

LEO101 LU5 PHYSICAL OPTICS TEST(62 pts)

What is the distance over which a wave repeats?

- a. wavelength
- b. frequency
- c. period
- d. displacement

A series of adjacent points along which all motions of the wave are identical is the _____.

- a. phase
- b. wave front
- c. crest
- d. trough

What do we call the interaction of two or more waves when they meet at the same point & time?

- a. nature of light
- b. principle of superposition
- c. principle of reversibility
- d. constructive interference

_____ are what Huygens called his secondary point sources.

- a. point sourcelets
- b. wave envelopes
- c. Snell's waves
- d. wavelets

What do you get when you cross a crest with a crest and a trough with a trough?

- a. destructive interference
- b. constructive interference
- c. little wavelets
- d. phase shifting

What does AR stand for in coatings?

- a. Annomely Report
- b. Anti-Reflection
- c. Aberration Resistant
- d. Amplifying Reproduction

Coherence in optics and lasers means:

- a. In step or order
- b. out of step or order
- c. single wavelength
- d. travels in one direction

When a light source is monochromatic it emits _____.

- a. many colors
- b. one color
- c. visible light
- d. white light

Wave optics is sometimes called what?

- a. physical optics
- b. geometric optics
- c. wavelets
- d. diffraction limited optics

The maximum displacement of a wave is called a _____.

- a. wavelet
- b. crest
- c. bright fringe
- d. max down

The time it takes for a wave to repeat is the _____ of the wave.

- a. period
- b. phase
- c. wavelength
- d. frequency

When two coherent waves meet at the same place and time and there is an increase in intensity, the interaction is called:

- a. destructive interference
- b. nature of light
- c. polarization
- d. constructive interference

When two light waves are superimposed and exactly 180 degrees out of phase with each other, the result is:

- a. no light
- b. bright fringe
- c. $\frac{1}{2}$ light
- d. 2Y

Christian Huygens :

- a. invented the pendulum clock
- b. improved lens polishing
- c. proposed germ theory of disease
- d. all of these

At what distance(y) from the zero order will the 3rd order bright fringe be with a HeNe laser ($\lambda=632.8\text{nm}$), a slit spacing(a) of 250 microns, and a 1.5m screen distance(d)?

- a. 11.4mm
- b. 3.8mm
- c. 1mm
- d. 25mm

Two slits 125microns apart project a 1st order bright fringe 7.8mm from a screen that is 2m away. What is the wavelength of the argon laser?

- a. 514.4nm
- b. 488nm
- c. 680nm
- d. 355nm

A light wave traveling from a low index to a high index of refraction _____ undergo a 180 degree phase change.

- a. does
- b. does not

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When light waves meet and the intensity weakens or a dark fringe is present it is called

_____.

- a. coherence
- b. **destructive interference**
- c. miss alignment
- d. constructive interference

Any deviation or bending of light resulting from the obstruction of a wave front by an obstacle or opening is

_____.

- a. **Diffraction**
- b. coherence
- c. divergence
- d. interference

Studying light up close to a source or in the near field is referred to as _____.

- a. far field diffraction
- b. **Fresnel diffraction**
- c. Fraunhofer diffraction
- d. near point

This person was considered the founder of the German optical industry and brought far field diffraction to the map.

- a. **Fraunhofer**
- b. Schultz
- c. Huygens
- d. Fresnel

A HeNe laser (632.8nm) is incident on a 150 μ m pinhole. At what distance should a screen be placed to insure it is in the far field?

- a. 28 cm
- b. **2.8m**
- c. 237m
- d. 237cm

A narrow vertical slit is placed in a laser beam. In what direction will the light spread or diffract the most?

- a. **Horizontal**
- b. doesn't spread out
- c. vertical
- d. depends on the wavelength

A slit with 0.125mm width generates a diffraction pattern on a screen 2.5m from the slit. If an argon laser(488nm) is incident on the slit, what is the full width of the center or zero order fringe?

- a. 3.9mm
- b. **15.6mm**
- c. 1m
- d. 64cm

What is the radius of the airy disc when a HeNe laser is incident on a 150 μ m pinhole? The aperture of the HeNe is 1.5mm in diameter.

- a. **14.37mm**
- b. 2.79m
- c. 28cm
- d. 69m

A device that has thousands of tightly spaced 'slits' that spread out the interference patterns is a _____.

- a. single slit
- b. **diffraction grating**
- c. light splitter
- d. Fraunhofer spreader

The best optics out there are only limited by the effects of diffraction, and are called _____ optics.

- a. **Diffraction limited**
- b. Huygens
- c. high quality
- d. thin film

Polarized light is determined by referencing the

_____.

- a. B-vector
- b. **E-vector**
- c. Z axis
- d. M-vector

In analyzing polarized light, an analyzer is rotated to 15 degrees off of the axis of the polarizer. What power is transmitted through the analyzer when 2 mW are incident?

- a. **1.87Mw**
- b. 1.93mW
- c. 2mW
- d. 0mW

The polarizers and analyzers used in the book and your polarized sunglasses, polarized light by

_____.

- a. direct generation
- b. **selective absorption**
- c. diffraction
- d. reflection

A windshield has an index of refraction of 1.5, what is Brewster's angle of the windshield?

- a. **56.3 degrees**
- b. 41 degrees
- c. 69 degrees
- d. 24 degrees

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Light exiting a HeNe laser with Brewster's windows leaves linearly polarized. How is it polarized?

- a. birefringence
- b. reflection
- c. magic
- d. direct generation

When light is reflected at this angle, it is linearly polarized, perpendicular to the plane of incidence.

- a. Brewster's angle
- b. normal
- c. Einstein's angle
- d. 45 degrees

Light waves bending around corners is due to

- a. monochromaticity
- b. diffraction
- c. polarization
- d. superposition

Fresnel diffraction is measured in the

- a. near field
- b. far field
- c. laser lab
- d. garage

Fraunhofer diffraction is measured in the

- a. near field
- b. far field
- c. laser lab
- d. garage

The best optics possible to buy are _____ optics.

- a. diffraction limited
- b. acrylic
- c. silicon
- d. aberration corrected

Laser light passing through a slit creates a pattern on a screen due to what?

- a. reflections
- b. interference
- c. polarization
- d. superposition

Wave optics is sometimes called?

- a. Physical optics
- b. Geometric Optics
- c. Wavelets
- d. Diffraction limited optics

The maximum displacement of a wave is called a?

- a. Wavelet
- b. Crest
- c. Bright fringe
- d. Wavelength

The time it takes for a wave to repeat itself is?

- a. Period
- b. Phase
- c. Lambda
- d. Frequency

When two coherent waves meet at the same place and time, there is an increase in intensity which is called?

- a. Destructive interference
- b. Nature of light
- c. Polarization
- d. Constructive interference

When two light waves are superimposed and 180° degrees out of phase with each other, the result is?

- a. No light
- b. Bright fringe
- c. .5 light
- d. 2Y

When light is reflected at this angle it is mostly linearly polarized.

- a. Brewster's angle
- b. Normal angle
- c. Angle of incidence
- d. Angle of rejection

Which diffraction is measured in the near field?

- a. Frankenstein
- b. Fraunhofer
- c. Frankfurter
- d. Fresnel

Which diffraction is measured in the far field?

- a. Frankenstein
- b. Fraunhofer
- c. Frankfurter
- d. Fresnel

The best optics to buy are?

- a. diffraction limited
- b. diffraction limited
- c. diffraction limited
- d. diffraction limited

Laser light passing through a single slit creates a diffraction pattern on a screen due to?

- a. Diffraction
- b. Interference
- c. Polarization
- d. Superposition

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Define diffraction. (3 pts)

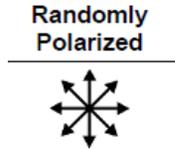
Any deviation or bending of light resulting from the obstruction of a wave front by an obstacle or opening

Define a transmission diffraction grating. (3 pts)

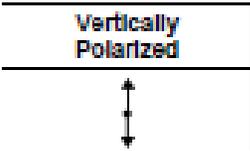
A device that has thousands of tightly spaced, parallel lines that spreads light out into interference patterns

Draw diagrams showing: (2 pts)

a. Unpolarized/Randomly light:



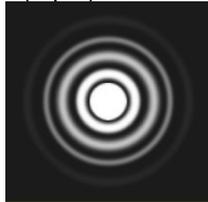
b. Linearly/Vertically polarized light:



What is the method for making a simple AR coating? (2 pts)

Depositing a single layer film

Draw the "airy-disk" pattern of interference created by a circular aperture. (2 pts)



How can it proven that sunlight reflected off of a specular surface is linearly polarized? (2 pts)

Rotate a polarizer/analyzer

What is the generally accepted number of degrees in Brewster's angle?

56°