# 14-2 Notes

# Lenses

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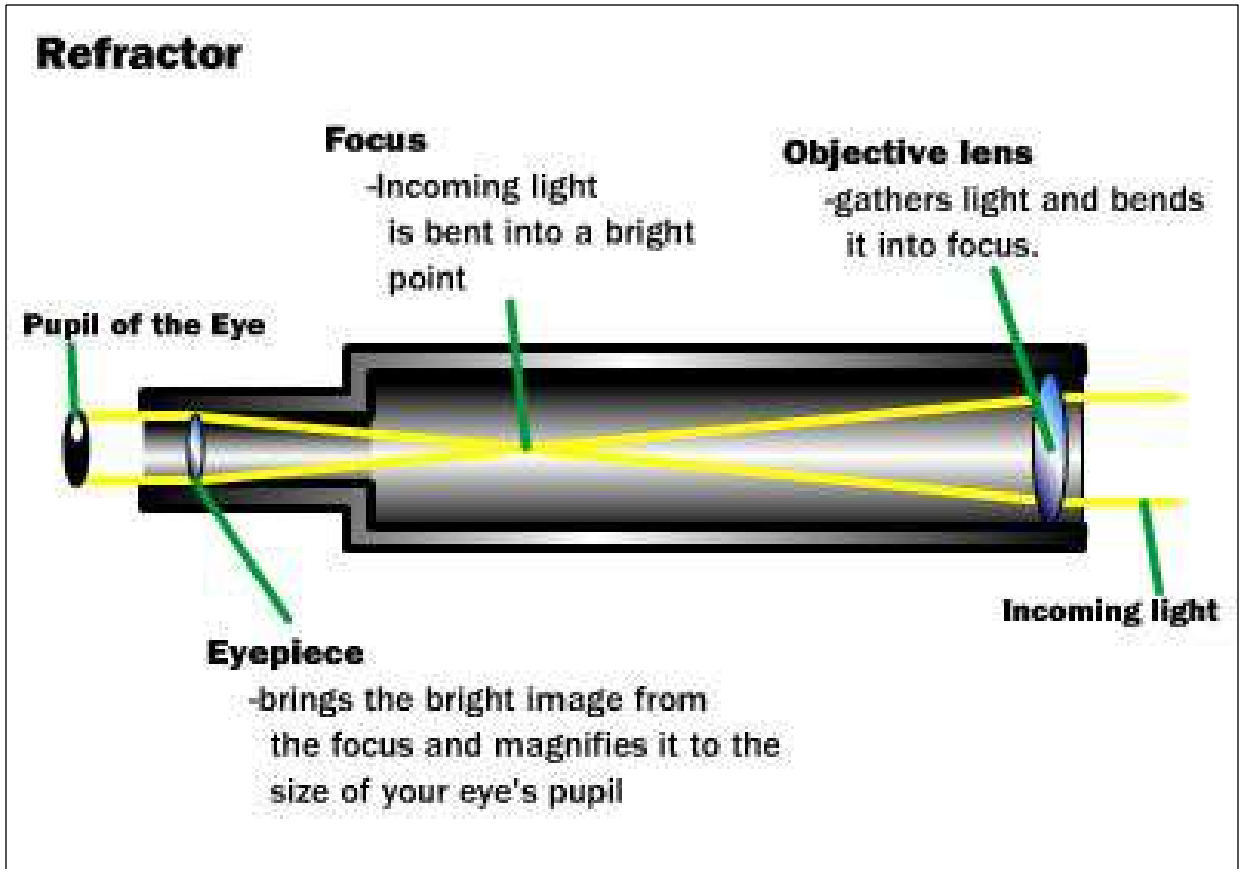
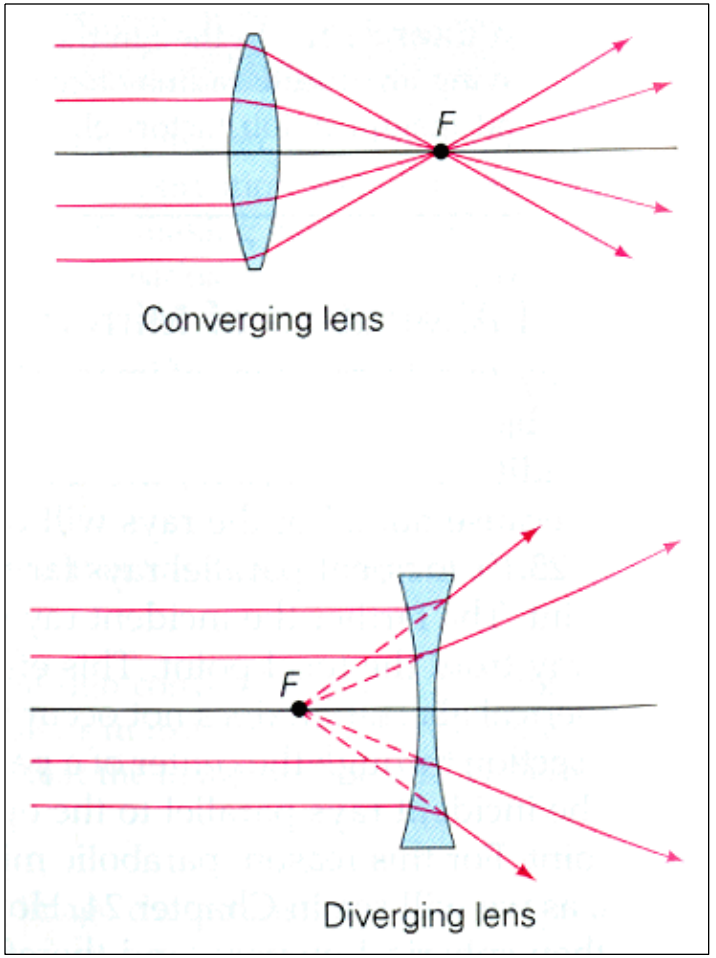
- Like mirrors, lenses form images, but lenses do so by refraction rather than reflection.
- Examples include, magnifying glasses, contact lenses, microscope, telescope.

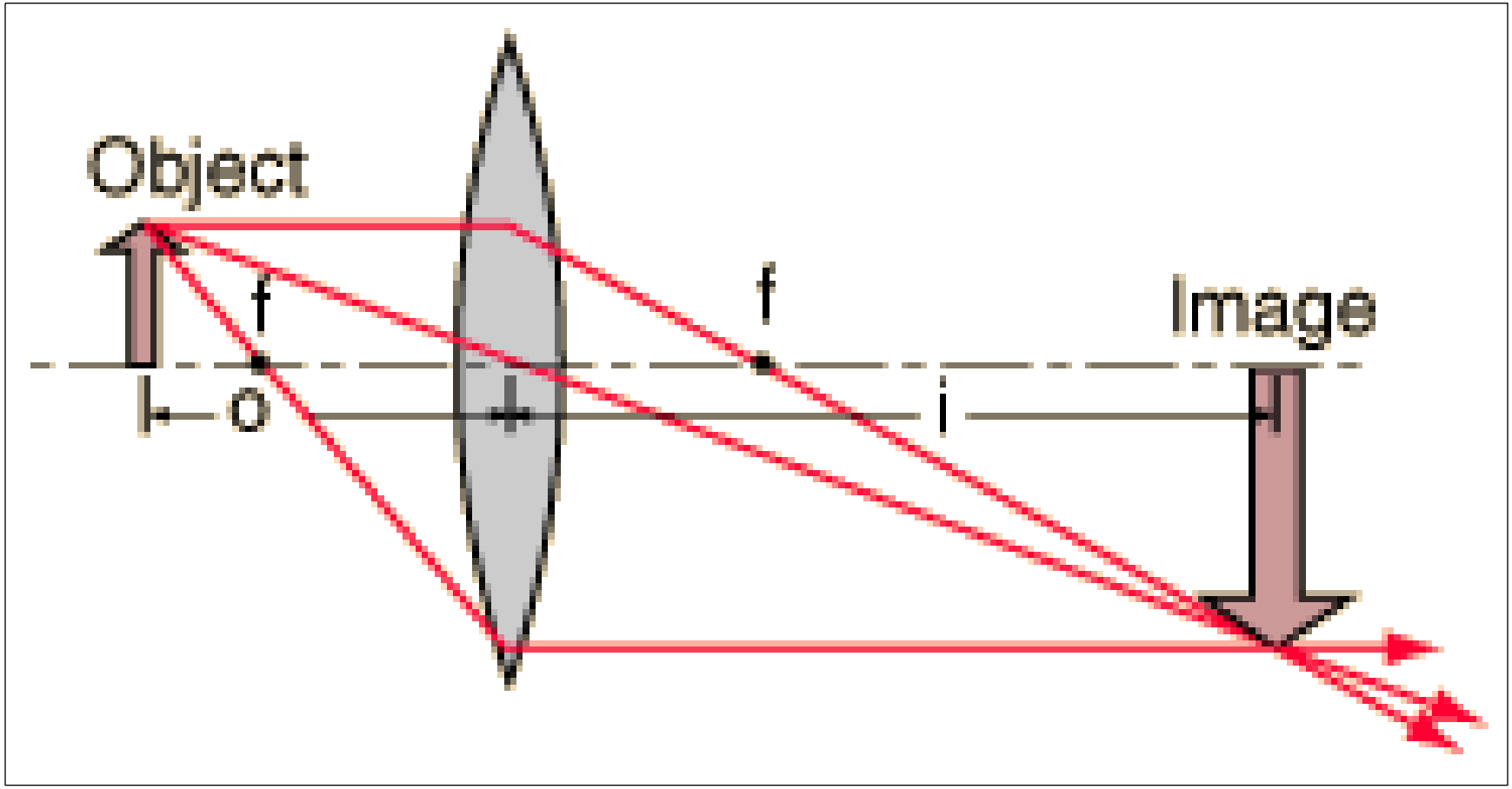


# 2 Types of Lenses

- Converging lenses – Thicker at the middle and thinner at edges
- Diverging lenses – Thinner at the middle and thicker at the edges



# Draw Image Created by Converging Lenses



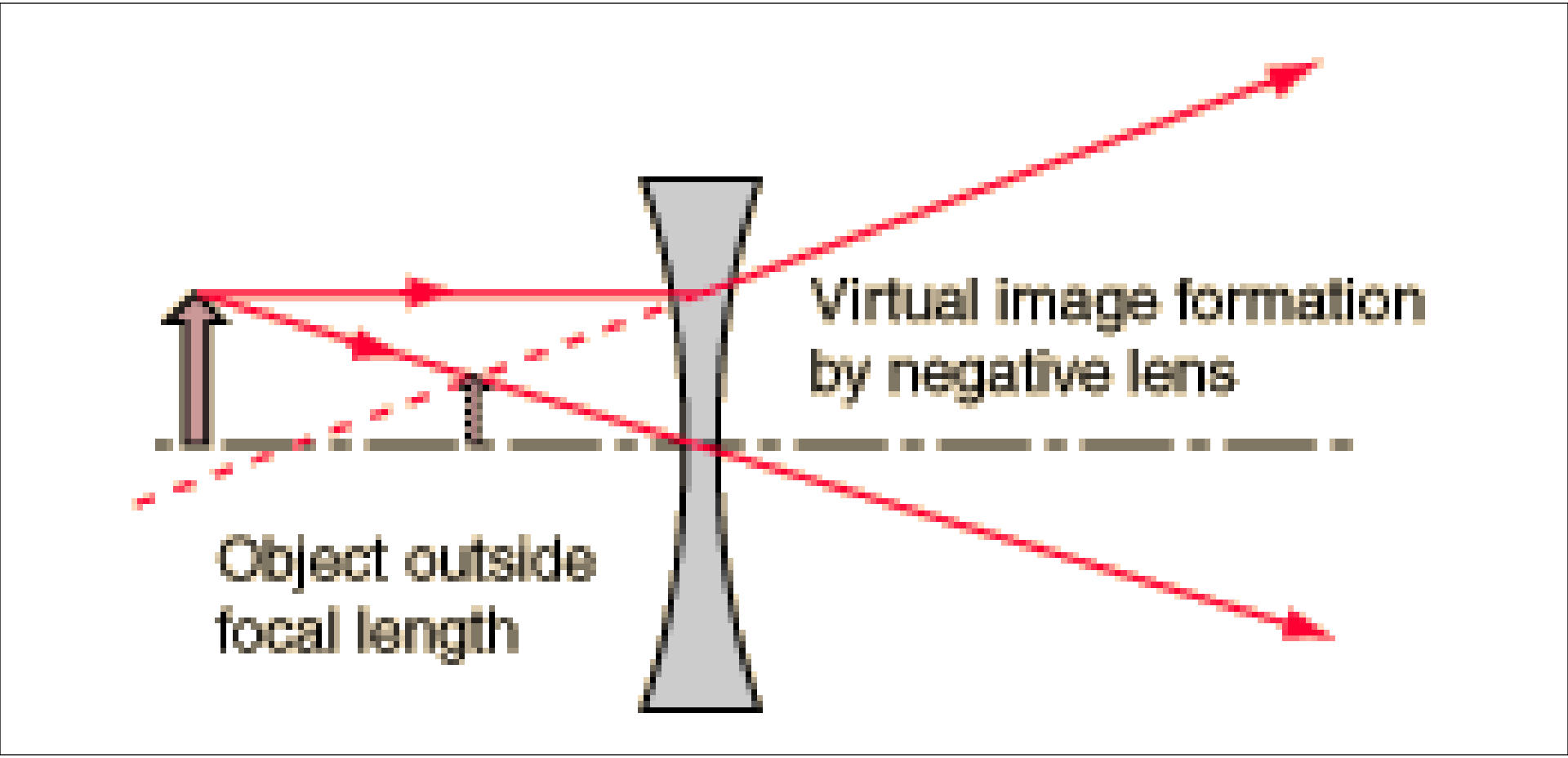
# Examples of Converging

- Magnifying Glasses
- Microscope – Work by using several converging lenses to focus light
- Far sightedness (Glasses)

# Examples of Diverging

- Telescopes – Work by using several Diverging lenses to focus light
- Near sightedness (Glasses)

# Draw Image Created by Diverging Lenses



- Real image – an image formed when rays of light actually intersect at a single point.
- Real image is a clear crisp image that is formed.
- Image location can be predicted with the mirror equation
- $1 / p + 1 / q = 1 / f$
- $1 / p + 1 / q = 2 / R$
- p = object distance; q = image distance
- f = focal length; R = Radius

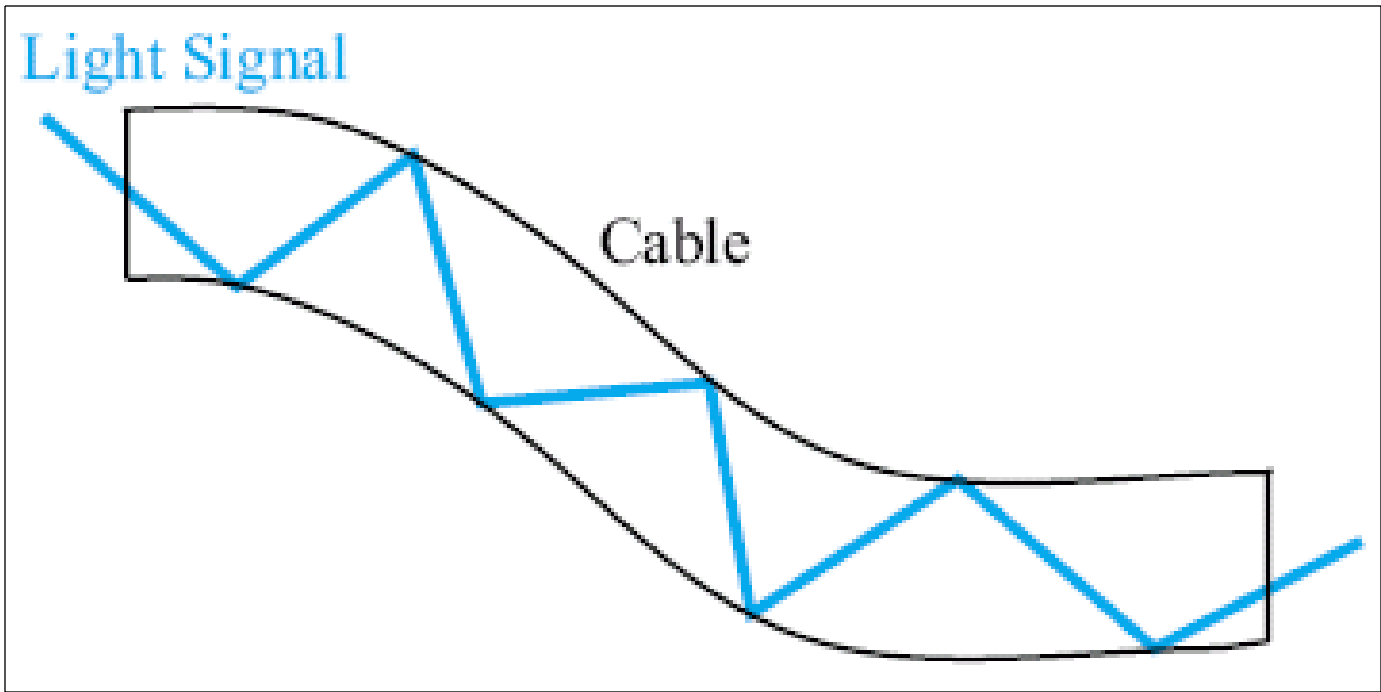
- Unlike flat mirrors, the images formed are not the same size as the original image.
- How big or small they appear can be calculated:
- $M = h' / h$
- $M = q / p$
- M = Magnification; h’ = image height
- h = object height; q = image distance
- p = object distance

- If M is + then the image is Upright and Virtual.
- If M is – then the image is Inverted and Real

- An object is placed at 30 cm in front of a converging lens. The focal length of the lens is 10 cm. Find the image distance and the Magnification. Is it real or virtual?

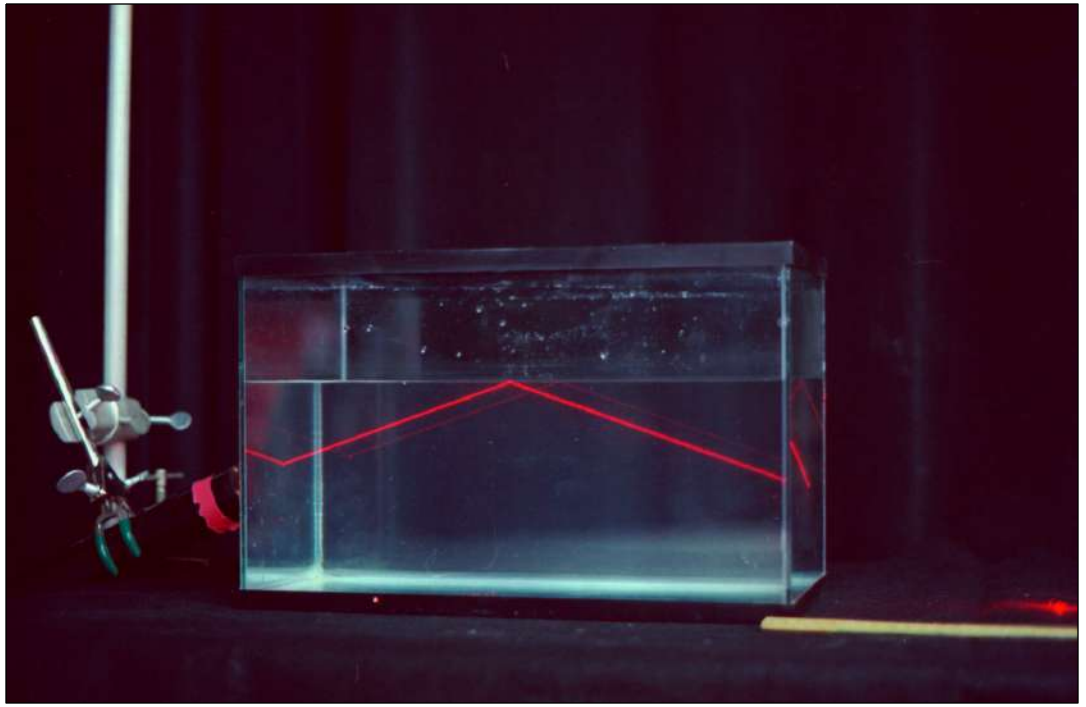
# Total Internal Reflection

- Total Internal Reflection can occur when light moves along a path from a medium with a higher index of refraction to one with a lower index of refraction



# Critical Angle

- At some particular angle of incidence, called the critical angle, the refracted ray moves parallel to the boundary, making the angle of refraction equal to a 90 degree angle.



# Critical Angle Equation

- Sine of Critical Angle = index of refraction of $2^{nd}$ medium / index of refraction of $1^{st}$ medium
- $\sin\theta_c$ = Index of Refract $_1$ / Index of Refract $_2$

Find the critical angle for a water-air boundary if the index of refraction of water is 1.5 and the index of refraction for air is 1.00.