

Chapter 26

Properties of Light

Light is an Electromagnetic Wave

Recall:

- Changing magnetic fields produce electric fields (Faraday)
- Changing electric fields produce magnetic fields. (Maxwell)

These vibrating fields continuously regenerating each other. **Only one speed** that maintains the balance: $c = 3.0 \times 10^8$ m/s.

The Electromagnetic Spectrum

- Radio Waves (low E & long λ)
- Microwaves
- Infrared
- Visible light
- Ultraviolet
- X-rays
- Gamma Rays (high E & short λ)

Light in a Material Medium

- **TRANSPARENT** materials
Light travels in straight line through material.
- **TRANSLUCENT** materials
Light can travel through material but is scattered along the way.
- **OPAQUE** Materials
Light is reflected or absorbed by material.

Chapter 27: Light & Color

The apparent color of something depends the frequencies of light that our eyes receive.

The perception of color is a physiological experience. Different individuals have different perceptions of color.

Selective Reflection

Only certain frequencies of light reflect off the object while the others are absorbed.

Example: An object painted blue appears blue in white light because it reflects blue light while it absorbs all the other frequencies.

The same blue object in red light appears black because it absorbs the red light. There is no blue light to reflect.

Selective Transmission

Only certain frequencies of light transmit through the object while the others are absorbed.

Example: A piece of blue glass appears blue when held up to white light because it transmits blue light while it absorbs all the other frequencies.

The same piece of blue glass held up to red light will not transmit red light and so appears black.

Additive Primary Colors of Light

R = Red, **G** = Green, **B** = Blue

R + **G** = Yellow (**Y**)

R + **B** = Magenta (**M**)

G + **B** = Cyan (**C**)

R + **G** + **B** = White (**W**)

Complementary Colors

Two colors (of light) that add to produce white light:

$$R + C = W$$

$$G + M = W$$

$$B + Y = W$$

Questions to consider...

- Why is the sky blue during the day?
- Why is the sky red during sunrises & sunsets?
- Why are fair weather clouds white?
- Why are storm clouds dark?
- Why does water appear greenish-blue (cyan)?
- What is the color of the sky on the moon?