

Today	Ch 27 Wave Optics, Ch29 Wave & Particles	HW24Redo; HW26
Wednesday	Ch 28 Relativity 1 st 1/2	HW 25Redo; HW 27
Lab	# 8 Wave Optics	

This Time**27.7 CD / DVD discs**

- Records
- CD's
- Interference:

27.1 Resolving Power / Diffraction limit

- Implication – ‘Bridge Out’ on the SIA Road to Miniaturization

Example 1: Astronomy. Two asteroids are traveling close to each other through the solar system at a distance of 2.0×10^{10} m from the Earth. With light of wavelength 550 nm, they are *just* resolved by the Hubble Space Telescope, whose aperture has a diameter of 2.4 m. How far apart are the asteroids?

27.2 The Diffraction Grating**Application – Spectroscopy**

- CD's The familiar rainbow on the surface of a CD

Example2: Light reflected form a CD. If light is incident perpendicularly on the surface, and the grooves in the disc are $1.1 \mu\text{m}$ apart, then at what angle would the first – order (a) red (660 nm) light and (b) violet (410 nm) light reflect?

- Spectroscopy.

27.9 X-Ray Diffraction**Chapter 29 Particles and Waves****Introduction****29.2 Blackbody Radiation and Planck's constant**

- Blackbody Radiator
- Blackbody Radiation:
- The sun
- You
- Quantization
 - Einstein
 - Photons
 - **Example: Photons** How much energy does a photon from our red laser ($\lambda = 634 \text{ nm}$) have?

HW 27

28. You are looking down at the earth from inside a jetliner flying at an altitude of 8690 m. The pupil of your eye has a diameter of 2.00 mm. Determine how far apart two cars must be on the ground if you are to have any hope of distinguishing between them in (a) red light) (wavelength = 665 nm in vacuum) and (b) violet light (wavelength = 405 nm in vacuum).
33. Astronomers have discovered a planetary system orbiting the star Upsilon Andromedae, which is at a distance of 4.2×10^{17} m from the earth. One planet is believed to be located at a distance of 1.2×10^{11} m from the star. Using visible light with a vacuum wavelength of 550 nm, what is the minimum necessary aperture diameter that a telescope must have so that it can resolve the planet and the star?
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40. A diffraction grating has a total width of 1.50 cm, divided into 2400 equally spaced lines. When used with light of a certain wavelength, a third-order maximum is formed at an angle of 18.0° . What is the wavelength (in nm)?