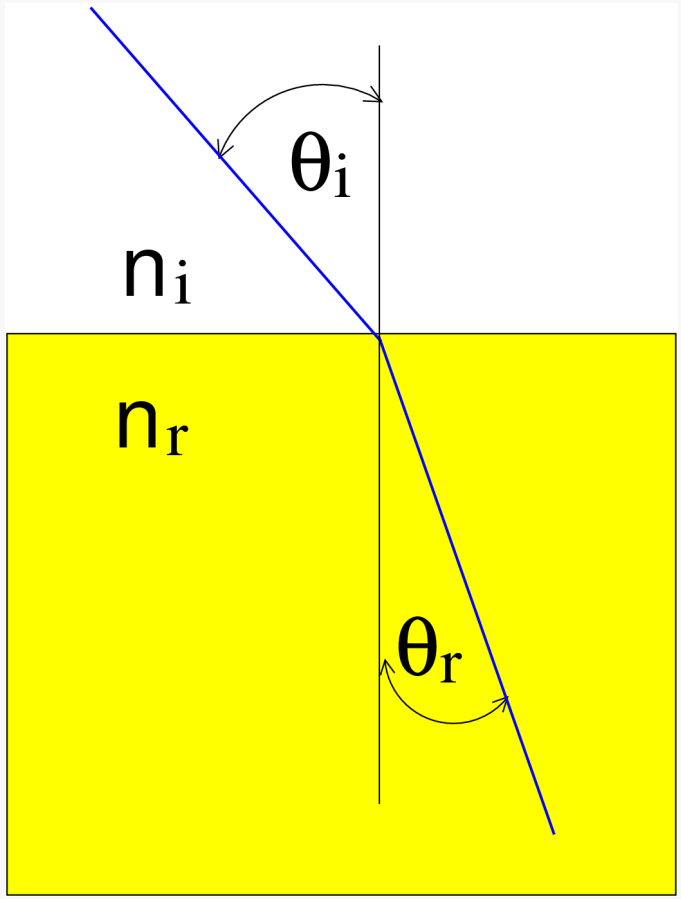



http://en.wikipedia.org/wiki/Reflection_(physics)#Diffuse_reflection

# Mirror Images

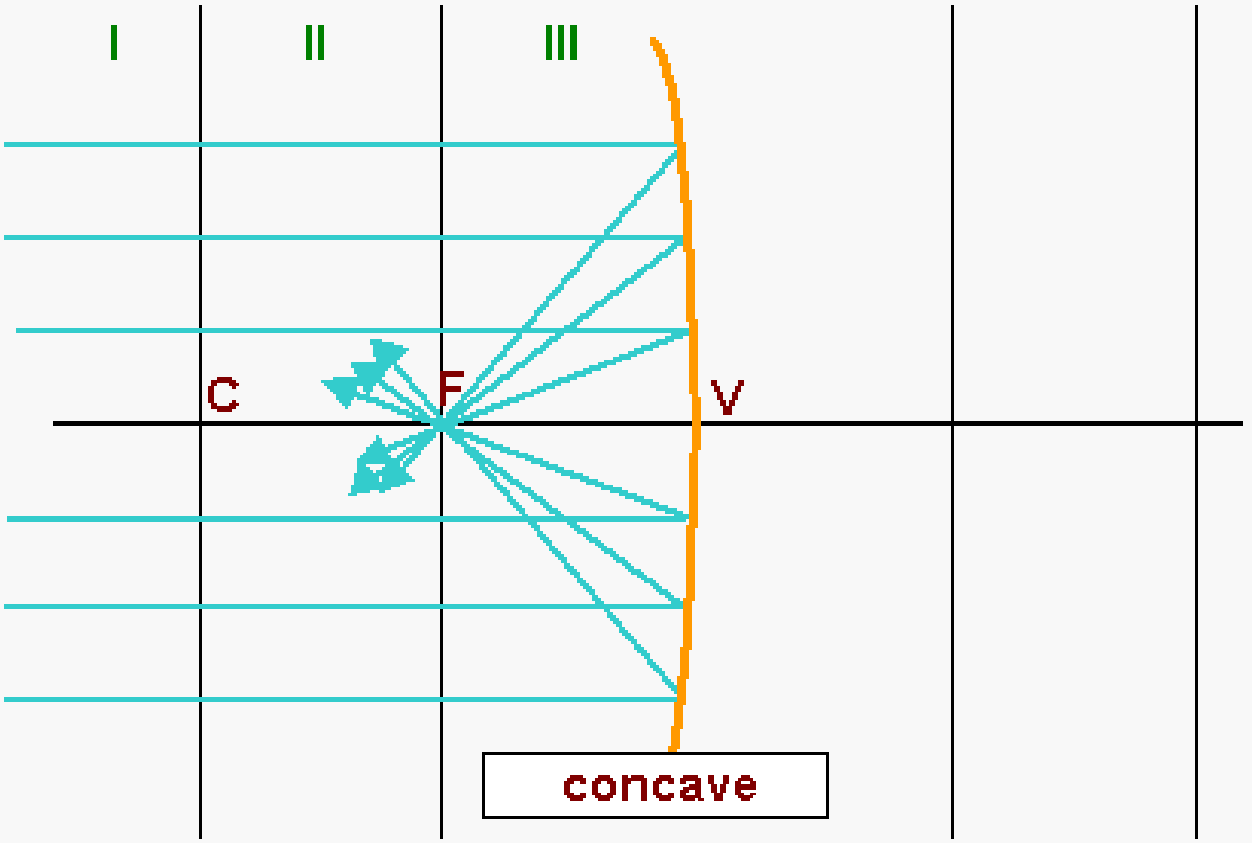


# Index of refraction $n = v / c$

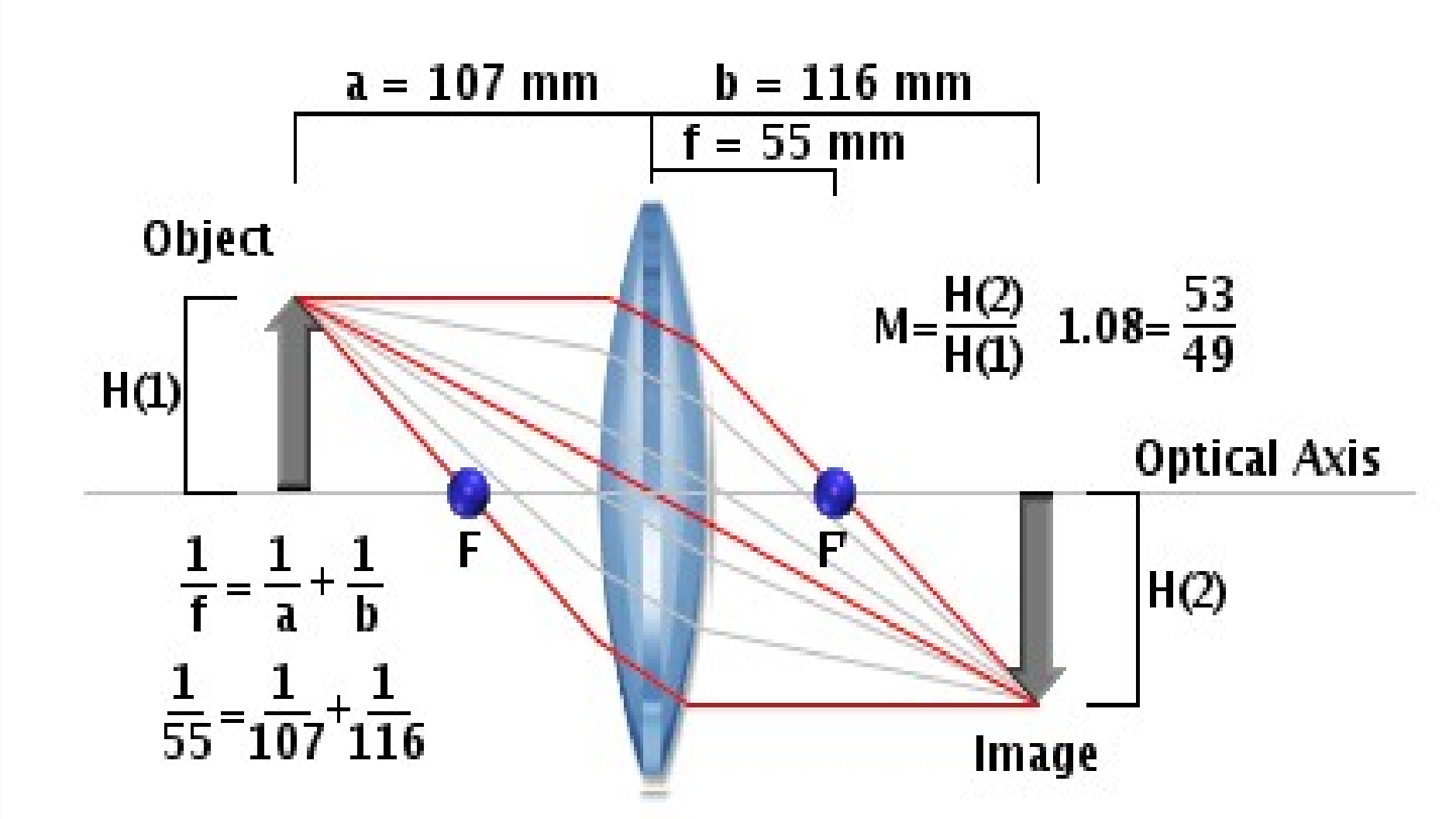



# Snell's law $n_i \sin(\theta_i) = n_r \sin(\theta_r)$

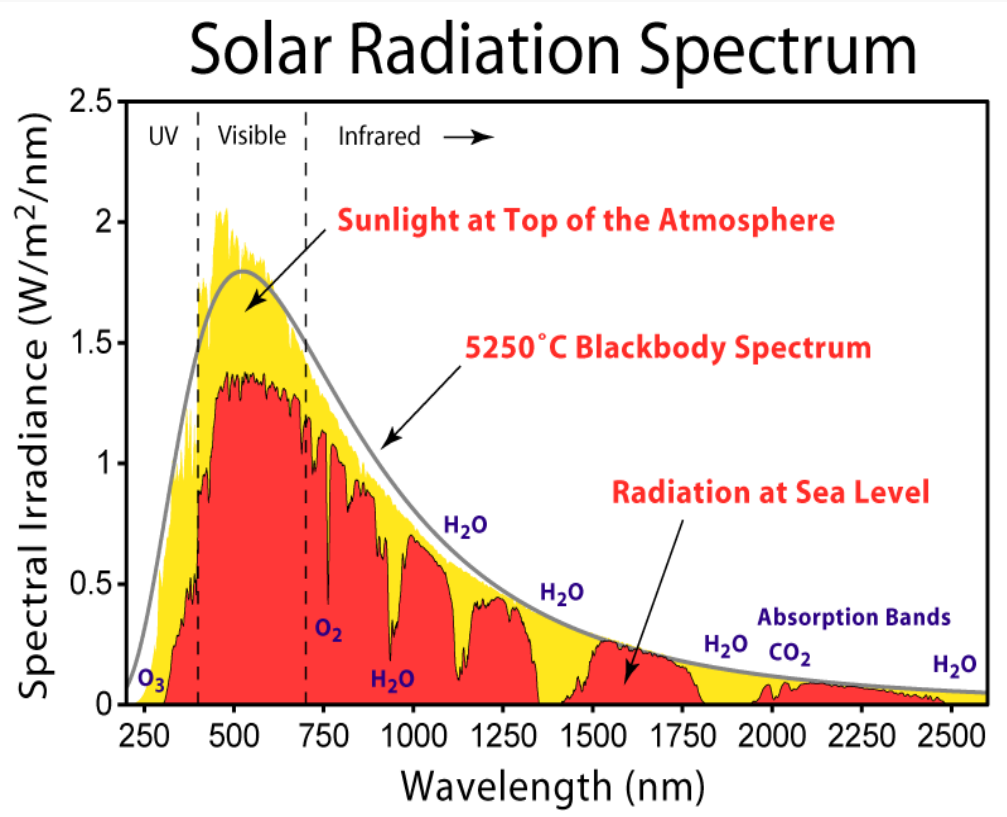
# Spherical Mirrors

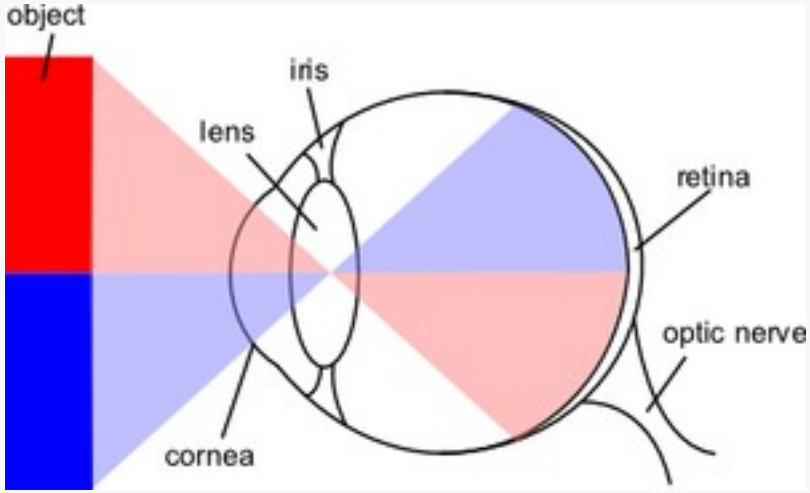


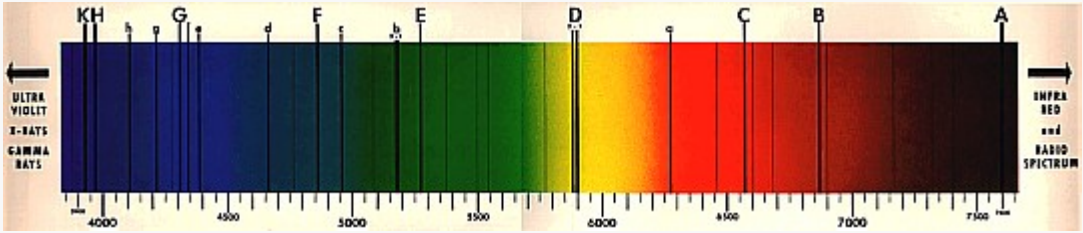
# Spherical Lenses



# Physical Optics



# Concepts

- Wave length, frequency, velocity

$$\lambda = C * T \qquad \omega = 2\pi f \qquad f = 1/T$$

- Doppler Shift

(moving away)

$$f = f_0 \left[ \frac{1 - (v_r / c)}{1 + (v_r / c)} \right]^{1/2}$$

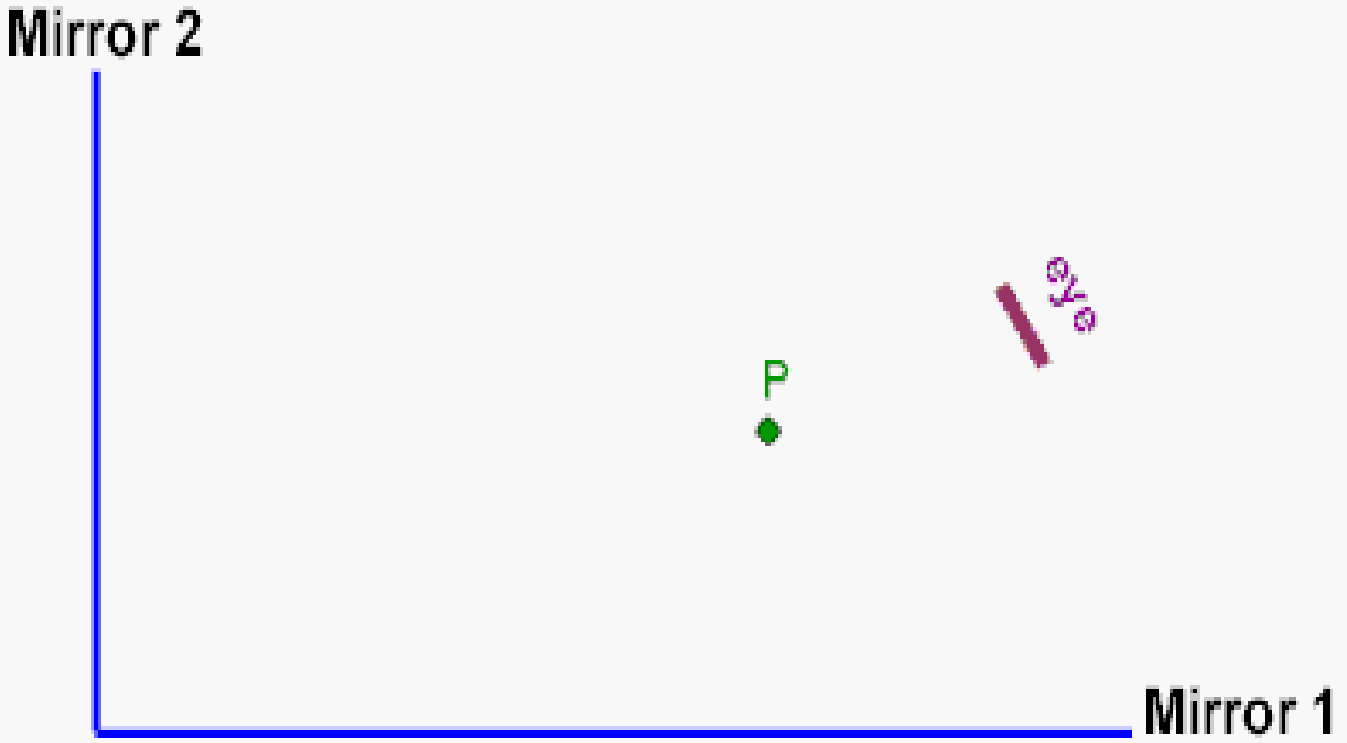
# State division C

- Ray Tracing of two lens systems
- Retreflection

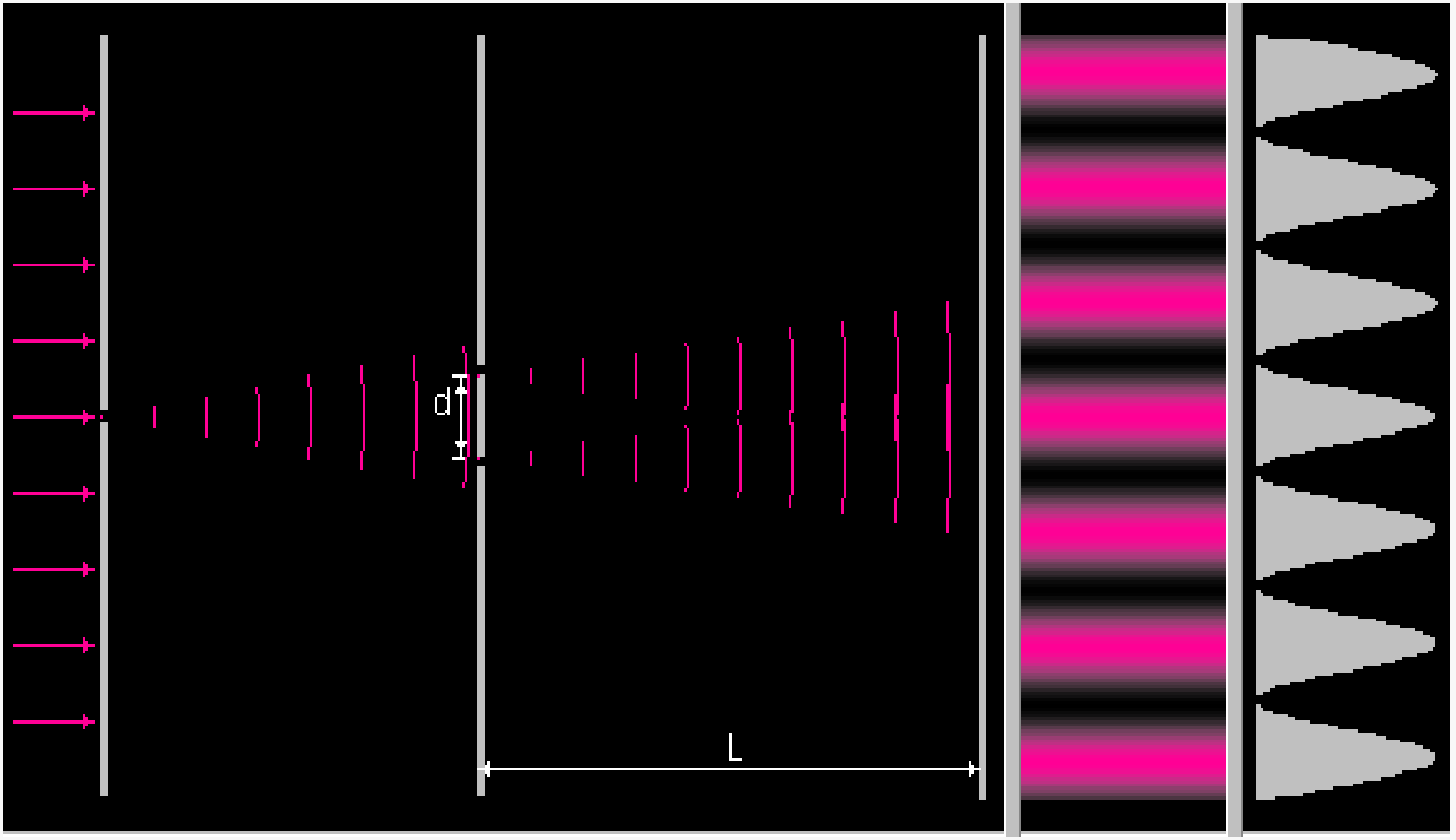
  http://en.wikipedia.org/wiki/Corner_reflector

-
-

# Mirror Images



# Interference



# Resources

apcentral.collegeboard.com/apc/members/courses/teachers_corner/30836.html#name1

sa | Merlin | MOS | News | Radio | Diction | cf-standard-nam... | Ajaxterm | contact | SciOLy | Spanish | Skills

FOR STUDENTS | FOR PARENTS | FOR PROFESSIONALS

About Us | Store | Help | My Account | En Español

Search Go

CollegeBoard inspiring minds

Education Policy & Advocacy | Membership | Testing | College Guidance | K–12 Services | Higher Ed Services | Professional Development | Data, Reports & Research

## AP Central

PRINT PAGE

Home > AP Courses and Exams > Course Home Pages > Interference and Diffraction

HOME

AP COURSES AND EXAMS

AP COURSE AUDIT

PRE-AP ®

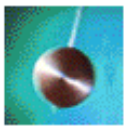
INSTITUTES AND WORKSHOPS

DISCUSSION GROUPS

BECOME AN AP READER

Now Available Online AP Scores for Schools and Districts

# Interference and Diffraction



**More About Waves and Optics...**

- Properties of Traveling Waves
- Properties of Standing Waves
- Doppler Effect and Superposition
- Dispersion of Light and the Electromagnetic Spectrum
- Reflection and Refraction
- Mirrors
- Lenses

Demonstrations
Lab Experiment
Lecture Notes and Tutorials
Simulations
Explorations

http://www.colorado.edu/physics/2000/quantumzone/bohr.html

Bohr's Atom - Google Chrome

Gmail - Spectral Line... | Bohr's Atom | Google Calendar

http://www.colorado.edu/physics/2000/quantumzone/bohr.html

Home | Gcasa | Merlin | MOS | News | Radio | Diction | cf-standard-nam... | Ajaxterm | contact | SciOLy | Other Bookmarks



# Bohr's Atom

To explain the spectral line puzzle, Bohr came up with a radical model of the atom which had electrons orbiting around a nucleus.

That doesn't sound so radical. We've already seen how electrons can orbit around a positively charged nucleus.

Yes, but in order to explain the "signature colors," Bohr came up with an extraordinary rule the electrons had to follow: **Electrons can only be in "special" orbits.** All other orbits just were not possible. They could "jump" between these special orbits, however, and when they jumped they would wiggle a little bit...

EXTRA FOR THE ADVANCED STUDENT

Next