

SI Physics - Full Discipline Demo

Reflection

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Physics - Full Discipline Demo
Course	SI Physics - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Classify each interaction between light and matter as either particle or wave.

	Particle	Wave
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Correct answers:

1 Absorption Reflection Refraction Transmission

2 Diffraction Interference

Classify each object as either a light source or light reflector.

	Source	Reflector
☐ Campfire	1	2
☐ Blade of grass		
☐ Candle flame		
☐ Candle holder		
☐ Desk		
☐ The Sun		
☐ Tree		

Correct answers:

1 Campfire The Sun Candle flame

2 Blade of grass Candle holder Desk Tree

Classify each statement as True or False.

⚡ Diffuse reflection does not follow the law of reflection. ⚡ Only rays of light that enter the eye are seen by the eye. ⚡ The angle of incidence is equal to the angle of reflection. ⚡ The image distance for a plane mirror has the same magnitude as the object distance. ⚡ The image formed by a plane mirror is real and forms in front of the mirror. ⚡ The ray model for light is valid as long as the objects the light interacts with are smaller than 0.5 micrometers.	
True	False
1	2

Correct answers:

1 Only rays of light that enter the eye are seen by the eye.

The angle of incidence is equal to the angle of reflection.

The image distance for a plane mirror has the same magnitude as the object distance.

2 Diffuse reflection does not follow the law of reflection.

The image formed by a plane mirror is real and forms in front of the mirror.

The ray model for light is valid as long as the objects the light interacts with are smaller than 0.5 micrometers.

Exploration

Light is an electromagnetic wave and also a massless particle.

- ☒ True ✓
- ☐ False

The ray model for light is valid as long as the objects the light interacts with are ____ the wavelength of light.

- ☒ larger than ✓
- ☐ smaller than
- ☐ the same size as
- ☐ None of the above

A laser beam can be thought of as an approximation of a(n) ____.

- ☐ light wave
- ☒ light ray ✓
- ☐ extended object
- ☐ None of the above

____ reflection is the reflection off of a smooth, shiny surface.

- ☐ Diffuse
- ☐ Optical
- ☒ Specular ✓
- ☐ None of the above

The law of reflection states that the angle of incidence is ____ the angle of reflection.

- ☐ greater than
- ☐ less than
- ☒ equal to ✓
- ☐ None of the above

The image formed by a plane mirror is a(n) ____ image.

- ☐ real
- ☒ virtual
- ☐ imaginary
- ☐ None of the above



Exercise 1

Do your results confirm the law of reflection. Reference Data Table 1 in your answer and explain any sources of error.

Results from **Data Table 1** confirm the law of reflection, which states the incident angle is equal to the reflected angle. Incident and reflected angles were very similar for the three angles tested. The highest error was produced for Lines B and B', but was still very low, <5%. Discrepancies could be caused by relative motion of the mirror, such as not making a 90° angle with the cardboard or not lying correctly on the mirror line

What is the theoretical relationship between object distance and image distance in a plane mirror? How do your results support this relationship? Reference Data Table 2 in your answer.

In theory, the object distance and the image distance in a plane mirror should be identical. The results in Data Table 2 support this with a percent error of 13.1%.

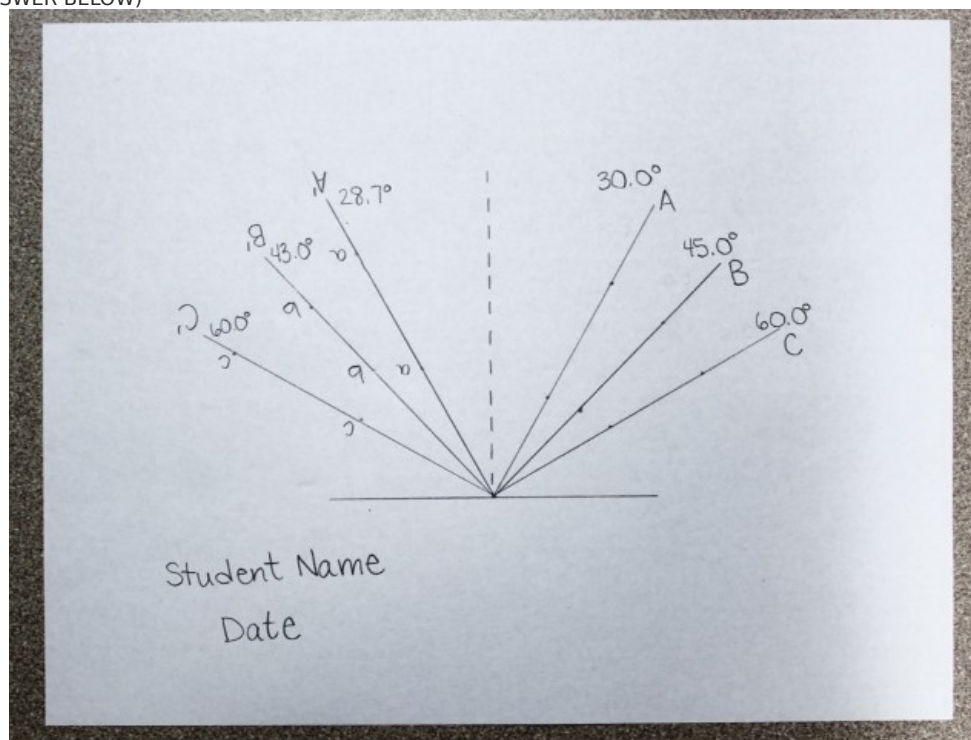
How does the location of the image (P') compare to the location of the object (P)? Is it directly across from the object, to the right of the object, or to the left of the object? Does this align with your expectation? Reference Photo 2 in your answer.

The location of the image is directly across from the object on the other side of the mirror line, as can be seen in **Photo 2**. This aligns with the expectation given by theory, which states the image will appear the same distance away from the mirror that the object is from the mirror, directly across.

Data Table 1: Verifying the Law of Reflection
(SAMPLE ANSWER BELOW)

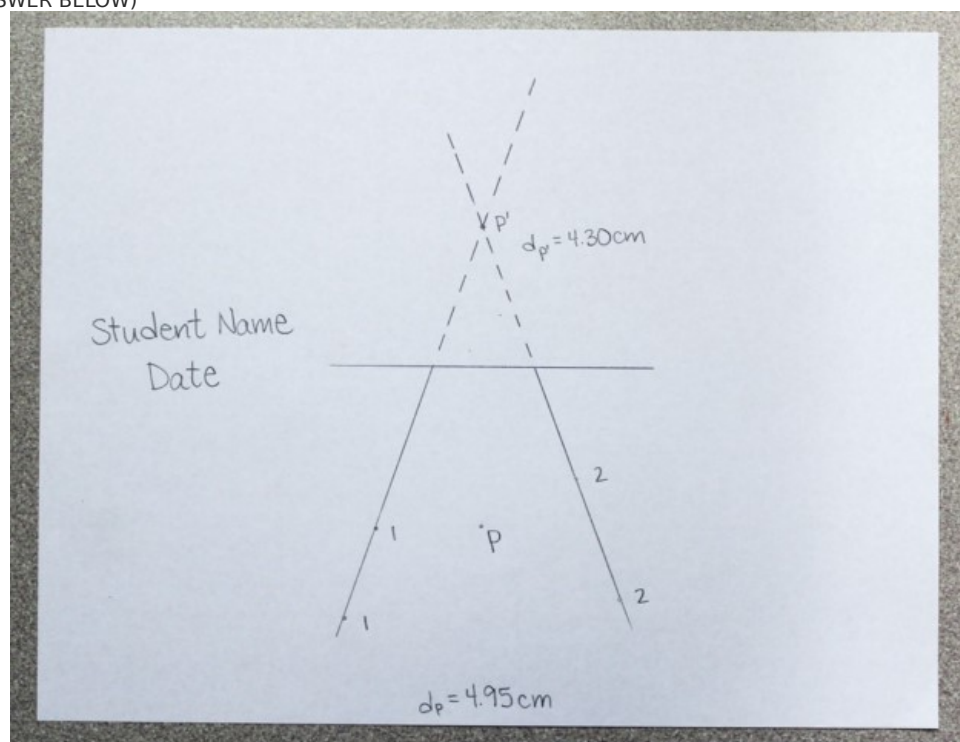
Line	Incident Angle (°)	Theoretical Reflected Angle (°)	Measured Reflected Angle (°)	Percent Error (%)
A/A'	30.0	30.0	28.7	4.33
B/B'	45.0	45.0	43.0	4.44
C/C'	60.0	60.0	60.0	0.00

Photo 1: Verification Drawing
(SAMPLE ANSWER BELOW)



Data Table 2: Locating an Image (SAMPLE ANSWER BELOW)		
Pin Location (cm)	Image Location (cm)	Percent Error (%)
4.95	4.3	13.1

Photo 2: Distance Drawing
(SAMPLE ANSWER BELOW)



Competency Review

When light is observed as a ____, its path is traced by a ray.

- ☐ wave
- ☒ particle ✓
- ☐ diffraction
- ☐ None of the above

Light rays ____ one another, so they can cross paths.

- ☐ absorb
- ☐ reflect
- ☒ do not interact with ✓
- ☐ None of the above

____ occurs when a ray of light changes direction by bouncing off the surface of a material.

- ☒ Reflection ✓
- ☐ Refraction
- ☐ Absorption
- ☐ None of the above

The incidence and reflected rays are ____ the normal to the reflecting surface.

- ☒ in the same plane as ✓
- ☐ perpendicular to
- ☐ at a 45-degree angle to
- ☐ None of the above

For diffuse reflection, microscopic bumps on the surface of the object send the reflected rays in every direction.

- ☒ True ✓
- ☐ False

The object distance is ____ the image distance for a plane mirror.

- ☐ greater than
- ☐ less than
- ☒ equal to ✓
- ☐ None of the above

A ____ image will not appear on a screen placed at its location.

- ☐ real
 - ☒ virtual ✓
 - ☐ true
 - ☐ None of the above
-

A light ray incident on a plane mirror at an angle of 30 degrees will reflect off the mirror at an angle of ____ degrees.

- ☒ 30
- ☐ 60
- ☐ 90
- ☐ None of the above



An object is visible from many angles as a reflection in a plane mirror because light rays leave the object and travel in ____ direction(s).

- ☐ one
- ☐ two
- ☒ every
- ☐ None of the above



The image of a plane mirror is located where two reflected rays meet when traced behind the mirror.

- ☒ True
- ☐ False



Extension Questions

a. Explain whether or not there is any difference between a light ray emitted by a candle flame and one reflected off the cover of a book. b. Determine whether the reflection off the cover of a book is specular or diffuse and explain your answer. (SAMPLE ANSWER BELOW)

There is no difference between a light ray emitted by a candle flame and one reflected off the cover of a book. The candle flame is a source of light rays, but those rays could travel to the book cover and reflect off the book cover diffusely so that the same ray is actually emitted by the candle flame and reflected by the book. The reflection off the book is diffuse reflection because the book is visible from any angle.