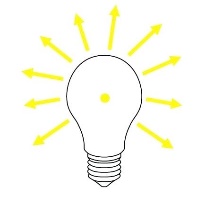
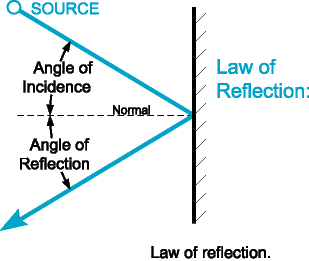
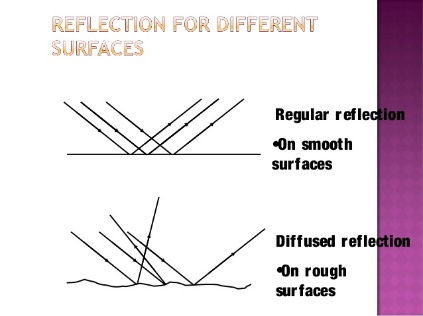
**Ch. 8 Light and Optics**

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.