**Ch. 8 Light and Optics**

Light

* Type of electromagnetic wave
* Can travel through space
* Speed = 300,000 km/s in a vacuum
	+ Changes in different mediums
		- Fastest = gas, slowest= solid
* Light ray – beam of light travels in straight lines
* Light source – anything that emits light
	+ light travels in all directions from a source

Light Interacting with media (mediums)

* Interactions
	+ Absorbed – soaked up
	+ Reflected – bounce off
	+ Refracted – bent (this is why you can see objects)
	+ Transmitted – go through
		- Transparent objects: let almost all light through
		- Translucent objects: let some light through
		- Opaque: allows no light through.
* Law of Reflection – the angle the light approaches a surface = the angle the light reflects from the surface.
	+ Angle of incidence (angle of incoming light)
	+ Angle of reflection (outgoing light)
* Reflection surfaces
	+ Flat shiny surface = virtual image (look like original)
		- Called regular reflection
	+ Dull/rough surface = scatter the light fuzzy image or no image at all
		- Called diffuse reflection
		- Scatter – make light traveling in 1 direction travel in many directions
* Refraction – caused by change in speed of light as it enters different media
	+ The more the speed changes = the more light ray changes directions (bends).

Optics

* Mirrors – reflecting surface that forms image

 By regular reflection

* + Plane mirror – flat reflective surface
		1. Reverse image
		2. Image size depends of distance object is from the mirror
			- The farther from the mirror the smaller the image
	+ Concave mirror – reflective surface curved inward

Shiny side

* + 1. If object is beyond 1 focal

Focal point – the point at which light ract are reflected

Optical axis

 length, the image appears upside

 down, smaller

B

* + 1. If object is at 1 focal length image appears upside down, same size as original

A

D

C

* + 1. If object is within 1 focal length, image appears upside down and larger

Focal length – the distance between the focal point and the center of the lens

* + 1. If object is at focal point – no image.

Shiny side

* Convex mirror – reflective surface curved outward

 Image: virtual

 Right side up

 smaller

* Lenses – a transparent object with at least 1 curved side that causes light to

 change direction

* + The more curved the lens the more light changes direction
	+ Convex lenses – thicker in middle than at its edges on a least one side
		- The more curved the lens the shorter the focal length
		- Objects farther than 1 focal length from the lens= upside down image
		- Objects less than 1 focal length from the lens = larger and right side up image

Ex: magnifying glass and camera lens

* + Concave lens a transparent object with at least one side curved inward. (thicker on the edges)
		- Image is upright and smaller
		- Ex: telescopes and microscopes
* Color
	+ White light = ROYGBIV red, orange, yellow, green, blue, indigo, violet

 Long wavelength shorter wavelength

* + White light is separated into different wavelengths (colors) by a prism
		- When interacting with an object
		- Some waves are absorbed
		- Some waves are reflected
		- A rose is red because it reflects the red wavelength and absorbs the others
		- Objects appearing white reflect all wavelengths
		- Objects appearing black absorb all wavelengths

\* light waves have no color. We see color because of a sensation produced by our brain when light waves enter our eyes.