Mr. Jenkins Physics I

Assignment Sheet
Waves and Light

Objectives
You will be able to:
Geometric Optics (Chapter 26, 27)

A. Define or explain laws of reflection and refraction, wave front, ray, real and virtual image, focal point and focal length, index of refraction, total internal reflection, critical angle, object distance, image distance, radius of curvature, converging and diverging mirrors and lenses, magnification, diffraction, and resolution.
   Use ray diagrams to locate images for plane and (convex and concave) spherical mirrors. Give the characteristics of the image in any given case (orientation and magnification).
B. Use Snell's Law in simple situations.
   Compute the index of refraction for a medium when the speed of light is given, and vice versa.
   Explain total internal reflection. Calculate the critical angle for total internal reflection.
   Explain dispersion and the formation of rainbows.
C. Use ray diagrams to locate images for thin lenses or curved mirror. Give the characteristics of the image in any given case (orientation and magnification).
   Use the lens or mirror equation to calculate focal length, image distance, or object distance when given any two of the three. Relate the focal length to the radius of curvature for a spherical mirror.
   Explain spherical aberration.

Physical Optics (Chapter 25, 28, 30)

D. Understand the relationship between frequency and wavelength for light.
   Recognize that visible light is only a small portion of the overall E-M spectrum.
   Relate intensity and distance from the source for an electromagnetic wave.
   Explain the Doppler effect for light.
E. Relate the rods and cones of the human eye to vision. Connect cones and reflected light to color vision primary colors and primary pigments.
   Explain why certain natural phenomena show particular colors. (sunset color, sky color)
F. Explain the ray model of light and the change in illumination with distance.
   Explain the relationship between constructive and destructive interference and the double slit experiment.
   Explain the photoelectric effect.
   Explain the concept of particle-wave duality.
   Explain the relationship between constructive and destructive interference and thin films.
   Explain the importance of diffraction to the ability of optical devices to observe detail.
   Explain and discuss the functioning and importance of polarized films.

Reading

A. 26-1, The Reflection of Light, p. 908–909
   26-2, Forming Images with a Plane Mirror, p. 909–912
B. 26-5, The Refraction of Light, p. 921–928
C. 26-6 Ray Tracing for Lenses, p. 928–931
   26-7, The Thin-Lens Equation, p. 931–933
   26-8, Dispersion and the Rainbow, p. 933–935
   27-1, The Human Eye and the Camera, p. 948–951
   26-3, Spherical Mirrors, p. 912–914
   26-4, Ray Tracing and the Mirror Equation, p. 914–921
D. 25-3, The Electromagnetic Spectrum, p. 881–884
   Inverse-Square Law for Radiation, notes
E. Color, notes
   Why is the Sky Blue?, 885–886
F. Illumination, p. 431–438
   28-1, Superposition and Interference, p. 977–979
   28-2, Young's Two-Slit Experiment, p. 979–983
   28-3, Interference in Reflected Waves, p. 983–990
   28-4, Diffraction, p. 990–993
   28-5, Resolution, p. 993–996
   28-6, Diffraction Gratings, p. 997–1000
   25-5, Polarization of Light, p. 889–896
   25-2.2 Doppler Effect, p. 879–880
   30-2, Photons and the Photoelectric effect, p. 1050–1056
   30-5, Wave-particle duality of light, p. 1010–1011, 1060–1068
   Note: The Phet applets are great. See the web site