



# Ch. 22 – The Nature of Light

## Section 4 Light and Color

# Essential Questions

- What are the three ways light interacts with matter?
- How is the color of an object determined?
- Why is mixing colors of light called color addition?
- Why is mixing colors of pigments called color subtraction?

# Light and Matter

- When light strikes any form of matter, it can be reflected, absorbed, or transmitted.
- Reflection happens when light bounces off an object.
- Absorption is the transfer of light energy to matter.
- **Transmission** is the passing of light through matter.

# Light and Matter 2

## Transmission, Reflection, and Absorption



You can see objects outside because light is **transmitted** through the glass.

You can see the glass and your reflection in it because light is **reflected** off the glass.

The glass feels warm when you touch it because some light is **absorbed** by the glass.

# Light and Matter 3

- **Transparent** matter is matter through which light is easily transmitted. Glass is transparent.
- **Translucent** matter transmits light but also scatters it. Frosted windows are translucent.
- **Opaque** matter does not transmit any light. Computers and books are opaque.



# Light and Matter 4

## Transparent, Translucent, and Opaque



**Transparent** plastic makes it easy to see what you are having for lunch.



**Translucent** wax paper makes it a little harder to see exactly what's for lunch.



**Opaque** aluminum foil makes it impossible to see your lunch without unwrapping it.

# Colors of Objects

- Humans see different wavelengths of light as different colors.
- The color that an object appears to be is determined by the wavelengths of light that reach your eyes.
- Light reaches your eyes after being reflected off an object or after being transmitted through an object.

# Colors of Objects 2

- **Colors of Opaque Objects** When white light strikes a colored opaque object, some colors of light are absorbed, and some are reflected.
- Only the light that is reflected reaches your eyes and is detected. So, the colors of light that are reflected by an opaque object determine the color you see.



# Colors of Objects 3

- **Colors of Transparent and Translucent Objects** Ordinary window glass is colorless in white light because it transmits all the colors of light that strike it. But some transparent objects are colored.
- When you look through colored transparent or translucent objects, you see the color of light that was transmitted through the material.

# Mixing Colors of Light

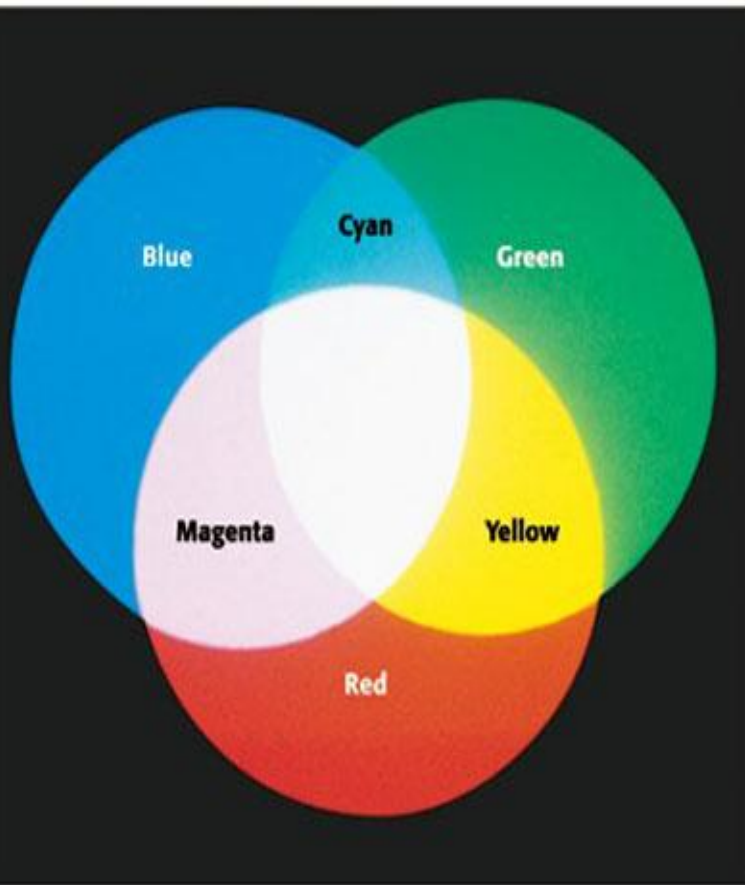
- Red, blue, and green are the primary colors of light. These three colors can be combined in different ratios to produce white light and many colors of light.
- **Color Addition** is combining colors of light.
- **Light and Color Television** The colors on a color TV are produced by color addition of the primary colors of light.

# Mixing Colors of Pigment

- **Pigments and Color** A material that gives a substance its color by absorbing some colors of light and reflecting others is a **pigment**.
- **Color Subtraction** When you mix pigments together, more colors of light are absorbed or taken away. So, mixing pigments is called *color subtraction*.
- Yellow, cyan, and magenta are the primary pigments.

# Mixing Colors of Pigment 2

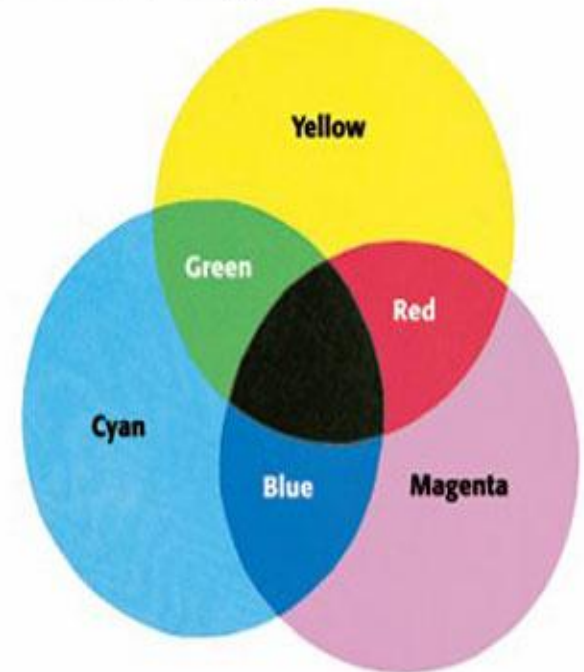
## Color Addition



*Primary colors of light—written in white—combine to produce white light. Secondary colors of light—written in black—are the result of two primary colors added together.*

## Color Subtraction

*Primary pigments—written in black—combine to produce black. Secondary pigments—written in white—are the result of the subtraction of two primary pigments.*





# Concept Mapping

- Use the terms below to complete the Concept Mapping on the next slide.

**magnetic fields**

**electromagnetic wave**

**Reflection**

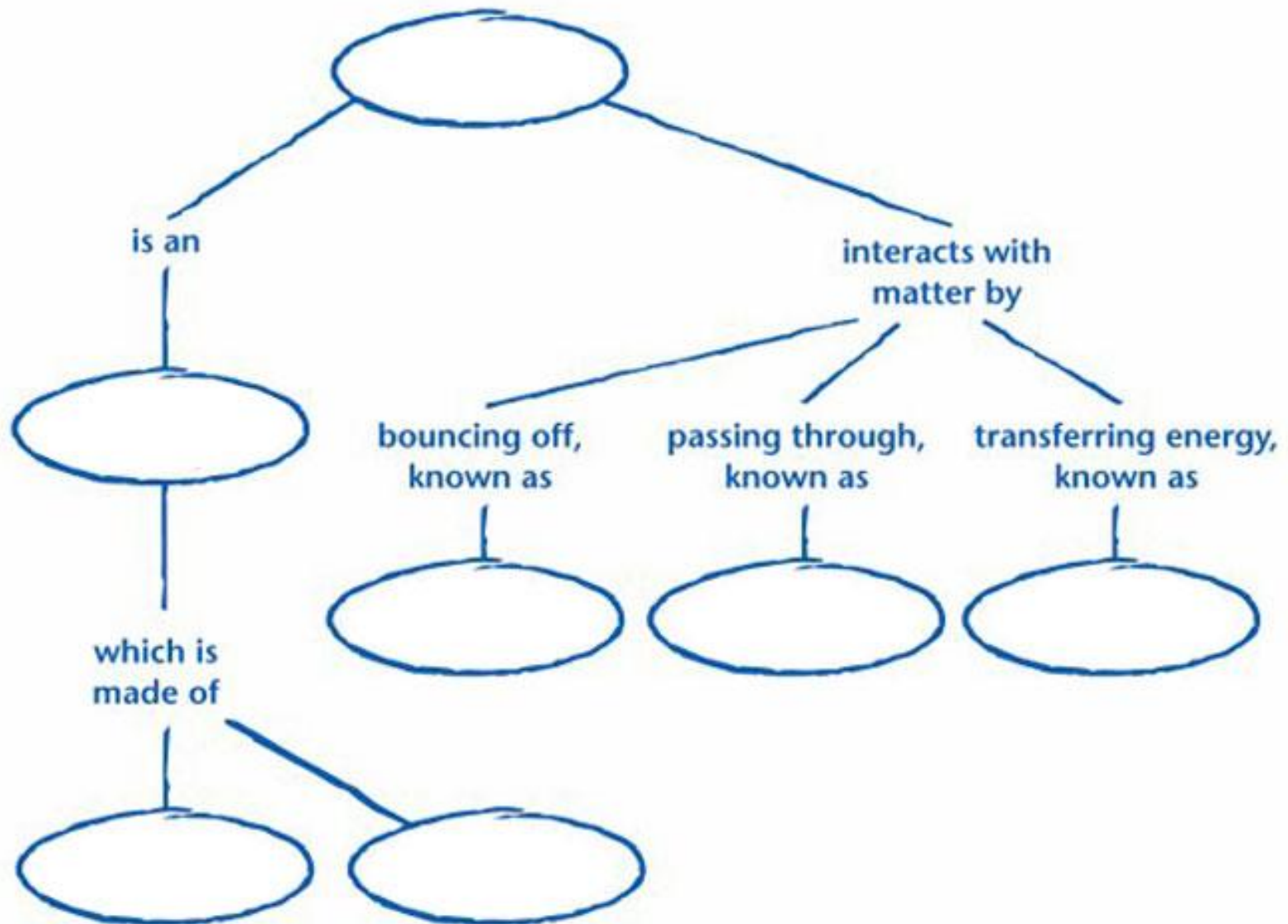
**electric fields**

**absorption**

**light**

**transmission**

Use the following terms to complete the concept map below:  
magnetic fields, electromagnetic wave, reflection, electric fields, light, absorption, transmission



Use the following terms to complete the concept map below:  
magnetic fields, electromagnetic wave, reflection, electric fields, light, absorption, transmission

