

Light & Optics Part 3

OPTICS

- The science of light properties and behavior is called _____.
- Optics usually refers to the properties and behavior of _____ light. However, optics is used to describe other _____ of electromagnetic radiation as well.
- Light _____ with matter.
- The type of _____ will determine how much light can _____ through it. Matter can allow _____, _____ or _____ light to pass through.

TRANSPARENT

- Matter that allows all light to pass through is _____.
- _____ and _____ are transparent. These mediums allow _____ light to pass through which is why you can _____ through them.

TRANSLUCENT

- Matter that allows _____ light to pass through is translucent. Most light waves are _____ by a translucent object.
- _____ and _____ are translucent. They allow _____ light to pass but you can't see _____ through them because they cause most light waves to _____.

OPAQUE

- Matter that does _____ allow light to pass through is opaque. An opaque object completely _____ light.
- _____, _____ and _____ are opaque. Most _____ things, including humans, are opaque as well.

SHADOW

- An opaque object produces a _____. A shadow is the region where light is _____ or _____.
- A shadow appears on the _____ side of the light source.

LIGHT BEHAVIOR

- Optics is most concerned with how light waves behave.
- What are four wave behaviors of light?
 1. _____
 2. _____
 3. _____
 4. _____

REFLECTION

- Light _____, or bounces, off the _____ of objects. When we look at an object, it is _____ light that we see.
- A _____ is a smooth and shiny surface that reflects light to produce clear _____. A mirror's _____ surface causes light to reflect _____ off it. This is why mirrors, unlike other surfaces, can produce _____.

REFRACTION

- Light refracts, or bends, when it moves from one _____ into another. It bends because its _____ changes.
- When light moves into a new medium, the _____ of light _____. This causes the change in speed.
- Why does a paintbrush in a glass of water appear "bent"?

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- What is a prism? What does it do to white light and why?
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INTERFERENCE

- Light waves can _____ with each other. When light waves _____, they _____, or lay over each other. This alters the _____ of light.
- Light waves can _____ interfere to produce _____ light.
- Light waves can _____ interfere to produce _____ light.
- _____ why bubbles have bright and dark spots.
- Bubbles are made of _____ of soap. Light waves reflect off the different layers and _____ with each other. When the waves

_____ interfere, they _____ each other and produce _____, colorful spots. When the waves _____ interfere, they _____ each other out and produce dark spots.

DIFFRACTION

- Light waves will bend or _____ if they encounter a small object or have to pass through a small _____ in a barrier.
 - When light waves _____, they produce a _____ pattern.
 - What produces the “silver lining” around clouds?
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WAVES & COMMUNICATION

- Electromagnetic waves are important to _____ or transmitting information across long _____.
- Different types of electromagnetic waves can be used to different kinds of information:
 - _____ waves are used to transmit television and radio programs
 - _____ are used to transmit information between cellphones or between an internet router and a computer
 - _____ waves were important to the first radio communications in the late 1800’s and early 1900’s. These waves were used to transmit _____ Code.
- Morse code was a method of communication used to transmit _____ information as a series of “_____ and _____” or short and long signals.
- Here’s how Morse code works:
 1. A unique _____ combination of dots and dashes codes for each letter of the alphabet and numbers 0 through 9.
 2. Words and numbers are _____ using Morse code and sent as a _____ via long radio waves. The signal is received by a radio receiver.
 3. This signal is _____ into letters and numbers of a text.

WAVES & SIGNALS

- Waves transmit information as _____.
- A signal is a wave with a specific _____ that carries _____.
- The _____, _____ and _____ of the wave determines the pattern and thus, the information carried by the signal.
- Here’s how a wave sends information via a signal:

1. Information (such as a text or music) is _____ into wave signals by a _____.
2. The signals are _____ or _____ from where they were generated across a distance to its destination(s).
3. At the destination(s), the wave signals are received by a _____ such as a _____ phone or computer.
4. The receiver _____ or _____ the signals back into their original form.

ANALOG VS. DIGITAL

- There are two different kinds of signals:
 1. _____
 2. _____

ANALOG SIGNALS

- Analog signals are wave signals that are not generated from _____ information.
- Analog signals are generated _____. Small fluctuations in the wave _____ of an analog signal are what _____ for the information that is carried by the signal.
- Analog signals are not generated as _____ or “bursts” of waves.

DIGITAL SIGNALS

- Digital signals are wave signals generated _____ from digital information.
- A digital signal transmits information as _____ or bursts of waves.
- Text, visual and voice information can be _____ or coded into numbers. We call this number-coded information _____ information.
- Digital information is coded into patterns of _____ and _____ instead of dots and dashes. This information can be stored or transmitted, received and decoded.
- Digital information can be _____ wirelessly via radio waves, microwaves or infrared.
- Here’s how a digital signal is usually created:
 1. Information is coded or _____ into digital information. Digital information is coded into patterns of _____ and _____. We call this a _____ pattern. This information can be _____ or _____ as a digital signal.
 2. The pattern of numbers is transformed into a signal with _____ values. In other words, a pattern of _____ or “wave bursts”

codes for information. The pulses correspond to the 1s and 0s of the digital information.

3. High-tech devices, such as _____ and _____ receive digital signals. They can _____ digital signals back into the original information OR _____ the information.

ANALOG VS. DIGITAL

- Both analog and digital signals are used today. However, modern communication relies most on the transmission of _____ information via _____ signals.
- Because analog signals are continuous, they tend to “catch” _____ (which we often call _____). For this reason, they are more likely to become _____ and corrupted. If corrupted, the signal may not be correctly _____ by receivers.
- On the other hand, digital signals transmit information in _____ values. The signals are less likely to get altered or _____ and thus, retain their _____ in delivering information across long distances.
- Additionally, digital signals are less likely to break down or _____ over long distances compared to analog signals and digital signals, generally, can be transmitted _____ than analog signals.