

# Optics

## Textbook

*Physics: Principles with Applications* (2009), Chpt. 23-24

## Homework/Activities

- |                                      |            |
|--------------------------------------|------------|
| <input type="checkbox"/> Worksheet 1 | Due: _____ |
| <input type="checkbox"/> Worksheet 2 | Due: _____ |
| <input type="checkbox"/> Worksheet 3 | Due: _____ |
| <input type="checkbox"/> Worksheet 4 | Due: _____ |
| <input type="checkbox"/> Worksheet 5 | Due: _____ |
| <input type="checkbox"/> Worksheet 6 | Due: _____ |

## Concepts/Topics

- Law of Reflection
- Index of refraction, Snell's Law ( $\Delta$ wavelength,  $\Delta v$ , draw diagrams, chromatic aberration)
- Total internal reflection
- Ray tracing (plane and spherical mirrors)
- Focal point and center of curvature (spherical mirror)
- Images: real vs. virtual, upright vs. inverted, reduced vs. enlarged
- Mirror equation (object distance, image distance, focal length, magnification)
- Images of objects inside or outside focal point of lens
- Thin lens equation (object dist., image dist., focal length, magnification)
- $\Delta$  in focal length due to  $\Delta$  in lens curvature,  $\Delta$  index of refraction, or  $\Delta$  in immersion medium
- Compound lenses (image of one lens is object of next)
- Interference - mult. sources (constructive/destructive interference, maxima/minima, intensity)
- Diffraction: single-slit, double-slit, grating (slit width, wavelength, patterns, why use grating for  $\lambda$ ?)
- Thin film interference
- Electromagnetic spectrum (bandwidths by increasing wavelength)

## Web Resources

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|---|--|
| Reflection/Refraction (BrightStorm)     | <a href="http://www.youtube.com/watch?v=Jvwm4hlzYmo">www.youtube.com/watch?v=Jvwm4hlzYmo</a>                                   |
| Snell's Law (HyperPhysics)              | <a href="http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/refr.html">hyperphysics.phy-astr.gsu.edu/hbase/geoopt/refr.html</a> |
| Snell's Law (PhET)                      | <a href="http://phet.colorado.edu/en/simulation/bending-light">phet.colorado.edu/en/simulation/bending-light</a>               |
| Snell's Law (WolframAlpha)              | <a href="http://www.wolframalpha.com/input/?i=Snell%27s+law">www.wolframalpha.com/input/?i=Snell%27s+law</a>                   |
| Refraction and Snell's Law (Khan)       | <a href="http://www.youtube.com/watch?v=y55tzg_jW9I">www.youtube.com/watch?v=y55tzg_jW9I</a>                                   |
| Snell's Law (BrightStorm)               | <a href="http://www.youtube.com/watch?v=M5EW15BOy-c">www.youtube.com/watch?v=M5EW15BOy-c</a>                                   |
| Total Internal Reflection (Khan)        | <a href="http://www.youtube.com/watch?v=WRuatAcd2WY">www.youtube.com/watch?v=WRuatAcd2WY</a>                                   |
| Ray Diagrams (BrightStorm)              | <a href="http://www.youtube.com/watch?v=H-ss4NjzTZc">www.youtube.com/watch?v=H-ss4NjzTZc</a>                                   |
| Virtual Images (Khan)                   | <a href="http://www.youtube.com/watch?v=y55tzg_jW9I">www.youtube.com/watch?v=y55tzg_jW9I</a>                                   |
| Physics Mirrors (BrightStorm)           | <a href="http://www.youtube.com/watch?v=BmHK25Mts3I">www.youtube.com/watch?v=BmHK25Mts3I</a>                                   |
| Physics Lenses (BrightStorm)            | <a href="http://www.youtube.com/watch?v=JJNV1SF1v30">www.youtube.com/watch?v=JJNV1SF1v30</a>                                   |
| Converging Lenses (Physics Classroom)   | <a href="http://www.physicsclassroom.com/class/refrn/u1415da.cfm">www.physicsclassroom.com/class/refrn/u1415da.cfm</a>         |
| Converging Lenses (Walter Fendt)        | <a href="http://www.walter-fendt.de/ph14e/imageconvlens.htm">www.walter-fendt.de/ph14e/imageconvlens.htm</a>                   |
| Convex Lenses (Khan)                    | <a href="http://www.youtube.com/watch?v=K0sjZ5nqQ7g">www.youtube.com/watch?v=K0sjZ5nqQ7g</a>                                   |
| Concave Lenses (Khan)                   | <a href="http://www.youtube.com/watch?v=Vh70PyitQzo">www.youtube.com/watch?v=Vh70PyitQzo</a>                                   |
| Lens Equation (BrightStorm)             | <a href="http://www.youtube.com/watch?v=Pi02n_lteXA">www.youtube.com/watch?v=Pi02n_lteXA</a>                                   |
| Image and Focal Distance (Khan)         | <a href="http://www.youtube.com/watch?v=rse0I7rZ8jM">www.youtube.com/watch?v=rse0I7rZ8jM</a>                                   |
| Single Slit Diffraction (Walter Fendt)  | <a href="http://www.walter-fendt.de/ph14e/singleslit.htm">www.walter-fendt.de/ph14e/singleslit.htm</a>                         |
| Double Slit Interference (Walter Fendt) | <a href="http://www.walter-fendt.de/ph14e/doubleslit.htm">http://www.walter-fendt.de/ph14e/doubleslit.htm</a>                  |
| Double Slit Experiment (BrightStorm)    | <a href="http://www.youtube.com/watch?v=aG1cM4BktlA">www.youtube.com/watch?v=aG1cM4BktlA</a>                                   |
| Diffraction Grating (WolframAlpha)      | <a href="http://www.wolframalpha.com/input/?i=diffraction+grating">www.wolframalpha.com/input/?i=diffraction+grating</a>       |
| Thin Film (Sioux Falls Physics)         | <a href="http://www.youtube.com/watch?v=RDurf2m1xhw">www.youtube.com/watch?v=RDurf2m1xhw</a>                                   |