



1.0 Explanations, Inventions & Investigations about Light and Vision

- Key Concepts
- Scientific experiments to explain how light and vision work
 - Optical devices – **telescopes** and **microscopes** – have lead to **astronomy** and **microbiology**

Outline a brief **Timeline History of Views about Light & Astronomy**

Ancient Times	
1 ST Century	
1000 AD (Middle Ages)	
1670	
1676	
1920's	

What are the four basic **properties of light**?

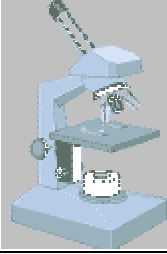

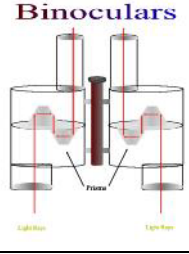
- _____
- _____
- _____
- _____



Outline a brief History of the **Invention of Optical Devices** <http://members.aol.com/WSRNet/D1/hist.htm>

1300 AD	
1595	
17 th Century 1600	
1854	
1985	
1990	

Briefly outline the advantages of each Optical Device shown here

Microscope	Telescope	Binocular
		



2.0 Light behaves in predictable ways.

- Key Concepts
- Ray diagrams are used to describe light
 - The **Angle of Incidence** equals the **Angle of Reflection**
 - **Concave** mirrors **converge** light to a focal point (headlights)
 - **Convex** mirrors **diverge**, or spread light out
 - **Refraction** – light is bent when it passes to and from areas of different densities
 - **Concave and Convex lenses** are **optical devices** that refract light to form **images**

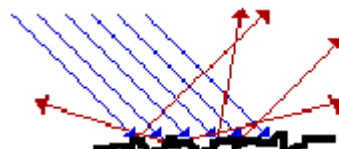
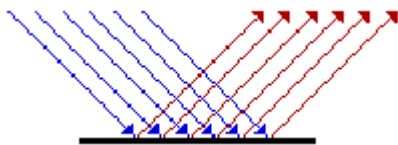
Use a **ray diagram** to show how light causes a **shadow**.

Explain the difference between **transparent**, **translucent** and **opaque** materials.

What is meant by **luminous**?

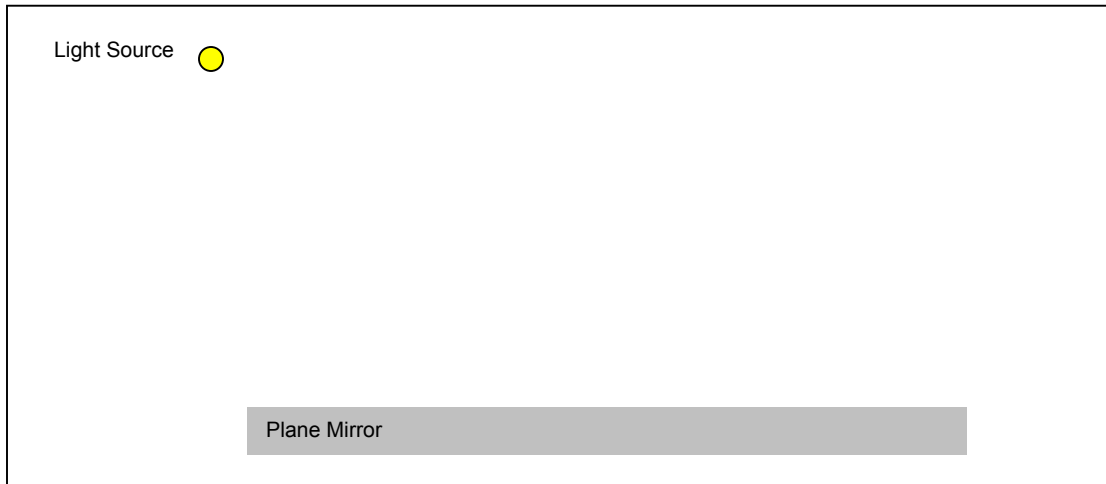
What is meant by **non-luminous**?

Identify each of the following types of reflection



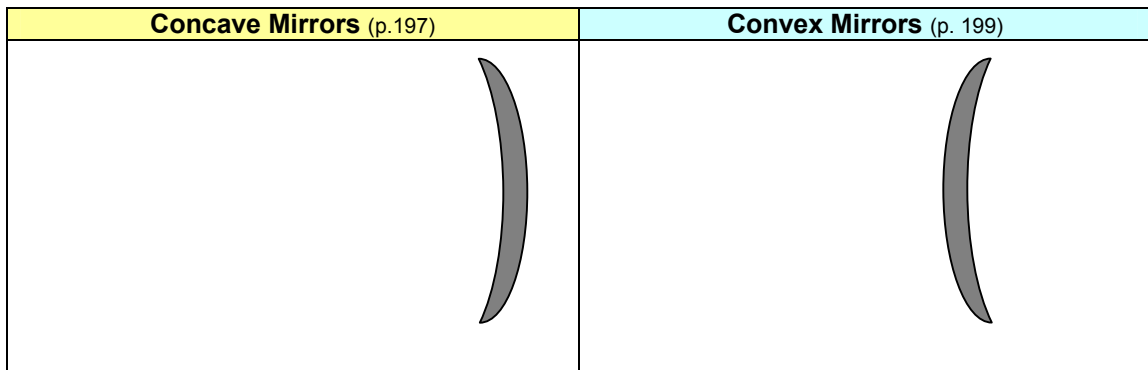


Illustrate the **Law of Reflection** and complete the statement below the illustration



The **Law of Reflection** states that _____

Illustrate with **ray diagrams** what happens when light strikes each of the following



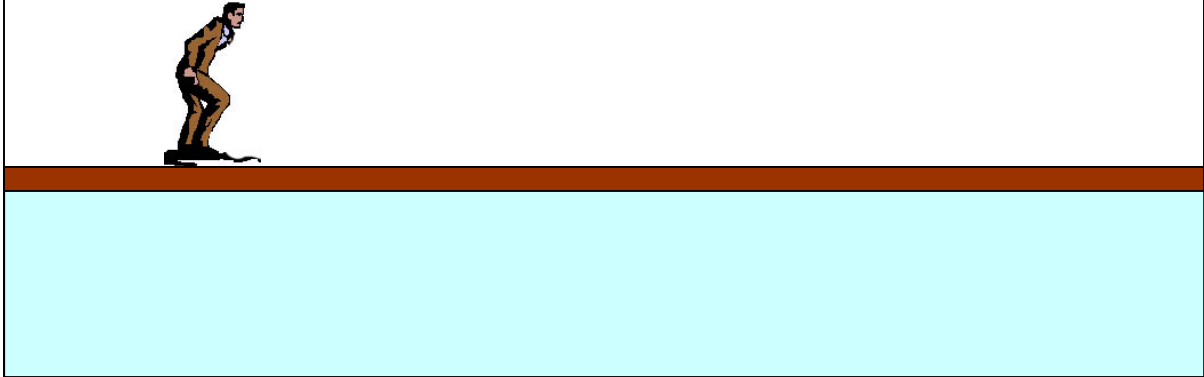
Illustrate how an image is formed in a concave mirror

Concave Mirror Images (p.198)		
Object far from focal point	Object at focal point	Object between focal point and mirror



Illustrate the **Law of Refraction** and complete the statement

Refraction occurs because of changes in the _____.

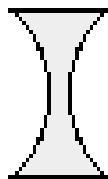


The **Law of Refraction** states that _____

What is a '**Mirage**' and what causes it? _____

Lenses refract light – Illustrate what happens to light passing through each lens and describe it below.

Concave Lens



Convex Lens

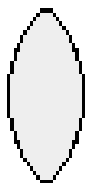





Image Formation with a Convex lens (p.208)

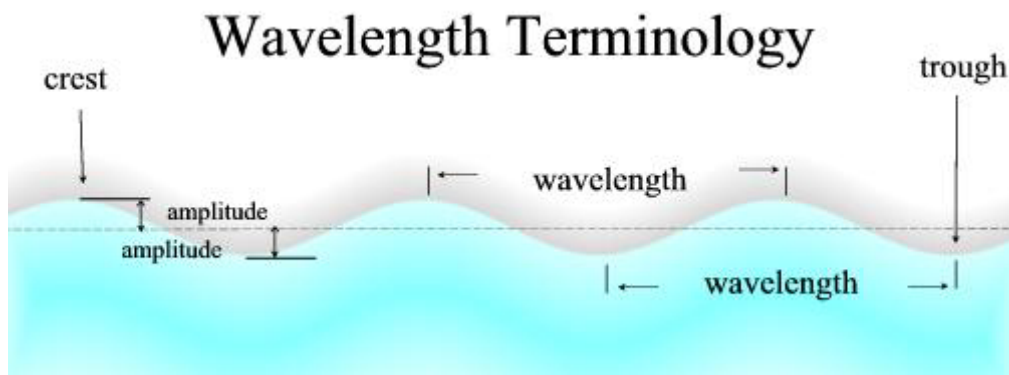
Object far from focal point	
Object near focal point	
Object between focal point and lens	



3.0 Electromagnetic Spectrum – Wave Theory

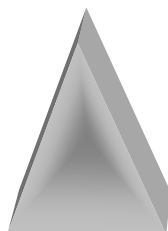
- Key Concepts
- Light has the properties of a **wave**
 - **Visible light** has different wavelengths and forms the colors of the rainbow
 - Electromagnetic spectrum also includes (**invisible** light) – radio waves, microwaves, infrared, ultraviolet, X-rays, gamma ray
 - Radio waves carry the least energy – gamma rays the most energy
 - Visible light can be produced naturally (**bioluminescence**, **sunlight**) & artificially (**phosphorescence**, **incandescence** and **fluorescence**)
 - White light combines red light – green light – blue light

Briefly explain the wave model of light? (Use the **wavelength terminology** provided)



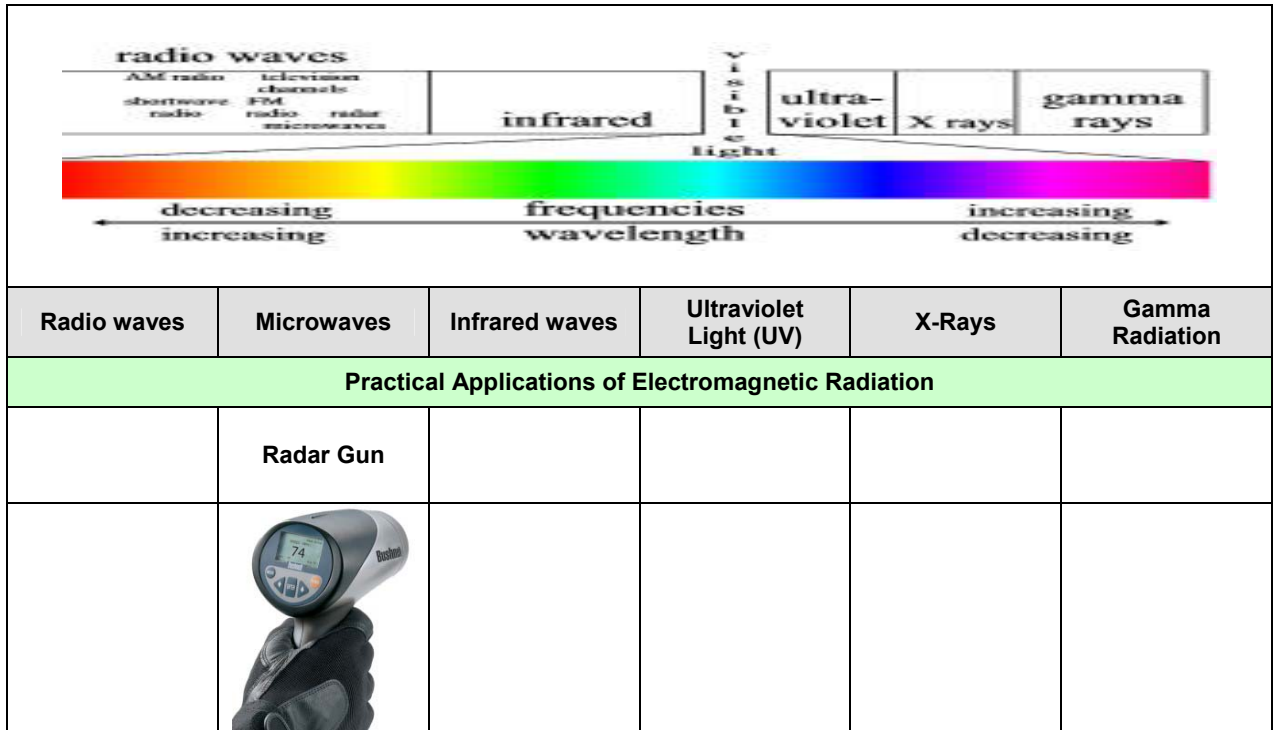
What is the mathematical relationship between the **speed**, **wavelength** and **frequency** of a wave?

Illustrate (with colors) what happens to white light when it is passed through a **prism**?





The **electromagnetic spectrum** shows us what different forms of energy are available to us. Use the table to illustrate and describe various uses of each form of electromagnetic energy.

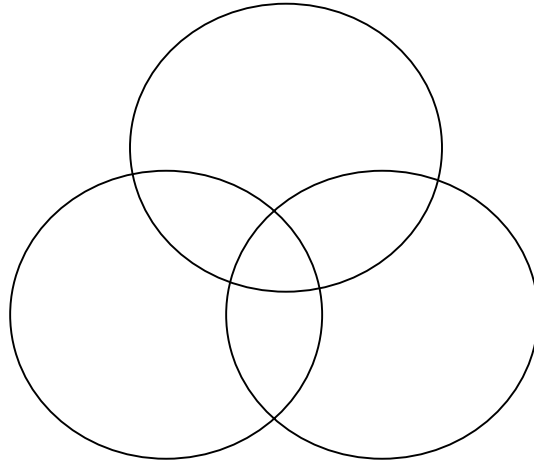


Sources of Light (pgs. 222-225) Identify the sources and give examples of each

Artificial Sources of Light	Natural Sources of Light



Identify the colors when added together produce white light?
(by coloring the appropriate parts of the circles below)



What are the **Primary** colors of light?

What are the **secondary** colors of light?

What is the **Theory of Color Addition**?

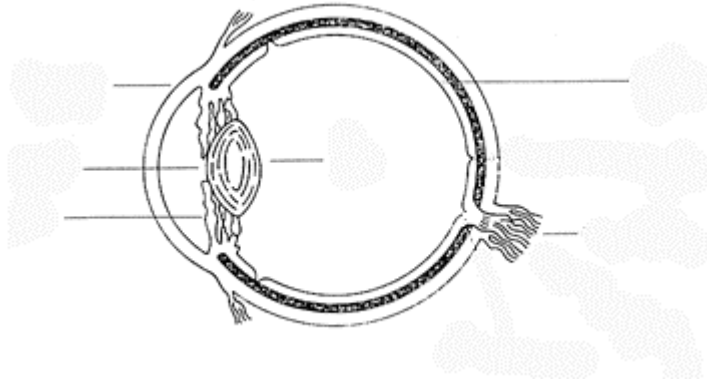
Briefly explain how a **television** works.



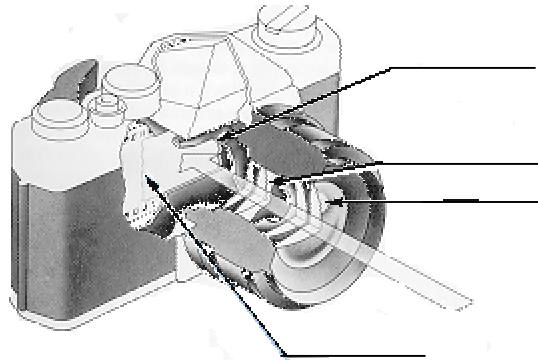
4.0 Eyes and Cameras capture Images using Light Properties

- Key Concepts
- Similarities – designed to capture and focus light to form an image on a light-sensitive material
 - Insects have **compound eyes** made of many tiny lenses
 - Digital images are made by a computer, which converts the image to **pixels** (a set of numbers)

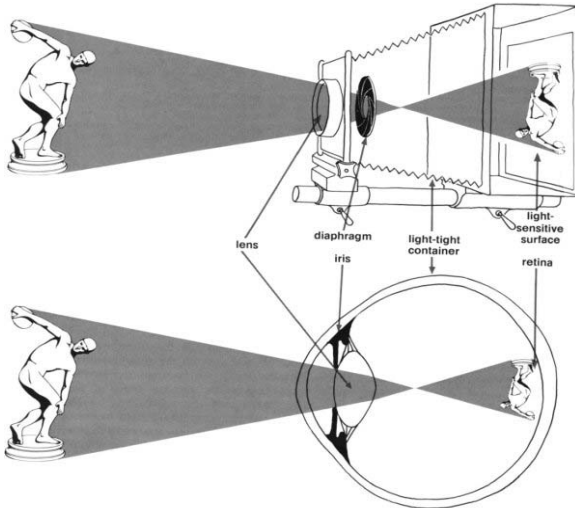
Label the parts of the eye



Label the parts of a camera



Explain how the eye and the camera are similar in what they do and how they do it.
(Use this illustration to help in your explanation)

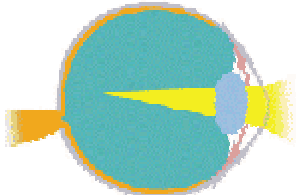




What is the function of the ciliary muscles in the eye?

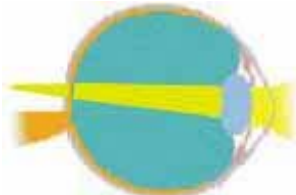
Illustrate with ray diagrams how vision problems can be corrected with lenses.

Normal Vision (Image formation)



Myopia

Nearsightedness (Myopia) corrected with Lens



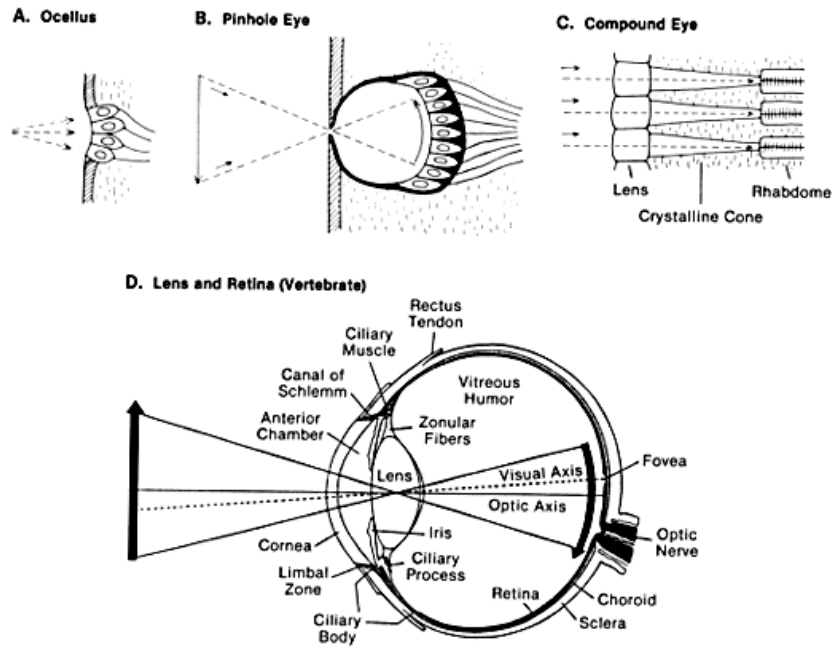
Hyperopia

Farsightedness (Hyperopia) corrected with Lens

Explain how night vision goggles work.

How can you find your **Blind Spot**?

Types of eyes in the animal kingdom



Identify some Advantages and Disadvantages of each type and which animals would have a particular type.

Type of Eye	Advantage	Disadvantage	Animals

How is a **stadium image** made?

What are **pixels** and **resolution**?
